

BRAWIJAYA INTERNATIONAL
CONFERENCE ON MULTIDISCIPLINARY
SCIENCES AND TECHNOLOGY

PROCEEDINGS

**BRAWIJAYA
INTERNATIONAL
CONFERENCE ON
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SCIENCES AND
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SUSTAINABLE FUTURE FOR HUMAN AND
NATURAL RESOURCES AND DEVELOPMENT

B²⁰²⁰CMST

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UJ Mengabdikan Diri Untuk Bangsa

FORWADEK II

Foreword

Dear conference participant, presenter, and guest,

Good day,

The first ***Brawijaya an International Conference on Multidisciplinary Sciences and Technology*** (BICMST 2020) is a conference that covered multidisciplinary studies. The conference is aimed to increase the understanding on multidisciplinary knowledge and to find the red line between each disciplinary in order to have comprehensive understanding about human and nature. In the BICMST 2020, we organized a technology development, medical science, life science, environment, advance in economy, law, human resource, education, social media, institution cooperation, etc. We also invited nine specialists from different countries as speakers. All of the invited speaker has different specialist and will presenting their research in the BICMST.

The BICMST is organized by the Forum of Vice Dean for General and Finance Affairs Universitas Brawijaya Malang (FORWADEK UB) with the theme of "Sustainable Future for Human and Natural Resources Development". By this conference, we would like to make a stand in the development of human sustainable through the knowledge and advancing the resource quality and development.

For all participants, I am very grateful with all of your participation and attending in this conference. I hope you to enjoy your stay in Malang city. There is a lot of tourism destiny in this city and I wish you all could visit them during your stay. Now, on behalf of BICMST organizing committee, I warmly welcome you in Universitas Brawijaya, Malang in the first Brawijaya an International Conference on Multidisciplinary Sciences and Technology 2020.

Sincerely yours

Prof. Sukir Maryanto, S.Si., M.Si., Ph.D

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Fluctuating Nutrition, Gut Microbiomes, And Parasite Infections in Wild Bornean Orangutans

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New Approaches in Investigating the Activity of Compounds from Natural Source: Strategies for Antimalarial Drug Discovery

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Innovation of the Local Government Implementation and Development in the Catchment Area Perspective

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Table of Contents

BICMST 2020 Organizing Committee	i
BICMST 2020 Editorial Board	iii
BICMST 2020 Keynotes	iv
G Environmental Budget Policy Analysis Using the Budget Tagging Model in Gresik Regency Badrudin Kurniawan, Muhammad Farid Ma'ruf, Eva Hany Fanida, Fitrotun Niswah, Deby Febriyan Eprilianto	1
A Conceptual Study on Business Performance Influenced by Three Exogenous Variables and Its Implications on Competitive Advantage (A Study on Overseas Education Consultation in Indonesia) Rianto Nurcahyo, Tirta Mursitama, Engkos Kuncoro, Setyo Wijanto	8
Ceper Foundry Industries, Technology Management Readiness for Industrial Revolution 4.0 Vivin Zulfa Atina, Anas Yusuf Mahmudi, Hamid Abdillah	14
Diagnosis and Analysis of Intrapreneurship Based Professionalism to Bridging the Culture Gap Innovation Approach the Theory of Importance Performance Analysis (IPA) Indi Djastuti, Amie Kusumawardhani, Mahfudz	18
GraEffect of Training and Job Satisfaction on Employees Performance and Company Performance in Support to Achieve The Internationalization Model of SME's Competitive Advantage Indi Djastuti, Mahfudz, Daryono, Lela Lestari	25
An Exploration of An Entrepreneurial Strategy in A Resource-Constrained Region: A Case Study of Cocoa Bean-To-Bar Business Venture in Aceh Yulia Annisa, Yandra Arkeman, Elisa Anggreani, Muhammad Ikhsan Sulaiman	32
The Role of Cultural Values in Networking Process of a Female Entrepreneur in Aceh: Study Case Gayo Coffee Industry Yuna Putri Berkah, Sukardi Sukardi, Aji Hermawan, Muhammad Ikhsan Sulaiman	38
Analysis The Readiness of Integrated Reporting of Mining Company in Indonesia Gita Astyka Rahmanda, Indah Kartika Sandhi, Zuhrotun	44
Is Inbound Marketing the Right Choice in Industrial Revolution 4.0 Era? Grace Nanda Priasti, Annisa Qurrota A'yun, Hanifah Ihsaniyati	49
Impact of Alternative Feed Technology Utilization, Between The Increase in Feed Cost and Revenue on Rural Cattle Farming	54

Richard E.M.F. Osak, Meiske L. Rundengan, Tilly F.D. Lumy	
The Comparison Effect Among of Red Ginger (<i>Zingiber officinale</i> var. <i>rubrum</i>) Rhizome, Tetracycline and Stimuno Forte® on the Total Fecal Bacterial Count of Broiler Chicken on Starter Stage Herawati, Fajar Shodiq Permata, Agri Kaltaria Anisa, Analita Puspabela	58
Morphological and Pasting Properties of Talas Beneng (<i>Xanthosoma undipes</i> K. Koch) Flour Nia Ariani Putri, Rifqi Ahmad Riyanto, Slamet Budijanto, Sapta Raharja	63
Replanting Model of Palm Oil With Paludiculture System on Peatland in South Kalimantan (Soil Physical Characteristics and Optimize Analysis) Taufik Hidayat, Fakhurrozi, Yudi Ferrianta, Rifiana	68
Exploring Antibacterial of Pulutan (<i>Urena lobata</i> Linn) Leaf Extract to Acne-Causing Bacteria Ummu Farah Fadillah, Erliza Hambali, Muslich	76
Learning Development Model of Pandhalungan Community Empowerment Program Through Training in Summersari District, Jember City Sylva Alkornia, Niswatul Imsiyah, Fuad Hasan	82
Politeness-Oriented Teaching Materials of L2 Indonesian for Foreign Learners Laili Etika Rahmawati, Yunus Sulistyono	89
Developing Visual-Novel Based Learning Application “简单故事” to Enhance Mandarin Vocabulary Skill Ressi Maulidina Delijar, Irine Cyntia Firdasari, Ahmad Faiz	96
Indonesian Undergraduate EFL Students’ Challenges in Writing Research Proposal Amanda Vira Maharani, Hilda Yustitiasari	103
Performance Accuracy Method of Machine Learning for Diabetes Prediction Dwi Harini Sulistyawati, Ali Murtadho	107
Sentiment Analysis on Ratu Boko Temple Tourist Perceptions Based on Review Content on TripAdvisor Website Edy Widodo, Mega Luna Suliztia, Putri Choirunisa, Rizka Yolanda Werdiningsih Wiyono	112
Analyze Clustering Province Based on Indicator of Social Welfare Using Self Organizing Maps (SOM) Clustering Algorithm Septian Wulandari, Nurfidah Dwitiyanti	118

Development of Digital Document Centralization System by Utilizing Cloud Technology Lailyn Puad, Rike Limia Budiarti, Windy Adriana	125
Design Simulation of Multi-Cell Hexagonal Crash Box with Holes Under Frontal Load Muhammad Rismanto, Moch Agus Choiron, Sugiono	130
User Acceptance of Knowledge Capture System: A Case Study in Agency for the Assessment and Application of Technology Prabu Kresna Putra, Abdullah Jamil, Mohammad Rizky Adrian, Dana Indra Sensuse, Sofian Lusa	135
Prediction Preventative Measures for Coronary Heart Patients Using K-Nearest Neighbor Algorithm Apri Junaidi, Sri Hayani, Ade Rahmat Iskandar	141
Organizational Culture Analysis for Knowledge Management: A Case Study on Ministry of Trade of the Republic of Indonesia Muhammad Rizki Pohan, Wahid Nurfiantara, Muhammad Alam Pasirulloh, Dana Indra Sensuse, Jonathan Sofian Lusa	145
Pattern Recognition of Mathematical Symbols Using Back Propagation Networks Abduh Riski, Ramadhani Rizky Kurniawan, Ahmad Kamsyakawuni	152
Comparison of Classification Methods for Handling Data Imbalanced in Dataset of Public Complaints SMS Based Using The SMOTE Approach Sulian Mozes Lukito Sedubun, Teguh Bharata Adji, Noor Akhmad Setiawan	156
An Automated Scoring Tool of Originality for Torrance Test of Creative Thinking-Figural Form Yeni Anistiyasari, Ekohariadi, IGP Asto Buditjahjanto, Luthfiyah Nurlaela	162
Parameter Estimation and Hypothesis Testing of Path Quadratic Using Ordinary Least Square (OLS) Annisa Larasati, Solimun, Adji Achmad Rinaldo Fernandes	167
Conceptual Model for Gamification of Sustainable Academic Administration Service System Beny Rustam, Indriana Hidayah, Silmi Fauziati	171
Managing High Availability of Strategic IT Service Case Study: BPS-Statistics Indonesia Muhammad Hiyar Syafaruddin, Abdullah Jamil, Mohamad Yusup Dias Ibrahim, Viktor Suwiyanto, Muhammad Rifki Shihab	176

<p>Role of Youth in Disaster Risk Reduction in Sinabung Eruption Areas Yesi Chairani Tanjung, Rizki Ramadhani Nasution, Erika Revida Saragih</p>	181
<p>Disaster Nursing Competencies in Disaster Management Rugaya M. Pandawa, Achmad Ridwan, Mahdiyah</p>	188
<p>Land Surface Temperature (LST) for Detecting Lava Flow in Gunung Anak Krakatau, Study Case Eruption in 2018 Cholisina Anik Perwira, Sukir Maryanto, Wasis, Muhammad Ghufro</p>	192
<p>Seismic Ray Tracing for Subsurface Structure Modelling of The Arjuno-Welirang Outflow Zone Daeng Achmad Suaidi, Sukir Maryanto, Didik Rahadi Santoso, Agus Naba</p>	196
<p>Optimization of Solar Cell as Alternative Energy in Water Treatment Plant Fadhillah Hazrina, Dodi Satriawan, Joko Setia Pribadi</p>	201
<p>Prototype of Data Logger as A Wind Energy Monitoring Miftachul Ulum, Kunto Aji</p>	206
<p>Start Priority Determination Methode of Gas Turbine in Block System of Combine Cycle Power Plant (Case Study: PT PJB Unit Pembangkitan Gresik) Purwasito, Mohammad Isa Irawan</p>	211
<p>Simulation of Syngas Production through Plasma Gasification from Indonesia's Low-Grade Coal as a New Energy Priyo Adi Sesotyo, Muhammad Nur, Oki Muraza</p>	216
<p>A Review on Recent Chemical Technology Developed for Real-Time Monitoring of Heavy Metal Ions in Water Layta Dinira</p>	222
<p>Aluminum Bioleaching from Water Treatment Sludge Using <i>Penicillium Simplicissimum</i> and <i>Aspergillus Niger</i> Dita Rifka Annisaa', Yulinah Trihadiningrum, Rizkiy Amaliyah Barakwan</p>	228
<p>The Effect of using Open-Plan Workspaces on Employee Performance of Interior Architecture Consultant (Case Study : Fine Team Studio, Jakarta) Sandra Ayu Permatasari Gunawan, Dyah</p>	233
<p>Bioleaching of Aluminum in Drinking Water Sludge Using <i>Acidithiobacillus ferrooxidans</i> and <i>Pseudomonas fluorescens</i> Triadna Febriani Aabidah, Yulinah Trihadiningrum, Rizkiy Amaliyah Barakwan</p>	239

<p>The Role of Supply Chain Integration to Improve SMES Performance – A Case Study of The Fisheries Industry in Aceh Rizki Agam Saputra, Machfud, Titi Candra Sunarti, Muhammad Ikhsan Sulaiman</p>	245
<p>Static Analysis of FGM Plate Using MITC3 Element Budiman, Imam Jauhari Maknun</p>	251
<p>Static Analysis of FGM Plate Using DST-BK Element Faisal Nuradi, Imam Jauhari Maknun, Irwan Katili</p>	257
<p>Static Analysis of FGM Plate Using DST-BL Element Gloria Zefanya Rilatupa, ²Imam Jauhari Maknun</p>	263
<p>The Importance of Customary Law in Indonesia That Protected by National Law Mohammad Yufi Al Izhar, Arrum Widowati, Alleandria La Graha, Ridwan Arifin</p>	269
<p>The Importance of Law Enforcers to Know Legal Psychology in the Investigation Process Dijan Widijowati, Rizky Purnomo Adji</p>	273
<p>Application of The Nesting Method to Baby with Low Birthweight (LBW) Wuri Utami, Ning Iswati, Sri Abdi Lestari</p>	278
<p>Effectivity PRP Using USG Guided Method in Morbus Hansen with Polyneuropathy : A Serial Case Shahdevi N.K., Ika A., Widodo M., Badrul M.</p>	282
<p>Histoid-Type Leprosy Polyneuropathy : A Case Report Shahdevi N.K., Brisda O.D., Machlusil H., Neila R.</p>	288
<p>Effectiveness mHealth Improves Adolescent Health: A Systematic Review Nurimeta Nurfiandi, Dian Ayubi</p>	292
<p>Tumefactive Multiple Sclerosis Mimicking Brain Tumors: Case Report Shahdevi N.K., Ariesia D.C., Rianawati S.B.</p>	297
<p>Employee's Based Program to Support Breastfeeding at Workplace: Systematic Review Meita Ilyana, Dian Ayubi</p>	301
<p>The Development Concept on Ecology Citizenship on The Community of Gunung Sewu Feri Taupik Ridwan, Dewi Gunawati, Rini Triastuti</p>	307

Simulation of Integrated Water Resources Management Scenarios in Unda Watershed Using Water Evaluation and Planning (WEAP)

Made Widya Jayantari, Nadjadji Anwar, Mahendra Andiek Maulana

312



G Environmental Budget Policy Analysis Using the Budget Tagging Model in Gresik Regency

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ABSTRACT

Gresik Regency is an industrial city in East Java Province. High economic growth in the district is also accompanied by increasingly severe environmental damage. Ironically, a number of cases show that local governments have very limited environmental functions in the public budget. Furthermore, local government did not has yet ability to identify cross-department environmental budget. These facts encourage researchers to study the Gresik Regency Government's budget policy for environmental functions. This study uses budget tagging techniques. It comprises three step namely input, process and output. Input process analyzes direction and goal of environmental development. Process phase tags budget allocated to the direction. Output step calculates the total number of tagged budget. Data mainly used by researchers are secondary one. The results of the study describe that the regional development planning document both long term and short term has determined several directions of environmental development. The funds allocated to reach the direction of environmental development reached more than two hundred billion (2014-2018). In that period the regional government was able to absorb the budget up to 80.3 percent of the total environmental function budget ceiling. The amount and percentage of budget realization in the period of 5 years is fluctuating.

Keywords: direction of environmental development; environmental budget; budget tagging.

INTRODUCTION

High economic growth rates have always been an indicator of the achievements of a government. Although economic growth does not always have a positive impact on every aspect. So far, economic growth in Indonesia tends to be accompanied by a decrease in environmental quality. Even though economic sustainability is also strongly influenced by good environmental quality (id.beritasatu.com). This is in line with what was conveyed by Professor of the Faculty of Social and Political Sciences (FISIP) Padjadjaran University, Prof. Oekan S. Abdoellah, M.A., PhD, namely improving the Indonesian economy at this time still relies on the

massive exploitation of natural resources which is a threat to environmental sustainability [1].

Meanwhile the budget allocation on the composition of environmental functions on central government spending tends to be stagnant. In the last five years, the development of the environmental function budget in the APBN has increased but its composition of the total central government expenditure has been relatively stagnant. The average environmental expenditure in the period 2010 to 2014 was below one percent [2].

At the regional level, Gresik Regency is one of the industrial cities with rapid economic growth. This economic growth is also accompanied by a decrease in the quality of the environment. Based on the Regional Environmental Management Performance Index (IKPLHD), in 2017, air quality in Gresik

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Regency is also in the lowest category. From the same data also shows the damage to coral reefs in this district. Damage to coral reefs is increasing. In 2016, coral reefs were damaged up to 90.37% then in 2017, the level of damage rose to 99.65%.

The Gresik Regency Government still needs a lot of improvements in various aspects to improve the quality of the environment. Related to the management of B3 waste in Gresik, skills upgrading for Environmental Department employees is carried out through training and workshops. Both of these activities are usually carried out by the agency itself or in collaboration with the Ministry of Environment and Forestry. But this activity is carried out in a very limited frequency. This is more due to limited official funding itself [3].

Budget limitations seem to be the main problem in environmental management in Gresik. Several years earlier it was also found that budget limitations were also a problem of this program. In 2008, monitoring activities carried out by BLH Gresik on the level of air pollution were still weak due to budget constraints, and the minimal number of monitoring officers. In the same year BLH Gresik submitted a proposal to purchase a measure of the quality of air pollution to the district government but could not yet be realized due to the high price of the equipment. Even though as an industrial city Gresik should have the tool. Not only that, the emissions test alone is not allocated a budget. The ambient test, which should be done twice a year in the rainy and dry seasons, is only done once [4].

Gresik Regency has actually also drawn up a Green City Regional Action Plan (RAD). But the RAD that has been set cannot be implemented optimally. According to the confession of the Secretary of the Gresik Regency Development Planning Board, the non-implementation of the RAD is related to the priority of budget allocations not intended for the function of environmental protection and preservation. The design of environmental-based fiscal policies in the regions depends on the budget politics of the local government. In local governments that do not have a good commitment in environmental management and protection, then in allocating their budget is not proportional and effective.

Based on the problems, the research strengthen the environmental-based fiscal policy

of the Gresik Regency Government. This is done by researching the environmental budget policy of the Gresik Regency Government. This research was conducted using the budget tagging method, which is a method of tagging the use of the budget. Precisely, in this context, budget tagging is carried out to see how much planned public budget allocations can be effectively and efficiently used to achieve sustainable development goals. This method is still not widely used by regional governments, including the Gresik District Government, so data on the alignment of budget allocations for environmental protection functions is not widely available. Therefore, the researcher wants to use this method to find out the design policy of the Gresik Regency Government budget for environmental protection.

METHOD

This research data includes data in the following documents: (1) Gresik Regency RPJPD 2005-2025; (2) the RPJMD of Gresik Regency 2010-2015 and the period 2016-2021; (3) Budget Utilization Documents (DPA) from OPD-OPD Environmental Function Budget Managers from 2014-2018. The determination of these OPDs is based on the direction of the environmental development policy stated in the Gresik Regency RPJMD.

The object of this research is the application of an environment-based budget in Gresik Regency. Regional apparatus organizations (OPD) that are the object of research are the Environmental Agency (BLH), the Regional Development Planning, Research and Development Agency (Bappeda), the Agriculture, Plantation and Forestry Office, the Public Works Office, the Cooperative Office, Industry and Trade, the Office Maritime Affairs, Fisheries and Animal Husbandry, Education Office and Health Office.

The approach used in this study is the budget tagging approach, namely tagging the use of the budget. This approach is to determine the direction of budget policy and measure the effectiveness or impact of the use of a budget. Budget tagging can serve to identify and calculate the proportion of local government expenditure allocated and realized. For local governments budget tagging can help carry out monitoring, evaluation, and reporting of targets and performance of budget achievements.

There are three stages of analysis carried out in this study, namely input, process and output. Input is part of the unit of analysis to look at the politics of the environmental budget in Gresik Regency. Here the researcher analyzes the direction of environmental development in the Gresik Regency's RPJMD. To carry out the direction of environmental development, eight OPDs were established. All of these OPDs become objects of analysis in the use of environmental functions. The process is the tagging stage. All budget usage data (DPA) from the five OPDs was tagged. Tagging stage: enter the name of the program and activity which are adjusted to the direction of the goal of environmental development. Next, the researcher examines the DPA/DPPA and includes a classification of impacts (direct and indirect impacts). Output is calculating the budget amount based on the tagging. The classification is the eight directions of environmental development and the classification of impacts.

RESULTS AND DISCUSSION

1. Environmental Development Issues in the Regional Development Planning Framework

The Regional Development Vision of Gresik Regency in 2005-2025 is: Gresik which is Religious, Dynamic, Democratic, Fair, Safe, and Prosperous. The vision statement stated in the 2005-2025 Long Term Development Plan (RPJP) document does not clearly state that environmental development is the concern of the regional government. However, if we look more closely, this environmental development is stated in the direction of development chapter. This direction of development will later become a reference in the preparation of the Regional Medium-Term Development Plan (RPJMD). The development directions listed in the RPJP include [5]

- a Industrial development with an environmental perspective
- b Conservation of water resources
- c Settlement construction that takes into account environmental functions
- d Development of sustainable facilities and infrastructure
- e Management and protection of natural resources

- f Enhancing education and environmental awareness campaigns

Although in the RPJPD several directions of development have been determined, but in the derivative documents namely the RPJMD document the direction of development is detailed and not all development directions in the RPJPD appear in each RPJMD document. Previously, in the research method it was stated that the budget tagging of the Budget Implementation Document (DPA) was carried out in the period 2014 to 2018. Therefore, the researcher identified the direction of environmental development stipulated in the 2010-2015 RPJMD and 2016- RPJMD 2021. Following are the directions of environmental development that have been formulated in the second RPJMD of the period.

In the 2010-2015 RPJMD document, it was stated that one of the five-year period development missions in Gresik Regency was to increase economic growth with an environmental perspective. Regional governments not only prioritize economic growth but also pay attention to the issue of environmental protection. Based on this mission, development goals and objectives are then formulated. Based on this formulation, at least it can be determined that the direction of environmental development includes (1) Protection of forests and land; (2) Prevention of environmental pollution; (3) Waste Management and increasing community participation in handling the problem; and (4) Management of energy and mineral resources based on environmental friendly principle [6].

In contrast to the RPJMD in the following period, the direction of environmental development was expanded. In the 2016-2021 RPJMD document, there are at least 8 directions for environmental development. There are 8 directions of environmental development listed in the 2016-2021 RPJMD document of the Gresik Regency Government, namely (1) disaster management; (2) environmental education; (3) environmental friendly fisheries production; (4) environmental friendly transportation; (5) environmental friendly infrastructure development; (6) preservation and conservation of forests, degraded land and natural resources; (7) sustainable agriculture; and (8) sustainable use of regional energy and mineral resources. Besides indicating an increase

in budgetary allocations for environmental functions, the increasing number of directions for environmental development has the potential to invite the involvement of many DPOs who have responsibility for environmental issues [7].

2. Budget Allocation for Environmental Management

From the results of the tabulation of the Gresik Regency Government budget data from 2014 to 2018, it can be seen that the allocated budget for the environmental sector fluctuates. From 2014 to 2018 there was a decline and an increase in both targets and realization. Where the 2014 target of Rp. 29,624,350,500.00 has decreased its target in 2015 of Rp. 20,417,896,000.00. Whereas in 2016 there was a fluctuating increase of Rp. 83,230,203,375.00 and also increased in 2017 by Rp. 90.866.287.337, 00. Furthermore, the target for 2018 will decrease by Rp. 33,187,601,000.00.

This also happened to the realization of the budget that has increased and decreased. Where in 2014 the realization of Rp. 27,002.505,476, 00 decreased in 2015 amounting to Rp. 17,793,783,068.00. Whereas in 2016 there was a significant increase of Rp. 52,978,657,138.00 and in 2017 also increased by Rp. 79,858,726,952.00. Furthermore, the realization in 2018 decreased by Rp. 30,258,996,213.00.



Target data and realization of the environmental budget in the Gresik Regency Government from 2014 to 2018 can be seen in the graph below.

Figure 1. Target and Realization of the Environmental Budget in Gresik District Government in 2014-2018

Source: author's document

3. Environmental Budget Allocation according to the Direction of Environmental Development

The increased budget allocation for environmental protection experienced a significant increase in 2016. This was due to an expansion in the direction of environmental development. Based on the identification of the directions of environmental development in the two RPJMD documents with different periods, the 2011-2015 RPJMD contains 4 directions of environmental development and the 2016-2021 RPJMD contains 8 directions of development as discussed in the previous sub-chapter. The following will discuss the budget allocation for environmental functions based on the direction of environmental development per year.

Table 1. Environmental Budget Allocation According to the Direction of Development in 2014 and 2015
Source: author's document

No	Directions of Environmental Development	2014		2015	
		Target	Realization	Target	Realization
1	Protection of forests and land	1,644,987,600	1,508,985,260	1,901,931,000	1,399,540,825
2	Prevention of environmental pollution	14,463,973,400	12,468,820,051	12,883,965,000	10,948,596,862
3	Waste Management and increasing community participation in handling the problem	13,383,232,000	12,893,737,615	5,482,000,000	5,298,420,181
4	Management of energy and mineral resources based on environmental friendly principle	132,157,500	130,962,550	150,000,000	147,225,200
Total		29,624,350,500	27,002,505,476	20,417,896,000	17,793,783,068

The table above shows the amount of budget allocation for each direction of development in 2014 and 2015 varies. In addition to the various budget allocations, in the time span there are development directions that have decreased but some have increased budget realization. There are 3 development directions that have decreased budget realization namely (1) Forest and land protection; (2) Prevention of environmental pollution; and (3) Waste Management and increasing community participation in handling the problem. While there is only 1 direction of development that has increased realization, namely the direction of development of energy management and mineral resources based on environmental friendly principle.

As explained previously that there are differences in the direction of development between 2014-2015 and 2016-2018. The number of directions for environmental development in the 2016-2018 period is higher than in 2014-2015. This change also had an impact on increasing the budget allocation for environmental functions. Based on interviews with the Secretary of the Regional Development Planning Board of Gresik Regency, the addition of the direction of environmental development was motivated by the increasing level of environmental damage.

Total budget allocation for the environmental function in 2016 experienced a

significant increase compared to previous years. But in 2017 to 2018 almost all budget realization for each direction of development has decreased. There are 6 development directions that have decreased budget realization, namely (1) Disaster Management; (2) Environmental Education; (3) Environmental Friendly Infrastructure Development; (4) Environmental Friendly Transportation; (5) Preservation and conservation of forests, critical land and natural resources; and (6) Sustainable Agriculture. Not all of the six development directions have decreased each year, there are some that have increased. While there is only 1 direction of development that has increased budget realization, namely the direction of development of Environmental Friendly Fisheries Production, although in 2016 and 2017 there are no budgeted programs in the direction of development. There are even development directions that have not yet been allocated a budget, namely for the direction of development of Sustainable Utilization of Regional Energy and Mineral Resources.

4. Environmental Budget Allocation according to Impact of Budget Use

Impacts on budget use can be divided into 2 categories namely Direct Impacts and Indirect Impacts. Programs or activities that have a direct impact such as the procurement of goods or the construction of a particular technology intended

for the community and used for environmental protection such as the provision of facilities and infrastructure for waste management, construction of landfills, procurement of seeds, provision of infiltration wells and biopores and others. While programs or activities that have indirect impacts such as socialization activities,

coordination meetings, monitoring and evaluation, research, training, and planning activities. The following is an Table of Environmental Budget Allocation According to the Impact of Budget Usage

Table 2. Environmental Budget Allocation According to the Impact of Budget Usage
Source: author's document

Type of Impact	Years (Budget Realization)				
	2014	2015	2016	2017	2018
Direct Impact	24,232,812,145	14,416,483,711	47,464,827,462	55,993,335,222	27,207,282,677
Indirect Impact	3,333,830,831	3,377,299,357	6,386,312,151	24,052,291,730	3,271,215,736

Based on the table above the budget allocation for environmental functions for programs that have direct and indirect impacts almost always increases each year. The sharpest increase in budget allocations occurred in 2016. The program budget allocation had a direct and indirect impact that nearly doubled. However, a sharp decline also occurred in 2018, especially for program budget allocation, which had an indirect impact. According to the table it can also be seen that the proportion of the environmental function budget for a direct impact program is always far greater than for an indirect impact program (less than 15%).

CONCLUSION

The results of budget tagging show main findings. *First*, the fluctuation of environmental budget. It caused by the direction of environmental development expanded. *Second*, in 2014-2015, the biggest budget allocation was in the direction of the development of Prevention of Environmental Pollution. While the budget is the least in the direction of development of energy management and mineral resources with an environmental perspective. In 2016-2018 the biggest budget allocation was for the direction of disaster management development. Whereas the direction of development of Sustainable Utilization of Regional Energy and Mineral Resources did not get a portion of the budget during 2014-2018. The direction of development of Environmentally Friendly Fisheries Production only received a budget allocation in 2018. *Third*, the budget allocation for environmental functions for programs that have direct and indirect impacts almost always increases every year. The proportion of the environmental function budget for direct impact programs is always far greater than for indirect impact programs (less than 15%).

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A Conceptual Study on Business Performance influenced by Three Exogenous Variables and its Implications on Competitive Advantage

(A Study on Overseas Education Consultation in Indonesia)

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ABSTRACT

Education is considered as one of the important factors to improve the competitiveness of a country and higher education institutions have an important role to produce qualified Human Resources. One of the efforts that has been made in response to the recent demands is by opening the scholarship programs offered by the government. Up until now, there are 35,000 Indonesian students continuing their study overseas. This phenomenon has created opportunities for overseas education consultants to provide overseas education services. Education agents are still greatly required due to the social interaction needs that those agents provide and complete information guidance that they give to the students to meet the overseas institutions' requirements. The aim of this research is to understand the influence of International Experience, Entrepreneurial Orientation, and Company Reputation on Competitive Advantage and Business Performance. The research result is also expected to provide a contribution to the knowledge development for academicians and experts, related to the theories used in this research, such as Strategic Management, Foreign Market Entry Mode, and Entrepreneurship as a grand theory. This research examines hypotheses and relationships using a quantitative approach with the sample of 82 company owners running businesses on overseas education consultation services as the research object units.

Keywords: International Experience, Entrepreneurial Orientation, Company Reputation, Competitive Advantage.

INTRODUCTION

Education is an important factor to improve competitiveness in a county. Based on the Education Index presented by the 2017 Human Development Reports (Nations, Development, & Programme, 2018) Indonesia was ranked seventh in ASEAN with a score of 0.622, and the highest score being held by Singapore at 0.832. One government initiative that sought to improve this competitiveness was by creating a scholarship program to assist high-achieving students (Ilmu & Indonesia, 2015). This program was intended to send the country's best youth to universities abroad. The data from

UNESCO as shown in Outbound Student (2017) indicated that in 2017 Indonesia was ranked 22nd in terms of sending their students abroad, and in the previous year, the number of students studying abroad was 47,317. The great interest of Indonesian students in continuing their studies abroad, according to ICEF (International Consultants for Education and Fairs), is due to economic and demographic factors of their country. Considering that there is a large number of Indonesian interested in studying abroad each year, an opportunity surfaces for overseas education consultants or education agents who serves as intermediaries between the overseas education institutions and the student candidates

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to provide their services for overseas study.

Currently, such an agent is in high demand despite the fact that they have to deal with the challenges of technology, since the internet allows students to directly contact the institution abroad. This eventually affects the agent's business performance. However, research conducted by Dewi (2015) found that Indonesians currently tend to want the process to be fast and more practical. Research by Thomson, Hulme, Hulme, & Doughty (2014) also explained that "a good agent will provide the complete and right information be it on academic, financial, geographical, and cultural issues and this will make them a helpful source and filter of information for the students in deciding their choices". They also explained that an agent with competitive advantage was one with a 'one stop shop' concept, meaning that they have more to offer. Meanwhile, Hagedorn and Zhang (2011) in Magyar & Robinson-pant (2015) suggested in their study that the reasons why China used agents were that many of their students did not know how to complete an application form and did not really know the institutions abroad and the documents required to continue their study.

Other studies explained that an agent played a role as an institution that provided information for people who wished to continue their study abroad (Raimo et al., 2014; Higher Education (HE); (based on web GOV. UK); Robinson-pant & Magyar, 2018; Hagedorn & Zhang, 2011 in Bista, 2018). In Australia and New Zealand, 47% of their institutions used agents to help their service processes (Javalgi & Todd, 2011; Zhang, Ma, & Wang, 2012). Meanwhile, according to Raimo, Humfrey, & Huang, (2014a) the reasons the overseas institutions chose agents to be their partners were influenced by institutional factors, local connections, services provided to prospective students, and services provided to universities. As the role played by these overseas education agents in building cooperation with overseas educational institutions grows more important, an internalization process becomes inevitable. Such a company must develop the right business strategy. They also need to develop their human resource competence and the amount of capital they might need to adjust the products they have to offer to customers.

As a company that encounters a high level of internationalization, it is necessary to have good international experience. According to Oliver Watson, chief board director of the Michael Page, international experience is valued by companies because the more knowledge and understanding on cultures it has, the more helpful it would be to expand its global scope. For this reason, this research is intended to discover the influence of three independent variables, which consist of international experience, entrepreneurial orientation and company reputation on business performance as mediated by competitive advantage.

What is new in this research is the industry it investigates, with a sample comprising of entrepreneurs running their businesses in overseas study education services in Indonesia and some previous qualitative and empirical studies with its unit of analysis being students and other studies on relevant topics with this research's variables that had never been subjected to either direct or indirect testing (Yang & Akhtaruzzaman, 2017; Shawn Lestage, 2016; Kirsch, 2014; Nikula & Kivistö, 2018; Zhang & Serra Hagedorn, 2014; Bisnis, Manajemen, Petra, & Siwalankerto, 2016; Thomson et al., 2014; Huang, Raimo, & Humfrey, 2016; Robinson-pant & Magyar, 2018; Sarkar & Perényi, 2018; Hagedorn & Zhang, 2011; Zhang & Serra Hagedorn, 2014; Raimo et al., 2014a; Jiang, 2015; Bista, 2018; Wiggins, 2016).

In the research conducted by Naidoo & Wu (2014), it was found that a company's specific factors (in the form of ownership factors) are associated with some literature on entry mode and that international business environment, international knowledge and experience are sources of invaluable competitive advantage. Meanwhile, the research conducted by Ferreira & Azevedo (2007) entitled "The Impact of Entrepreneurial Orientation and Resource-Based View on Growth of Small Firm" tested the influence of entrepreneurial orientation and organizational resources on small enterprise's growth performance. This study proved that entrepreneurial orientation had a positive and significant influence on organizational resources for gaining sustainable competitive advantage in small enterprise growth. Fombrun (1996) in Awang et al. (2009: 174) suggests that a good company reputation

will increase profitability since it will attract customers for its products, appeal to investors for its security, and entice workers for its quality.

Competitive advantage will improve small & medium enterprises' business performance through profit growth, sales growth, and customer growth. Chan et al. (2004) in Meutia & Ismail (2013) showed that competitive advantage positively affects company performance. Meanwhile, regarding the previous studies on the influence of reputation on business performance such as what has been carried out by Made & Ratnadi (2017), Rao et. al., (2012), Attig et. al. (2013) and Bridoux and Stoelhorst (2014), found that top managers are the keepers of reputation, and it was expected that top management could maintain the reputation to be the basis for measuring company performance.

OBJECTIVE

It is expected that this research could give an academic contribution in the form of new knowledge related to international experience, entrepreneurial orientation and company reputation in management, particularly in relation to education agents. It is also expected that this research result will contribute knowledge to both academics and practitioners alike who are currently handled by overseas study education agents. Meanwhile, this research aims at:

1. Discovering the general picture of the influence of International Experience, Entrepreneurial Orientation, Company Reputation on Competitive Advantage in international education agent in Indonesia.
2. Figuring out how Entrepreneurial Orientation influences Competitive Advantage in international education agents in Indonesia.
3. Finding out how Company Reputation influences Competitive Advantage in international education agents in Indonesia.
4. Discovering how Competitive Advantage influences Business Performance in international education agents in Indonesia.
5. Figuring out how Company Reputation influences Business Performance in international education agents in Indonesia?
6. Finding out how International Experience influences Business Performance in international education agents in Indonesia

7. Discovering the significance of influence of Entrepreneurial Orientation on Business Performance in international education agents in Indonesia.

LITERATURE

This research takes a practical perspective by seeing the condition in the field of this industry, and therefore the grand theory underlying this research is Foreign Market Entry Strategy, Resource Based View (RBV) with Middle Theory through Agency Theory and Internationalization approaches. Strategic management according to Pearce and Robinson (2015) is the decisions and actions that produce an implementation of a plan and is designed to achieve the company's goals.

Meanwhile, Wheelen and Hunger (2015) explain that strategic management determines an organization's long-term performance, which begins with environmental observation (both externally and internally) and is followed by long-term strategy planning. Furthermore, the research on entry mode that has an implication on performance was conducted by Brouthers (2002), and Chen & Hu (2002). Agency theory suggests that one of the important factors in controlling third parties to make them efficient is the institution's ability to monitor the agent's performance (Kiser, 1999; Kivistö, 2008).

Law & Lindsay's (2018) research explains that when an organization performs business activities with other countries, it means this company has performed the internationalization process. The company uses an organizational structure which matches the industry, the available resources, characteristics of market to be penetrated, and the reasons for internationalization requirement, and the potentials of market to be penetrated (Dunning 1998). One of the approaches a company could use to deal with various challenges is Resources-Based View (RBV). A company applying RBV (Resource Base View) should be capable of managing its internal resources through numerous strategies that allow it to compete in a long run. Barney (1991) explains that these resources should have such characteristics as valuable, rare, inimitable, and non-substitutable (VRIN).

PREPOSITION

Company performance is one of the factors to determine the strategy used in performing internationalization. Some literature explain that the conditions of international experience, reputation and entrepreneurial orientation have an influence on performance, because if this industry had internal weaknesses, including low quality of human resources, lack of knowledge or international experience and absence of the right business orientation, this would have an impact on company performance.

International experience is one variable to process internationalization in a company (Johanson & Vahlne, 1977; Eriksson et al., 1997). Companies also compete in international experience and it also has innovation capacity, which are parts of strategic resources (Barney, 1986; Dierickx & Cool, 1989). Lumpkin and Dess (1996) argue that entrepreneurial orientation (EO) is an activity and process of making decisions in developing a new business. The presence of EO increases the profit for the company when it is applied within the organization using the right method with supports from strategic management. The problem if the company does not achieve the desired performance through EO is that it is due to the lack of other strategies and practices.

Su et al. (2015) in their research explain that a company has a competitive advantage when it applies the strategy which creates value added for customers and their competitors could not duplicate or find it too expensive to try (Ireland, Hoskisson). Therefore, customers could anticipate to receive high-quality services and this expectation could improve their perceived satisfaction with the company (Chang, 2013). Chang (2013) also finds that reputation has a positive effect on customer satisfaction in the context of restaurants, such as what Loureiro and Kastenholz (2011) did in Portugal.

A previous study found that there is a significant association between an organization's competitive advantage and business-based performance where business-based performance is measured by the level of sales income, profitability, investment return, market share and product growth. Moreover, a previous empirical study has described the significant correlation between competitive advantage and organization-based organization performance,

when this organization-based performance is measured with an emphasis on the organization's efficient internal process, customer satisfaction, employee development and job satisfaction (Neely, 2005). Suhong Li et.al (2004) in W. A. D. . Wijetunge (2016) conducted research using 196 companies in the US and found that competitive advantage could have a direct and positive impact on organization performance.



Figure 1: The research model to be studied in this research

PROPOSED METHOD

This research uses descriptive and explanatory approaches. Descriptive research according to Whitney (1960) is the attempt to find the facts with the right interpretation. Descriptive research (Sekaran and Boogie 2016) is intended to collect and study the issues in the community, as well as the procedures applicable in a society and under certain circumstances, including in regard to correlation, activities, attitudes, views and ongoing processes which are used to collect explanations from the research objects. Meanwhile, explanatory survey (Sekaran and Boogie 2016) is meant to discover the characteristics of variables by studying the sample. The unit of analysis of this research is overseas education consultant companies in Indonesia.

The research data are collected within one cross-sectional time frame. The entrepreneurial process of value creation is driven by entrepreneurs and entrepreneurial intentions (aspirations for entrepreneurial gifts). The entrepreneurial process is not an autonomous process; entrepreneurs are integral parts of the entrepreneurial process. Mishra & Zachary (2015) explain that the theory of entrepreneurship was a theory of entrepreneurial

value creation, which explains the experience of entrepreneurship in the most full form, from entrepreneurial intentions and the discovery of entrepreneurial opportunities, to the development of entrepreneurial competencies, and giving gifts to the best entrepreneurs (Mishra and Zachary, 2014, in Mishra & Zachary, 2015).

The internationalization process is an important factor for determining the modern system of higher education in the world (Grishin, 2013, in Dima & Maassen, 2018). Several experts define the idea of internationalization in education differently. Knight (2003, 2007 in Dima & Maassen, 2018) has formulated the definition of education internationalization, which has been given a broad understanding in a professional environment, where internationalization is the process of integrating international, intercultural or global dimensions into education, where the institution has research and service functions. 108 operational managers/general managers/directors of overseas education consulting services companies in Indonesia served as the object of this study. The stages of the research were intended to facilitate the steps in the research process on overseas education consultants. In the first stage, the writer will conduct an initial test before going to the results and discussion with 30 agents who have branches in certain geographical areas. The sample in this research is taken using saturated sampling technique.

Sugiyono (2017: 85) defines saturation sampling as: "The technique of determining the sample if all members of the population are to be used as samples. This is often done when the population is relatively small, less than 30 people, or if the research wants to make generalizations with very small errors. Another term for saturated samples is census, where all members of the population are sampled." Thus, from the explanation of the sample technique above, it should then be understood that the writer does not determine the sample since all members of the population will be examined. Considering that all variables of this research model are reflective factor models or reflective measurement models, this study uses CB-SEM supported by LISREL software as the analysis test.

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Ceper Foundry Industries, Technology Management Readiness for Industrial Revolution 4.0

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ABSTRACT

The development of the industrial revolution 4.0 will certainly be a new problem in The Ceper Metal Casting Industry if it is not accompanied by technological developments. This research has an important goal which is to be reference data for determining policies to government, to provide protection and support the metal casting industry players. Interviews and questionnaires become a method to collect this data and there were 110 respondents. The method to process the data used SPSS 18 and Excel. 30 respondents from outside the sample have been tested for validity and reliability. The results are reliable, $76.5 \geq 0.5$. The data showed that 47.3% of respondents thought that their human resources ready to faced industrial revolution 4.0. And then, 50.9% of respondents assumed that the metal casting industry still used manual systems in the manufacturing process. Therefore the conclusion is that industrial revolution 4.0 has not yet been fully implemented in the metal casting industry because the technology used still manual and not yet automatic.

Keywords: technology; metal; casting; revolution 4.0.

INTRODUCTION

The Metal Industry is a metal casting industrial area that has been established since ancient times. This industrial center has core business as a metal casting expert. Various kinds In its journey, the development of metal casting technology has little and little impact on the craftsmen of the metal industry in Ceper. For business people who are able and ready to compete will certainly be able to survive and develop. But, it will happen for business actors who do not have openness to the development of the times.

Industry 4.0 was born from the idea of the fourth industrial revolution. European Parliamentary Research Service in Davies (2015) said that the industrial revolution occurred four times. The first industrial revolution took place in England in 1784 where the invention of steam engines and mechanization began to replace human work. The second revolution took place at the end of the 19th century in which production machines powered by electricity were used for mass production activities. The use of computer technology for manufacturing automation starting in 1970 marked the third industrial revolution. At present, the rapid development of sensor technology, interconnection and data analysis has led to the idea of integrating all of these technologies into various fields of industry.

The development of the industrial revolution 4.0 will certainly become a new turmoil if it is not matched by adequate readiness

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and knowledge. Therefore research is needed that focuses on discussing the knowledge and readiness of the flat metal industry center on the industrial revolution 4.0. With this study, it is expected to be able to provide an overview and input for further development activities, so as to be able to maintain the existence and existence of the flat casting industry center.

At this time Industry 4.0 began and new trends occurred in various industries (Kemper, 2016). According to Kemper (2016) Companies that are ready to welcome the industrial revolution 4.0 are companies that can build production ecosystems based on the Industry 4.0 concept, such as companies that can provide network infrastructure for the Industrial Internet. For developed countries, Industry 4.0 can be a way to regain infrastructure competitiveness, especially for Western European countries, which are not currently experiencing cuts in electricity costs like in the US.

As for developing countries, Industry 4.0 can help simplify the production supply chain. This is of course very much needed to reduce the rising production costs. 2011 marks the first official use of the term Industry 4.0. Publicity and demonstrations of how this could benefit the company began to appear in the presentation. In 2013, the German manufacturing industry chose to invest in the Industry 4.0 process and the German government increased funding, which led to the Industry 4.0 Platform being created. In 2014, digital product manufacturing activities and use of IoT began to occur (Kemper, 2016).

The development of IoT is in line with Industry 4.0, although to date there is no definitive definition of IoT, research in the field of IoT is still in the development stage. Following are some alternative definitions put forward to understand IoT. According to Ashton K (2009) the initial definition of IoT is that the Internet of Things has the potential to change the world as the Internet did. According to IDCH (2016) "A Things" on IoT can be defined as subjects such as people with heart implant monitors, farm animals with biochip transponders, a car that has a built-in sensor to warn the driver when tire pressure is low. So far, IoT is most closely related to machine-to-machine communication in manufacturing and electricity, oil and gas. Products are built with Machine to machine communication capabilities

that are often referred to as "smart" systems. For example, smart cables, smart meters, smart grid sensors According to Atzori, et al. (2010).

Changes in the industry in the form of additive manufacturing, sophisticated materials, intelligent machinery, automatic machinery, and other technologies, usher in a new era of physical production. At the same time, increased connectivity and more sophisticated data collection and analytical capabilities made possible by IoT have led to a shift towards an information-based economy. With IoT, data, besides physical objects, are a source of value and connectivity makes it possible to build smarter supply chains, manufacturing processes, and even ecosystems from upstream to downstream (Sniderman et al., 2016).

The development of the industrial revolution 4.0 will certainly become a new turmoil if it is not matched by adequate readiness and knowledge. Therefore, research is needed that focuses on discussing the knowledge and readiness of metal industry centers for the industrial revolution 4.0.

Current literature regarding the work subject should be examined and the differences of the said work from the past, similar works should be presented clearly in the introduction section.

MATERIALS AND METHODS

This type of research has been conducted in the form of quantitative descriptive research. The method that will be used in this research is the Explanatory Survey Method. Explanatory Survey Method is a survey research method that aims to test hypotheses by basing on observations of the consequences that occur and looking for factors that might be the cause through certain data (Rusidi, 1992). This method is limited to the understanding of sample surveys aimed at testing hypotheses that have been previously formulated (testing research). Although the description also contains a description, but as a relational study the focus lies in explaining the relationships between variables. According to Sanapiah Faisal (2007: 18) explains that: Explanation research is a study that is intended to find and develop theories, so the results or research products can explain why or why (any antecedent variables that affect) the

occurrence of a symptom or certain social statements.

This study involved 110 respondents consisting of 3 employees of the Klaten Metal Casting Industry. These companies include Kop. Batur Jaya, Pt. Aneka Adhi Logam and PT. Cipta Guna Lestari. This study uses the SPSS application to test the validity and reliability of the questionnaire. Also, conducting crosstab and chi-square tests to test the relationship and significance.

RESULTS AND DISCUSSION

Test results with the Frostst and Chi-square tests that have been carried out with the age factor and educational background on the readiness of the Flat Industry HR in the Industrial Revolution Era 4.0 are presented in the table whose data has been processed below.

Table 1. Technology Readiness * Industry 4.0

Kategori	Sub-kategori	Tingkat Kesiapan				
		Sangat Tidak Siap	Tidak Siap	Cukup	Siap	Sangat Siap
Jenis Industri	Metal Casting	0	0	0	0	0
	Non-Metal Casting	0	0	0	0	0
Usia	18-24	0	0	0	0	0
	25-34	0	0	0	0	0
Pendidikan	SD/SLTP	0	0	0	0	0
	SMK/STP	0	0	0	0	0
Total	Jumlah	0	0	0	0	0
	Persentase	0%	0%	0%	0%	0%

Chi-Square Tests	
	Value
Pearson Chi-Square	0.000

a. 11 cells (68,8%) have expected count less than 5. The minimum expected count is ,05.

Table 2. HR Readiness * Industry 4.0

Kategori	Sub-kategori	Tingkat Kesiapan				
		Sangat Tidak Siap	Tidak Siap	Cukup	Siap	Sangat Siap
Jenis Industri	Metal Casting	0	0	0	0	0
	Non-Metal Casting	0	0	0	0	0
Usia	18-24	0	0	0	0	0
	25-34	0	0	0	0	0
Pendidikan	SD/SLTP	0	0	0	0	0
	SMK/STP	0	0	0	0	0
Total	Jumlah	0	0	0	0	0
	Persentase	0%	0%	0%	0%	0%

Kategori	Sub-kategori	Tingkat Kesiapan				
		Sangat Tidak Siap	Tidak Siap	Cukup	Siap	Sangat Siap
Jenis Industri	Metal Casting	0	0	0	0	0
	Non-Metal Casting	0	0	0	0	0
Usia	18-24	0	0	0	0	0
	25-34	0	0	0	0	0
Pendidikan	SD/SLTP	0	0	0	0	0
	SMK/STP	0	0	0	0	0
Total	Jumlah	0	0	0	0	0
	Persentase	0%	0%	0%	0%	0%

Chi-Square Tests	
	Value
Pearson Chi-Square	0.000

a. 12 cells (75,0%) have expected count less than 5. The minimum expected count is ,16

If assumed, the first hypothesis; Ho: there is a relationship between technology and readiness to face the industrial revolution 4.0. H1: there is no relationship between technology and readiness to face revolution 4.0. The second hypothesis; Ho: there is a relationship between human resources and readiness to face the industrial revolution 4.0. H1: there is no relationship between human resources and readiness to face the industrial revolution 4.0.

Thus, the results of the first hypothesis chi-square analysis show that a value of 0.00 <0.05 means that Ho is accepted and H1 is rejected. Frostab analysis shows that all respondents' age categories of 50.9% agree that the technology used in the manufacturing process is still manual and not automatic. 40.9% disagree, 1.8 strongly disagree and 6.4% strongly agree. So based on the survey above, the majority stated that technology was not ready to face the 4.0 revolution.

The results of the second hypothesis chi-square analysis show that a value of 0.005 <0.05 means that Ho is accepted and H1 is rejected. Frostab analysis shows that all categories of human resources in the face of the industrial revolution 4.0 of 47.3% are ready. 40% were not ready, 2.7% were very unprepared and 10% were very ready. So based on the survey above, the majority stated that human resources in the metal casting industry were ready to face the 4.0 revolution.

CONCLUSION

The conclusions of this study state that there is a link between technological updates and the readiness of human resources for the industrial revolution 4.0. however, this is not matched by the readiness of the technology because the majority of the metal casting

industry in Ceper still uses manual systems and is not yet automated.

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Diagnosis and Analysis of Intrapreneurship Based Professionalism to Bridging the Culture Gap Innovation Approach the Theory of Importance Performance Analysis (IPA)

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ABSTRACT

This study aims to analyze how the attitude of the entrepreneur orientation of the company's employees auxiliaries (EOS) and Attitude Entrepreneur Leadership (ELQ) employees of the target company are analyzed with IPA (Importance Performance Analysis). The samples are employees who also have a business as a target of PT Perkebunan Nusantara IX with nonprobability sampling techniques. The analytical tool used is Structural Equation Modeling (SEM). There were 200 respondents who participated in this study, but the number of questionnaires eligible to be processed as many as 190 questionnaires. The data obtained from the questionnaire and then analyzed by confirmatory regression weight with 24 AMOS program. The findings of the study using the IPA approach show that there is no gap between perception and expectation, where is the importance of behavior describing expectations and how often the behavior describes the perception

Keywords: Professionalism culture; intrapreneurship; competitive advantage; organizational learning; cultural transformation.

INTRODUCTION

The agricultural sector accounted for 14.43 percent of Gross Domestic Product (GDP) at current prices. Indonesia's population works in the agricultural sector is still the largest position that is able to absorb 38.07 million people, or 34.6 percent of the workforce of 100 million national labor force (CBS, 2017). PT Perkebunan Nusantara IX, which currently has a working area in Central Java province with a number of Gardens 15 units Work Gardens 1 unit Agrowisata and the amount of Sugar Factory (PG) 8 units, currently manages four major commodities such as rubber, sugar, tea, and coffee. In addition, the company has also developed several downstream products as consumer products such as Kopi Luwak, Banaran Premium Coffee, Tea Kaligua, Semugih

Tea, Sugar 9, and Syrup Pala. Business Unit which has seen beautiful tourist because of its uniqueness has been developed as a regional agro- tourism, such as Agro Tourism Gardens Kaligua, Agro Tourism Gardens Semugih, Scenic Gardens Jollong, Kampong Kopi Banaran, Central Park Balong, Banaran 9 Resort, Travel Agro Gardens Semugih, Agro Tourism Sondokoro, Sugar Factory Pangka, Sugar Factory Gondangan Winangoen and Banaran 9 Coffee & Tea. PT Perkebunan Nusantara IX will be developed into a rubber plantation companies with business as the backbone (breadth closer to 50,000 Ha), and sugar business as one pillar of the company's revenue.

Central Java province is one of the patterns of the partnership between the Smallholder Plantations PIR KKPA (Kredit Koperasi Primer Anggota) or AABA (Anak Angkat Bapak Angkat). This partnership is a partnership formed by the companies with a local cooperative wherein it belongs to the farmers. Cooperative is an association with the aim of trying together

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consisting of those who are weak and cultivated always in the spirit of selfless such a way that each one capable of carrying out its obligations as a member and rewarded in proportion to their use for the organization. The partnership approach emphasized in the construction estates in favor of the small people.

The problem in this research is the cultural importance of intrapreneurship companies (Corporate Intrapreneurship) on PT Perekebunan Nusantara IX (Persero) requires entrepreneurial qualities in their company. The behavior of entrepreneurial leaders of work units auxiliaries who plays

as an employee PTP IX (Persero) needs identification, importance, and implementation (Expectations and Perceptions) means how important is the work unit performance businesses built (which depicts Hope) And How well does the work unit performance businesses built (which depicts Perception) thus, the company can determine managerial behavior should be increased or decreased to amplify the desired corporate culture and to achieve its goals.



Figure 1. Research Framework

Hypotheses of IPA: (EOS and ELQ) EOS:

Ho: There is no gap between the expectations of the perception of orientation entrepreneur

H1: There is a perception gap between the expectations of the orientation of the entrepreneur

ELQ:

Ho: There is no gap between the expectations of the leadership's perception of entrepreneurs

H1: There is a perception gap between the expectations of the orientation of the entrepreneur

Hypotheses of Questionnaire II (Respondent Corporate Patronage):

H1: Organization Learning (with dimensions of Mental Models, Share the vision, Systems Thinking Personal Mastery, Team Learning) positively affects Competitive Advantage

H2: Organizational Culture Transformation (with dimensions Proactive, Risk Tolerance, Innovative) has a positive effect on competitive advantage.

H3: Innovation (with dimensions Innovativeness, Capacity to innovative, Willingness to Change) has a positive and significant effect on the competitive advantage

METHOD

The data in this study are primary data and secondary data. Primary data collected directly from the field, which is obtained by observation, surveys, and interviews or provides a list of questions. This study uses a measurement tool EOS and ELQ distributed to work units that employees of PT Perkebunan Nusantara IX (Persero). Secondary data is data obtained from the corporate environment. EOS is used to measure the overall entrepreneurial environment in a company. EOS will be studied in the key dimensions of corporate entrepreneurship. While ELQ entrepreneurial aims to study the behavior of managers and top management of the target company's work unit.

Target company PTPN IX, with the subsidiaries (the target business) 8 units of the research sample with the details shown in Table 2. In each of the target Enterprises spread in 8 Unit of Work PT Perkebunan Nusantara IX, taken 40 Enterprises inmates who role as employee and business leaders built, for a total of 200 respondents taken by purposive (non-probability sampling), but the data can be processed as many as 190.

Table 1 Unit of Work PT Perkebunan Nusantara IX

Name	Address	Commodity
Tobun Kawung	Desa Karangrejo Kec. Cimanggu, Kab. Cilacap.	Wood, Rubber
Tobun Krumpit	Desa Karangrauc Kec. Banyumas, Kab. Banyumas.	Wood, Rubber, Agrotourism
Tobun Semugih	Desa Banyumudal Kec. Moga Kab. Brebes.	Tea, Wood, Agrotourism
Tobun Jolotigo	Desa Jolotigo Kec. Talun Kab. Pekalongan.	Tea, Rubber, Wood
Tobun Siluwok	Desa Plelen Kec. Gringsing Kab. Batang.	rubber, Wood
Tobun Sukamangli	Desa Sukamangli Kec. Sukorejo Kab. Kendal.	Rubber, Coffee, Wood
Tobun Getas	Desa Kauman Lor Kec. Pabelan Kab. Semarang.	Rubber, Coffee, Wood
Kampoeng Kopi Banaran	Jl. Raya Bawen – Solo Km. 1.5 Kab. Semarang.	Agrotourism

The analysis technique used in this study using the Theory of IPA (Importance Performance Analysis). Quadrant analysis or Importance Performance Analysis (IPA) is a descriptive analysis technique introduced by John A. Martilla and John C. James in 1977. Importance Performance Analysis is an analytical technique used to identify critical performance factors that should be shown by an organization. Questions that are qualitative quantified and measured using a Likert scale. According to Husein Umar Kinner (1999) scoring on each item, the question of the issues examined was measured by the Likert scale, the scale associated with the statement of one's attitude toward something.

Furthermore, at this stage of the analysis and interpretation of the results of analysis and discussion of the data obtained and processed. Selanjutnya will examine the culture of entrepreneurial PT Perkebunan Nusantara IX (Persero), whether in accordance with the dimensions of Intrapreneurship. The researcher also analyzes the nature of entrepreneurial leadership at PT Perkebunan Nusantara IX (Persero). From the results of the analysis carried out will be known the actual corporate culture and corporate culture are expected. According to the creator EOS and ELQ that Neal Thornberry, both the gauge is a measuring instrument that has been tested reliability and validity, and is often used to measure the dimensions of Corporate Entrepreneurship in big companies such as

Mott's, Siemens and Sodexho.

RESULTS AND DISCUSSION

In each of Enterprises assisted scattered in 8 units of work PT Perkebunan Nusantara IX, taken 40 Enterprises inmates who serve as employees and business leaders built, for a total of 200 respondents taken by purposive (non-probability sampling), but the data can be processed as many as 190. Based on data from 190 respondents, respondents gender there are men as much as 157 people and women are 33 people. While in terms of education level, amounting to 51.05% educated to the level of high school, bachelor's degree amounted to 32.63%, and a diploma amounted to 14.21%. Based on age, it is highest in the age group 36-40 years in the amount of 34.74%, the age group of 31-35 years amounted to 26.32%, and the 26-30 years age group amounted 19.47%.

1. IPA Analysis (Importance Performance Analysis)

EOS attributes divided into two dimensions: Dimensions Attitude/Personality Dimensions employee and boss attitude on aspects of business development. Questions asked of respondents was as follows:

EOS1. The orientation of the company (EOS) Dimensions Attitude / Personality Tops: (1) In a positive communication with superiors concerning things that could be done better; (2)

It effectively convince your boss on business ideas; (3) communicate-kan conditions better company in the future, if the need to make changes; (4) Delivering to subordinates in which the company's position against competitors;

(5) To motivate subordinates to think of innovative ways to beat the competition; (6) Supporting the suggestions of subordinates for the betterment of the company; (7) To encourage subordinates to innovate in carrying out the work; (8) Showing enthusiasm when subordinates learn new skills; (9) Support employee initiatives to realize their ideas; (10) To motivate employees to think to find ways of working; (11) Provide time to help employees find ways to improve products and services; (12) Create an atmosphere that supports continuous improvement; (13) Expect subordinate to constructively mengidentifikasi and solve problems across the organization; (14) Support subordinates in pushing for changes for the betterment of the work.

EOS2. The orientation of the company (ESQ) Dimensions boss attitude on aspects of business development: (1) Taking into account the competitors' weaknesses and find ways to take advantage of their weaknesses; (2) Take the time to develop a new business; (3) Listen to and act on consumer complaints; (4) Encourage thinking to find new and better ways to carry out the work; (5) Looking for creative ways to organize and use of assets and resources of the company; (6) Eager to find new ways to grow the business; (7) Ensure that the interests of consumers in mind when we make changes in the organization; (8) Actively seek new business opportunities; (9) To ensure that we have the right team to take advantage of business opportunities bar; (10) To encourage organizations to be more flexible so quick to react when emerging business opportunities; (11) To analyze the resources, processes, and workflows for better results for companies and consumers.

ELQ1. Entrepreneur Leadership (ELQ) Tops Attitude Dimensions: (1) Trying desperately to build an innovative culture within the company; (2) To encourage entrepreneurial behavior / and take the entrepreneurial risks; (3) Reacting quickly to eliminate organizational barriers that can disrupt business;

(4) Encourage open communication and sharing of ideas across the functional units; (5) Provide the latest information on industry trends

and competitor strategies; (6) Actively encourage business improvement suggestions from all components of the organization; (7) Perform real action to implement the various suggestions for improvements; (8) Make the organization always focuses on its core business, but also to support new business initiatives; (9) Set aside money outside the regular budget for financing and supporting innovative ideas; (10) Supporting employees to question decisions that have already been taken.

2. Results Analysis

a. *Difference Analysis Expectations and Perceptions in Entrepreneurial Dimension Orientation*

From the results of the normality test calculations have been done using the One-Sample Kolmogorov- Smirnov test, the average perception and above-average expectations ESQ Kolmogorov Smirnov statistic values obtained at 0.098 and 0.082 with a value of 0.092 and Asymp. Sign Asymp. Sign at 0.200. Because of the values for the mean expectation ESQ Asymp. Sign greater than 0.05, it can be concluded that the data were normally distributed. Then testing different tests using Paired sample t- test. Result Paired sample t-test for differences in perceptions and expectations of above-average entrepreneurial orientation can be seen in Table 3. The value sig (2-tailed) in Test Paired sample t-test showed the value of 0.763 means probabilities value > 0.05. So we can conclude accept H₀ and reject H_a, meaning there is no gap between the expectations of the entrepreneurial orientation perception.

Table 2 Results of paired samples t-test

	t	df	Sig. (2-tailed)
Mean Perception ESQ - ESQ Mean Hope	.302	69	.763

b. *Difference Analysis Expectations and Perceptions in Dumensi Entrepreneurial Leadership*

Because of the values for the mean expectation ELQ Asymp. Sign smaller than 0.05, it can be concluded that the data are not normally distributed. Then testing different tests using the Wilcoxon Signed Ranks Test Test Statistic.

Test Results Statistics Wilcoxon Signed Ranks Test for differences in perceptions and

expectations EQL dimensions are shown in Table 5. From the results of the output Rank (Table 4), there were 24 respondents who experienced a decrease in perception and expectation.

Table 3 Output Rank

Mean Hope ELQ – Mean Perception ELQ	N	mean Rank	Sum of Ranks
negative Ranks	24	30.71	737.00
positive Ranks	32	26.84	859.00
ties	14		
Total	70		

Table 4 Test Output Statistics Wilcoxon Signed Ranks Test

	Mean Hope ELQ - Mean Perception ELQ
Z	-.502b
Asymp. Sig. (2-tailed)	.616

Based on the statistical test output in Table 5, note Asymp. Sig (2-tailed) worth 0616. Because the 0616 value is greater than 0.05, it can be concluded that accept H0 and reject Ha. This means that there is no gap between the perceptions and expectations of respondents in judging.

c. *Important Performance Analysis (IPA) for the orientation of the Company (EOS) at Dimensions Attitude / Personality Tops*

Overall assessment of the Orientation attribute Companies (EOS) Dimensions Attitude / Personality Tops produces an average attribute value totaling 87 250 and in the category of Very Good. It can be concluded that attribute the behavior performed by the manager/supervisor in accordance with what is expected by the company's employees in aspect orientation (EOS) Dimensions Attitude / Personality Tops. Of the value of Performance Rate and Importance Rate obtained from the weighting of the processing results of questionnaires carried out in the criteria for each item, then searched averaged to obtain the value of importance (importance) and the level of performance (performance) next in the plot- kan into Cartesian diagram foresee the distribution of attributes.

d. *Important Performance Analysis (IPA) for Entrepreneur Leadership (EQL) in*

Dimension Attitude Tops

Overall assessment of the attributes Leadership Entrepreneur (EQL) Dimensions Attitude Tops produce average attribute value totaling 79 525 and in the category of Good. It can be concluded that attribute the behavior performed by the manager/supervisor in accordance with what is expected by employees in Leadership aspect Entrepreneur (EQL) Dimensions boss attitude. Of the value of Performance Rate and Importance Rate obtained from the weighting of the processing results of questionnaires carried out in the criteria for each item, then searched averaged to obtain the value of importance (importance) and the level of performance (performance) next in the plot-kan into Cartesian diagram foresee the distribution of attributes.

e. *Full Analysis Model Structural Equation Model (SEM)*

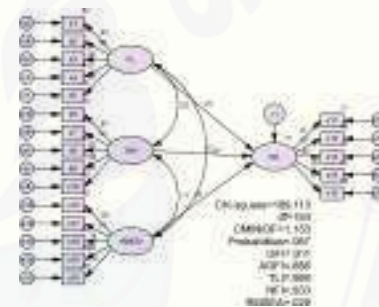


Figure 2 Test Results Full Model Structural Equation Model (SEM)

Having obtained the full model SEM study, further testing is done in conformity with the cut-off value of Goodness of Fit with the results shown in Table 5.

Table 5 Goodness of Fit All models SEM Eligibility Test Results

Criteria	Cut Off	Result	Conclusion
Chi-square	expected small	189 113	marginal
significance Probability	$\geq 0:05$	0087	Fit
CMIN / DF	$\leq 2:00$	1,153	Fit
RMSEA	≤ 0.08	0028	Fit
GFI	≥ 0.90	0911	Fit
AGFI	≥ 0.90	0886	Fit
TLI	≥ 0.90	0989	Fit
NFI	≥ 0.95	0933	Fit

Table 5 shows the chi-square test on the full model obtains research results a value of 189 113 under the chi-square table with a degree of freedom 98 at the 5% significance level of 147.010 this means that the value of chi-square model of good-class research. A probability value of 0.087 is greater than 0.05 which is the threshold probability value has been qualified means good standard probability values. GFI value of 0.911 on the value of 0.90 which is a required value means the value GFI GFI has good value.

3. Hypotheses Results

From the calculation through confirmatory factor analysis and structural equation model of the model in this study may otherwise accept it supported also by the values of the goodness of fit that has shown results that fit, even though there some testing goodness of fit which showed a marginal, but the model is still acceptable. Then we can do hypothesis testing using t-Value with a significance level of 0.05. The T-Value program, AMOS 24 is the value of Critical Ratio (CR) on Regression Weights of the model. Testing criteria is if the value of t-Value or value (CR) $\geq 1,967$ or a probability value (P) ≤ 0.05 (in AMOS indicated by ***) and then HO rejected if the values and the research hypothesis is accepted.

Table 6 Regression Weights (Group number 1 - Default model)

		estimate	SE	CR	P
Competitive advantage	<--- Learning Organization	0172	0054	3,178	0001
Competitive advantage	<--- Organizational Culture Transformation	0147	0066	2,243	0025
Competitive advantage	<--- Innovation	0:25	0079	3187	0001

Table 7 Summary of Invention Hypotheses

Hypothesis	Decision	Findings
H1	Received	Organizational Learning positive effect on Competitive Advantage
H2	Received	Organizational Culture Transformation positive effect on competitive advantage.
H3	Received	Innovation positive and significant on competitive advantage

CONCLUSION

The results showed that the Learning Organization, Organizational Culture Transformation and Innovation positive and significant impact on the Competitive Advantage. The results of the Tests Full Model Structural Equation Model (SEM) show that the innovation variable has the highest influence to enhance the company's competitive advantage. It is understood that in order to achieve competitive advantage, the respondent company's plasma and plasma farmers (Intrapreneurship) at PT Perkebunan Nusantara IX. Need more strongly in innovation in the sense of proposing new ways to achieve goals and objectives. Propose new ideas and practices to improve its performance. Tracing technology, processes, new techniques, as well as the product idea. Propose new ways to improve quality.

From the analysis of science, it can be concluded that there are no gaps between the top Harapanresponden rate attributes importance to the orientation aspect of the company (EOS) Dimensions Attitude/Personality Tops with performance/performance boss, and respondents/employees feel satisfied with the performance/performance boss. This is supported by the results of Conformity Analysis (IPA), which shows that of the 14 attributes Very Good, 11 attributes into the Very Good category and only 3 are in the category of Good. From the above results, it can be concluded that there is no gap between the expectations of respondents over rate importance attributes of Leadership Entrepreneur (EQL) Dimensions Tops attitude to performance/performance

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GraEffect of Training and Job Satisfaction on Employees Performance and Company Performance in Support to Achieve The Internationalization Model of SME's Competitive Advantage

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ABSTRACT

Efforts preparation of models and strategies used to improve the competitiveness of creative industries in the conduct of internationalization, especially in the ASEAN Economic Community (AEC), which has been produced in the study the first year has been done by connecting the variable performance Small and Medium Industries (SMI) with variable internationalization of SMEs and network resources. SEM Statistical test results showed that the performance of SMEs is not affected by the internationalization variable, meaning that international business activities have not been carried out intensively characterized by the limited scope of operation of the international market and the low level of sales profits. SME performance is affected by network resources' ability to utilize network resources is important for SMEs to access international resources, knowledge and market opportunities. Internationalization low level and the need for the utilization of network resources, making this study in the second year concentrates on the manufacture of the modules to be tested on a group of SMEs surveyed, with an emphasis of matter related to the knowledge of the creative industry in general and specifically in Kendal District. Knowledge of import-export and knowledge of the Indonesian Export Financing Agency and knowledge about running a business based on digital. Modules that have been prepared are then used to test the SMI group of 145 SMEs. Furthermore, the results of training are evaluated and the results are significantly increased knowledge of the materials that have been given. Other than that, also linked variable influence on the performance of workers' training and performance of SMEs. Based on the increase in import-export knowledge possessed by SMEs in Kendal district is expected competitiveness of creative industries in Kendal increases which in turn will be able to face the AEC.

Keywords: training; knowledge; SME performance; job satisfaction; competitive advantage; internationalization; AEC; company performance.

INTRODUCTION

Described the results of research in Kendal SMEs through the selected sample of 145 companies in the garment and fashion industry group is the largest industry (47%), which produces a variety of products such as clothing Muslim, praying tools, batik clothing, embroidered clothing, and shirts. Followed by the companies included in the category of craft and jewelry made from raw materials such as

rattan, leather, wood, bamboo, batik, mendoan, pandan, natural stone, silver, and ceramics. Judging from the number of workers, most companies have a workforce of between 21-99 people (64%), and the rest has a workforce of between 5-20 people. Based on the total workforce of the Directorate General of Small and Medium Industry of the Ministry of Industry of Indonesia (2009: 1-3) determined that the criteria for small industrial groups are a company with 5-20 employees and 21-99 for the secondary industry. On the basis of these criteria, most of the samples in this study are secondary industry group and the rest are small industrial groups.

In terms of total annual sales, the majority

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(41%) ranges between Rp 200 million to Rp 2.5 billion. The study identified the existence of companies with total sales of Rp 2.6 billion to Rp 50 billion, which is dominated by companies with sales ranging from Rp 2.6 billion to Rp 12.5 billion (25%). Furthermore, when viewed in terms of experience in the industry, most companies (63%) have more than 5 years of experience, including those dominated by companies with experience of 6 years to 20 years. Experience is an important basis for preparing to expand its business in both domestic and international markets. Internationalization is a "closed-loop", ie previous experience is a guarantee for the next step. Other than that, there are companies that operate a maximum of 5 years (26%). From these findings, it is known that there are some companies that do international business rapidly. The results of interviews reveal that there are some fast SME entrepreneurs working in the international market and to prioritize export markets rather than the domestic market with huge market potential. Table 1 shows the international activities of SMEs in Kendal.

building a network, the majority (78%) of employers say they have a network of SMEs. Networks built with various parties such as purchasers (people), agents, suppliers, trade associations, banks, and the government can support international businesses. By building a network, the SME entrepreneurs to overcome obstacles in carrying out international activities, namely that they can gain access to resources and knowledge as well as access to market opportunities. The importance of the internationalization of the network can be described theoretically using the network model (Flanders 2008: 38) "Small and medium businesses are generally limited by the lack of knowledge and resources in conducting international activities so that in conducting international business need support from partners in the network". In order to successfully build a business network, collaborative relationships based on trust and commitment is an important aspect to keep in touch. SME entrepreneurs can overcome obstacles in carrying out international activities, namely that they can gain access to resources and knowledge as well as access to market opportunities.

Table 1. International Activities of SMEs in Kendal

Activity	%	Activity	%
International Business Methods		Level of Interest in International Business Running	
Indirect export	65	Not important	43
direct export	35	Not too important	36
Operations in the International Market		Quite important	-
1-3	47	Important	-
4-6	21	Very important	-
7-9	-	Ownership Business Network	
10-12	-	Iya	78
12+	-	Not	22

For most SMEs, entrepreneurs tend to judge a major international business due to huge market potential and the possibility of a greater benefit than if you only do business in the domestic market. The results of empirical studies conducted by the European Commission "Internationalization of European SME's" (2010: 8) were carried out on more than 50% of small and medium enterprises in Europe have resulted in findings "Being international operations strongly do higher growth" which means active internationally firmly to grow more rapidly. SME entrepreneurs realize the importance of

The importance of the internationalization of the network can be described theoretically using the network model (Flanders 2008: 38) "Small and medium businesses are generally limited by the lack of knowledge and resources in conducting international activities so that in conducting international business need support from partners in the network". In order to successfully build a business network, collaborative relationships based on trust and commitment is an important aspect to keep in touch. SME entrepreneurs can overcome obstacles in carrying out international activities,

namely that they can gain access to resources and knowledge as well as access to market opportunities. The importance of the internationalization of the network can be described theoretically using the network model (Flanders 2008: 38) "Small and medium businesses are generally limited by the lack of knowledge and resources in conducting international activities so that in conducting international business need support from partners in the network". In order to successfully build a business network, collaborative relationships based on trust and commitment is an important aspect to keep in touch. The importance of the internationalization of the network can be described theoretically using the network model (Flanders 2008: 38) "Small and medium businesses are generally limited by the lack of knowledge and resources in conducting international activities so that in conducting

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The results of the research in the first year indicate that the performance of SMEs is not affected by the internationalization variable, meaning that international business activities have not been carried out intensively characterized by the limited scope of operation of the international market and the low level of sales profits. SME performance is affected by network resources' ability to utilize network resources is important for SMEs to access international resources, knowledge, and market opportunities. Internationalization low level and the need for the utilization of network resources, making this study in the second year concentrates on the manufacture of the modules to be tested on a group of SMEs surveyed, with emphasis of matter related to the knowledge of the creative

industry in general and specifically in Kendal District. Knowledge of the Export-Import and knowledge of the Indonesian Export Financing Agency and knowledge about running a business based on digital.

METHOD

Methods of data collection: Primary data was collected through surveys and interviews with Dinerindagkop Kendal, Kendal Dekranasda, academia, consumer creative industries, and group discussions, while secondary data was collected using documentation. The data collected by contacting the relevant contact person or official/staff.

Sampling Method: The sampling method used to select the creative industry entrepreneurs is purposive sampling, that the creative industry entrepreneurs who have made internationalization and business-oriented to internationalization. The number of samples that participated in this study amounted to 145 SMEs (Small and Medium Industries) of the 245 target population. Respondents involved in this study came from three sectors in the creative industries, namely: fashion, crafts, and furniture. Data were collected from June to August 2019 using a questionnaire.

Respondents creative industry entrepreneurs to interview taken by snowball sampling method or also known as referral chain network. The interview method used is a structured interview method, allowing researchers to obtain data that is wider and deeper, and to the flexibility of the interview process. Then, research data processing is done by using the SEM analysis of covariance matrix input to the maximum likelihood estimation method.

RESULTS AND DISCUSSION

This research data processing is done by using the SEM analysis of covariance matrix input to the maximum likelihood estimation method. Before forming a full model SEM, prior testing of the factors that make up each of the variables/constructs using a model of confirmatory factor analysis (CFA) has been done before. Model fit (goodness of fit for confirmatory factor analysis will also be tested. With AMOS program version 23, the test results show the goodness of fit in the output.

Conclusions about the suitability of the model created can be seen from the results output goodness of fit obtained.

Having obtained the full model SEM study, further testing is done in conformity with the cut-off value of Goodness of Fit with the results presented in Table 2. Table 2 shows the chi-square test at full research model obtains the results a value of 145.319 under the chi-square tables with a degree of freedom 98 at the 5% significance level of 212.45 this means that the value of chi-square marginal level research model. A probability value of 0.009 is less than 0.05 which is the threshold probability value is not yet eligible means probability value marginal. However, several other indicators of goodness of fit showed good results, for example, RMSEA smaller than 0:08 (0,044) and TLI value worth 0.97.

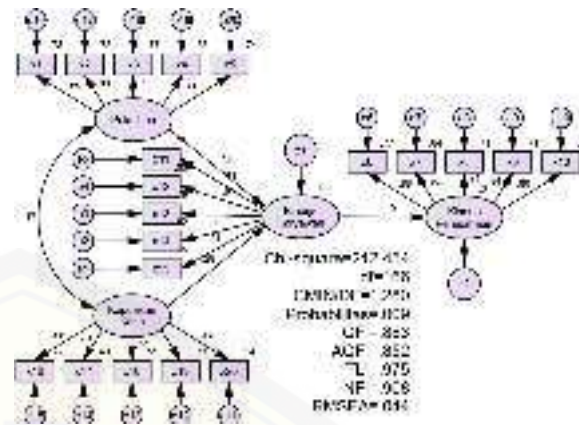


Figure 1. Test Results Full Model Structural Equation Model (SEM)

Table 2. The goodness of Fit Test Results Feasibility Full Model Structural Equation Model (SEM)

<i>The goodness of Fit Index</i>	<i>Cut-off Value</i>	Results Model	Information
Chi-square	expected small	212.45	marginal
significance Probability	$\geq 0:05$	0009	marginal
CMIN / DF	$\leq 2:00$	1:28	Fit
RMSEA	$\leq 0:08$	0044	Fit
GFI	$\geq 0:90$	0883	marginal
AGFI	$\geq 0:90$	0852	marginal
TLI	$\geq 0:90$	0975	Fit
NFI	$\geq 0:95$	0908	marginal

Table 3. Summary of Invention Hypotheses

Hypothesis	Decision	Findings
H1	Received	Training a positive and significant impact on the performance of employees
H2	Received	Job satisfaction has a positive influence on employee performance
H3	Received	Employee Performance positive effect on company performance

CONCLUSION

Internationalization of SMEs affected by the ability to utilize network resources. The intensity in the internationalization of SMEs is determined by the ability of the SME entrepreneurs to build partnerships and relationships with partners in the network to overcome the limitations to be able to enter the international market. Build a network with partners such as buyers, suppliers, government, and trade associations to improve understanding of international business. Internationalization is the "Closed Loop" ie, previous experience is a guarantee for the next step. SME entrepreneurs should be able to quickly work in international markets and to prioritize export markets rather than the domestic market because of the potential for a larger market.

Performance in SMEs affected by network resources with a strong influence, which means that changes in the performance of SMEs are due to changes in the use of network resources. The ability to utilize network resources is important for SMEs to access international resources, knowledge, and market opportunities, thereby causing a change in the performance of SMEs. It can be concluded, "SME performance in conducting international activities can be formed by a network of capital". The ability to utilize network resources is important for SMEs to access international resources, knowledge, and market opportunities that lead to changes in the performance of SMEs.

Performance is not affected by the internationalization of SMEs. These findings indicate that because of the aspect of "smallness", the intensity of internationalization is still low so it does not have a strong influence on performance. The internationalization level that can be achieved by SME entrepreneurs is still low, which means that international business activities have not been carried out intensively characterized by the limited scope of operation of the international market and the low level of profits and sales.

Internationalization is still low, which showed also knowledge of the Export-Import respondent SMEs is still low. Therefore, in the second year of this research activity conducted by compiling a module of the model Internationalization Training To improve Competitive Advantage. Once the module is

compiled, the next step is organizing pieces of training for entrepreneurs/owners of SMEs as many as 145 people. The results of the training are then evaluated by distributing questionnaires related to training, job satisfaction, performance His company respondents and performance. The results of the survey were tested using SEM Test Statistics show that training with the indicator material provided, the method used, the ability of coaches, learning tools.

1. Implications

This study shows that the use of network resources as a decisive factor to push the level of internationalization and performance. Build and maintain relationships with business partners into a capital network, as it supports access to the resources and knowledge to exploit the opportunities in the international market. For SME entrepreneurs, they should be more active in developing a network with various partners, namely to take the following actions:

1. Improving the use of information and communication technology optimally as a means to build the network. Creating a website on the internet can create a company profile form or online stores making it easier for international buyers to search and find businesses of SMEs and can communicate directly. This method is effective to capture buyers who are not too expensive and difficult to develop SMEs.
2. SME entrepreneurs who are still experiencing difficulties in exporting advised to cooperate with local exporters who have similar products.
3. Opening a business network more widely with various stakeholders such as government (ministries, state-owned companies), associations, private companies, and banks and other financial institutions such as LPEI (Insurance Institution Indonesian exports) so employers SMEs can gain some benefits, namely: (a) fostered partner of SOEs to help facilitate entrepreneurs have a strong business network at an international level; (B) get the opportunity to access capital through non-banking institutions to finance exports so that they are not fixated on any banking; (C) the opportunity to participate in various training to improve the capacity of business: innovation, quality

international standards, technology development, product design, and capacity building of employees; (D) the opportunity to participate in exhibitions both locally and abroad; and (e) be informed about the international market: the profile of buyers, potential overseas markets, and trends in overseas markets.

Increase the internationalization of business activities by taking concrete steps as follows: (a) Actively involved in participating in various exhibitions abroad organized by government agencies such as the Ministry of Cooperatives and SMEs, the Ministry of Industry (DG IKM) and the Department of Commerce; (B) take into account aspects of marketing when the exhibition with the aim of promoting the products and invite buyers to visit the stand/booth. The point is the principle of Business to Business (B2B) should be considered not only do retail business. Things that can be done are: pay attention to the design of the stand/booth and layout should be made attractive, the appearance of the product with an interesting composition, actively involved in the exhibition and not only assign employees who have no knowledge of the product.

2. Limitations of Research and Development of Further Research

This study still has limitations, ie capital networks built by entrepreneurs have not significantly affected the performance of SMEs. Further research is needed to determine the barriers to SMEs in doing business internationally (export) and how strategies to address the impact on increasing the performance of SMEs. From this research, it was found that the network through the use of capital relations and cooperation with partner build is the dominant factor affecting SME internationalization and performance. The results of this study can be used as a preliminary step to learn more about the internationalization of SMEs based network capital by incorporating other exogenous variables in a concept that has close ties to the level of internationalization, the international knowledge.

Experience is an important basis for the preparation of the expanding business in both the domestic and international markets, as outlined in the European Commission report "Supporting the Internationalization of SME's" (2007: 9) that international orientation is a consequence of

experience in the industry in which the company does business. Internationalization is the "Closed Loop" ie, previous experience is a guarantee for the next step.

This research can be developed in the unit of analysis (SME export-oriented) in a wider area by considering the following: (a) By strictly categorize the criteria between group companies in light industry and a group of companies in the media industry because it is based on findings in the field, there are considerable differences in terms of the ability to manage the business. Thus, for further study, respondents targeted for companies in the industry of small and medium industries need to be analyzed differently to get the right profile; (B) Distinguishing SMEs conducting business internationally on the basis of the stages of the process of internationalization, which is between the new SMEs in the early stages with SMEs who have international activities (regular export activities). This is important because of the different business strategies implemented. Based on the findings in the field, SMEs are still in the early stage of internationalization requires more support regarding production capacity, quality, and product design. Inexperienced SMEs, conducting international business is facing more constraints associated with the network and government support to facilitate export procedures and permits.

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An Exploration of An Entrepreneurial Strategy in A Resource-Constrained Region: A Case Study of Cocoa Bean-To-Bar Business Venture in Aceh

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ABSTRACT

As the third largest cocoa producing country after Ivory Coast and Ghana, Indonesia has many regions which rely on cocoa as one of the main commodities. Aceh Province is one of the cocoa-producing regions in western Indonesia. However, the slow rate of development of Aceh province plays a role in inhibiting the emergence of entrepreneurship in Aceh. This study examined the phenomenon of entrepreneurship in in resources-constrained area and hostile with entrepreneurial activity. The study focuses on the case study of phenomenal cocoa business venture in Aceh, *Socolatte*, which sustain in depleted and penurious environment. The data collection of the paper was done using in-depth interview. The study shows that the entrepreneur applied different treatment to obtain and manage resources. The entrepreneur emphasized that the physical resources and labor are the importance factors which need to be considered in creating the venture in depleted and penurious environment. By using the resourcefulness strategies as the frameworks in interpreting the data, it can be assumed that the bricolage and improvisation concept were used by the entrepreneur as the approach during the creation and the growth of the ventures. The strategies were not only used in acquiring and managing the resources but also used as tools to assist the entrepreneur in finding alternative solutions to alleviate the problems in the venture. These strategies can be considered to be applied as the framework which can abet the potential entrepreneurs, particularly in Aceh, to create a venture in such resources-constrained area.

Keywords: Entrepreneurship; Resources-constrained; Aceh; Bricolage; Cocoa

INTRODUCTION

Indonesia is the third largest cocoa producing country after Ivory Coast and Ghana and contributes about 10% of the world's cocoa beans production [1]. Nevertheless, 75 % of Indonesia's cocoa production is exported to various countries in the world while the rest is processed by domestic industries [2]. Aceh Province is one of the cocoa-producing regions in western Indonesia. In Intermediate Term Development Plan of Aceh Province, the government include development plant for cocoa plantation sector as one of the priorities [3]. The statement shows the importance of development of cocoa industry sector for the development of Indonesia. However, the slow rate of development of Aceh province plays a role in

inhibiting the emergence of entrepreneurship in Aceh. The disparity between Aceh province and other region, the capital city of Indonesia in particular, is significant which indicates that Aceh is underdeveloped regions [4]. In facing hostile environment, entrepreneur can choose to surrender on the situation and experience the sorrow or take actions to somehow make do [5].

Regardless located in depleted and penurious environments, one of the cocoa farmers still urge to create cocoa processing venture which still continuously growing and impact the society and economic in Aceh positively. *Socolatte* is the only cocoa bean-to-bar business which established and actively operate in Aceh. This venture was initiated in 2003 by local cocoa farmer in in Aceh. The idea undergone various challenges but also supports from different

sectors. The resource-constrained condition is considered as the challenging obstacle in creating and sustaining the venture. Having difficulties in acquiring the resources force the entrepreneur to improvise the entrepreneurial strategy in order to actualize and sustain the venture. Fisher [6] indicates that the constraint of resources may trigger the level of creativity and innovation of the entrepreneur. Honig, Karlsson, & Hägg [7] also stated that the unique opportunities can be invented by addressing the gap in the resources.

The research aims to explore the experiences and strategies taken by the entrepreneur in developing the industry located in a remote area with limited access for resources. The focus of the study is the cocoa bean-to-bar venture in Aceh which processed the cocoa beans grown in Aceh into final products. The paper aimed to answer questions as follow: What aspects may affect the venture creation of the cocoa industry in resource-constrained area? What kind of strategies should be applied to support the creation and sustainability of cocoa industry of Aceh in the marketplace? The information is intended to contribute to the practical knowledge regarding entrepreneurial strategies and encourage the development of entrepreneurship in Aceh and provide the potential strategies as the recommendation for the future entrepreneur.

METHOD

1. Object of research

The research will only study single case study of cocoa bean-to-bar venture in Aceh due to the lack of number of entrepreneurs who involve in cocoa manufacturing industry in Aceh. The object is the cocoa bean-to-bar venture located in Aceh province. The venture named as “Socolatte”, which located in the roadside of main road of Pidie Jaya, which connect the province with the neighbor province, north Sumatra. The factory located precisely at Meunasah Baroh Musa village Bandar Baru District, 132 kilometers from Banda Aceh, the capital city of Aceh. The venture is currently is the only venture which manufactured the cocoa bean originated from Aceh to edible products such as chocolate bar, chocolate drink powder and cake. Beside the manufacturing unit, the venture also has a show room which has side function as café. The interviews were done with the founder of the venture, Mr. Irwan Ibrahim,

and wife, Mrs. Safrida, on January 2019.

2. Data Collection

The research applies qualitative research methodology, focusing on case study. The research exploration activity started by doing the literature research related with the venture, namely news, research publications or any kind of publication related to the venture. The identification of entrepreneur experiences was acquired using in-depth interview method. The Interviews assist the process of data collection which relevant to the research question(s) and objectives. The predetermined list of questions is not required in in-depth interview method [8]. The interviews were executed in Acehnese and Indonesian language, depended on the preferences of the entrepreneur. The local language was predominant in the interview since the use of the language made the entrepreneur felt more comfortable to describe the experience.

3. Data Analysis and Interpretation

The paper used study comparison by comparing the results of the interview with the literature available regarding resources-constrained venture creation and the cocoa industry in developed area. The results aimed as the sources of information regarding strategy and considered issues which may occur as the obstacles in creating the venture in resources-constrained region. During the analysis, we found out that the creation process of the firm related to several theories of entrepreneurial strategy such as the bricolage concept and improvisation. The concepts help to assist the researcher to elaborate the interpretation and explanation of the regularities applied by the entrepreneur during the venture creation stage and in ensuring the sustainability of the firm.

RESULTS AND DISCUSSION

1. Actions Applied Based on Resources Type

a. Raw material

As the idea of forming the venture derived from the availability of the cocoa bean as the main resources, the strategies applied in managing the resources is maximizing the utilization of the raw material owned by the region. Based on the interview, the entrepreneur emphasized that the main raw material of *Socolatte* is cocoa beans which grown in Aceh.

The main suppliers of the raw material are from Pidie Jaya and Pidie. Despite the possibility to acquire cocoa beans from other province, Mr. Irwan insists to only process the cocoa beans from Aceh because he wants to keep the first intention of creating the venture, which is to give the value added for the cocoa bean from Aceh.

My idea to create this industry derived from the awful situation of cocoa sector in Aceh. We produce the cocoa, but we only sell the bean. Other party will process it and we buy it back. It makes me sad, I think we can make our own cocoa industry, process our own cocoa and consume our own cocoa. (I. Ibrahim, Personal communication, 16 January 2019)

However, the cocoa bean from Aceh still lack in quality due to the ignorance of the farmer to apply the fermentation treatment to the beans. To encourage the farmer to ferment the beans, Mr. Irwan decided to increase the purchase price of the fermented cocoa bean. The improvisation reciprocates mutually to both parties. The farmers acquire more profit while the factory receive good quality beans. Back in the days of the early stage of the venture, the cocoa beans were all originated from Pidie Jaya. However, due to the increase of demand and the ability of the site to produce more, Mr. Irwan decided to acquire cocoa bean from another suppliers. Currently, the main suppliers of *Socolatte* are the farmers from Pidie Jaya and the supplier venture named “*Ku Dengo Su Gata*” which located in Bireuen, the neighbor district of Pidie Jaya. The supplier acquires fermented bean from Bireuen, Gayo Lues and South East Aceh.

b. Production Equipment, Factory and café site

The pioneer of the production phase of *Socolatte* happened when the plantation agency of Aceh decided to give machine for the business venture. The machine was not cocoa processing machine, it was not fulfilling the basic requirement for food producing machine. However, Mr. Irwan still decided to accept the equipment from the agency. The existence of the machine allowed the entrepreneur and the team to start to learn the procedure of chocolate product making. Even though, the other process like molding and packing was done manually.

I know that the machine from Plantation agency was not tailored for cocoa production, but I think it would be useful to help us doing some

experiment while learning to produce a great product. (I. Ibrahim, Personal communication, 16 January 2019)

The first production factory of *Socolatte* was taken place in warehouse owned by the entrepreneur in his plantation field. All of the procedure took place in the same chamber and was executed manually. Eventually, the support from the external parties help the venture to hasten the expansion of the factory and build the café site. The entrepreneur decided to build the café due to proliferate the selling level. Mr. Irwan also open the opportunity for students to visit the factory and do some observations. He believes that this occasion is also one of the ways to promote the business without having to issue capital.

I decided to build a café in front of the factory site to increase our selling level. I also want people to able to enjoy chocolate right in front of the factory. I also think that it will fit the emerging concept, the agricultural tourism. On the other hand, it is also can be classified as direct promotion. (I. Ibrahim, Personal communication, 16 January 2019)

c. Labor

Located in the province which has problems in human resources development, the owner of the venture decided to neglect the limitation. In terms of labor, *Socolatte* utilize the human resources who are available in the neighborhood site despite of the incapability owned by the individuals.

When the idea of creating the cocoa manufacturing site in this area, I did not only think on how to make profit, but I also think how to employ and enhance the quality of human resources in my neighborhood. Thus, I insist to employ the worker from my own area. Even though I know that they still do not have sufficient capability. (I. Ibrahim, Personal communication, 16 January 2019)

In recruiting the workers, Mr. Irwan decided not to ask any specific requirement. Instead he accepts any background and qualification as long as the worker has intention to work in the venture. Nevertheless, he still has difficulties in acquiring sufficient number of workers.

I know that it is very difficult to find qualified workers in this area. Even though I already neglect the specific requirement and provide privileges, there is still few people who

want to work wholeheartedly. One of the main reasons is because of the prestige issue. The people in my society still degrade the dignity of people who work in factory. Furthermore, because the factory is not located in Banda Aceh. (I. Ibrahim, Personal communication, 16 January 2019)

Before the training support from OISCA came, Mr. Irwan train the worker by himself to enhance the capability of the worker. Mr. Irwan himself had followed several trainings related to cocoa production and decided to share his knowledge to the worker in order to ensure the sustainability of the venture. Owing to the fact that the number of the worker also limited back then, the workers were used to work in every aspect of the production process, depend on the situation. At the early stage of the venture creation, the founder himself, Mr. Irwan also involved in production, distribution, marketing and even financing aspect of the venture. Currently, Mr. Irwan also still involve in marketing and procurement. Mr. Irwan still insist to not apply “open recruitment” and employ worker from another province. He still urges to empower the society surround the venture to make the human resources quality in the area better.

2. Discussion

a. *Bricolage application*

In forming venture in depleted and penurious environments, the entrepreneur may face difficulties in accessing the necessary resources. In the bricolage concept, the entrepreneur focusses on the resources possessed and the service provided by the resources [9]. This concept aligns with the practice done by Mr. Irwan. Mr. Irwan focus on the resources at hand such as the raw material, machine and labor. The idea of forming the venture itself is derived from the availability of cocoa beans in Aceh. In the bricolage concept, the entrepreneur tends to neglect the limitation of practice, definition and standards of material input which commonly accepted in society and trying out the alternative solution, observing and behave toward the result [9]. Mr. Irwan decided to neglect the limitation of the resources, such as the quality of the cocoa beans and labor or the mismatch specifications owned by the machine. Mr. Irwan decided to focus on the potential own by the beans, labor and machine as the resources at hand by “making

do” those resources.

Bricoleurs, people who adopt the bricolage concept either intentionally or unintentionally, may remedy the resources condition by helping the firms enhance innovation through improvisation [10]. By adopting bricolage practice, small medium enterprises may apply improvisation to find the solution to solve the problem [11]. The competitive advantage of the organization also can be gained through the application of bricolage [12]. In *Socolatte* for instance, Mr. Irwan use the practice of only using the cocoa beans originated from Aceh as the competitive advantage in signature souvenir market. He promotes the social value of utilizing the cocoa beans of Aceh as the act of empowerment of the commodity of the province and use it as the competitive advantage. Bricolage is not merely about conserving resources and making do of the resources for the primer function, the concept also emphasizes on the creativity by recombining the resources towards novel purposes which were not originally intended [13]. The innovativeness of the entrepreneur also revealed from the ability to derive ideas, style, or taste from a broad and diverse range of sources and embed the ideas in new purposes [14].

Along with journey, the entrepreneur decided to augment the purpose of the factory site by opening the opportunity for students or visitor to visit the factory site and built the café right in front of factory plant. The entrepreneur realize that the curiosity is one of the attractive points seeked by the society which can trigger people to visit the factory and accidentally buy the product as the gift. Hisrich & Ramadani [15] mentioned offering the experience by organizing the event is also one of the ways to promote the existence of the business. Even though, the observation is free, the recombination of the resources at hand is able to create new purpose for the existence of the factory as promotion device. This development claimed by the entrepreneur as the significant factor in proliferating the number of buyers. Furthermore, in terms of labour, Mr. Irwan empower the employees by allocating diverge tasks which initially was not the job description of the employee. This strategy allows the entrepreneur to embed novel purposes of the employee, this occasion happened due to the limited number of workers. Thus, in the early stage of development

there was no significant line which differentiate the tasks of each employee.

b. Improvisation

The constraint of resources may trigger the level of creativity and innovation of the entrepreneur [5]. In the organizational creative process, there are three main aspects which play important roles; knowledge, drives and ability [15]. In the improvisation process which done by Mr. Irwan, Mr. Irwan seems to have all those elements. Even though the elements were not acquired from formal education, but the experience and network owned by the entrepreneur may qualified enough to overcome the importance of the elements. The knowledge regarding cocoa production was obtained from various trainings followed by Mr. Irwan during his involvement as cocoa farmer in national organization of cocoa farmer. Mr. Irwan also has strong intention to learn new knowledge which triggered him to actively seek for opportunity to follow many trainings. In terms of drive, the idea of forming the cocoa manufacturing site was derived from his own desire to create value added for the cocoa bean from Aceh, his hometown. The motivation to enhance the human resources quality in his area was also one of the drives which made him actively improvise to find a better solution to alleviate the lack of human quality problem in his hometown.

According Hisrich & Ramadani [15], the third aspects, the ability refers to the way of the entrepreneur seek solution to tackle the problem. In *Socolatte* case, Mr. Irwan did many ways to solve the problem of the venture. In terms of cocoa beans quality for instance, realizing that the socialization of the importance of fermentation practice is not effective among the farmer Mr. Irwan decided to increase the price of fermented cocoa beans. Thus, the farmers have other motivation to apply the fermentation practice. Mr. Irwan applied the improvisation approach during the creation process of the perfect formula for the product. Due to the lack of knowledge in food processing particularly in chocolate bar or powder product, Mr. Irwan followed various training and established corporation with education institution in Aceh or national to help the business to tailor the formula which fit the taste of the market. Etzkowitz [16] stated that as the technological level of the firms need to be enhanced, the firms will tend to open to the academic model by occupying in the

higher level of knowledge-sharing model. In the interaction between university and industry, the university can play a significant role by taking the knowledge into the practical use [16]. The university can broaden the research definition by involving the external parties as the sources for the research problem in a join project [16]. This form of interaction had been done by *Socolatte* by being involved in activities hosted by the educational institution in Aceh, such as research and being a destination for study tour.

CONCLUSION

The study shows that the method on obtaining and managing physical resources and labor play a significant role in the creation of cocoa business venture in depleted and penurious environment like Aceh. The reveal that the entrepreneur inadvertently used the bricolage concept and improvisation concept as the entrepreneurial approach during the early stage of the venture creation. Owing to the fact, the approach can be considered as the recommendation for future entrepreneur in creating and managing a firm in environment like Aceh.

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The Role of Cultural Values in Networking Process of a Female Entrepreneur in Aceh: Study Case Gayo Coffee Industry

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ABSTRACT

Gayo Coffee industry is one of the most promising sectors in Aceh. The popularity of Gayo Coffee both in national and international market led the emerging start up in this sector. Until recently, Gayo Coffee industry is dominated by male entrepreneur. Male domination of the Gayo Coffee industry is a significant cultural factor as it effects the opportunity for women in this industry. This study seeks to broaden understanding of women's entrepreneurial process by exploring issues of cultural role in entrepreneurial and networking process of a woman entrepreneur in Aceh, Indonesia. The aim of this study is to know how a woman entrepreneur in Aceh can successfully establish her own business against the traditional gender stereotype in the society. Data of this study was collected through in-depth interview and study comparison. Data from this study was synthesized using biographical method. The participant of this study is a woman entrepreneur from Gayo Highland, Aceh, Mrs. Riskani. Result of this study showed that culture plays a significant role in entrepreneurial process. The findings of this study suggest that women in Aceh should have equal opportunities as men in terms of career choice. Furthermore, this study also intended as a reference for Aceh community to reframe the traditional gender stereotype towards working women, so that women in Aceh in the future could have equal right as men in terms of career choices.

Keywords: Aceh; Gender; Culture; Entrepreneurial Process; Networking.

INTRODUCTION

Gayo Coffee is one of the main commodities originating from Gayo Highland, Aceh Province, Indonesia. Brought by Dutchman in 1904, coffee plantations which flourished in Bener Meriah and Central Aceh districts has been the main source of income for people in Gayo Highland. In 2017 Gayo Coffee attained the Protected Geographical Indications (PGI) status from the European Union (EU)^[1]. The popularity of Gayo Coffee in national and international market led to the emerging start-ups in Gayo Coffee industry.

Until recently, Gayo Coffee industry in Aceh is dominated by male entrepreneur. It is may affected by the cultural aspect in Aceh that considering a woman as a family caretaker, not a worker. Due to a special status granted by Indonesia government to Aceh province, make

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Aceh significantly differ to another region in Indonesia. The special status let Aceh has its own control on almost every aspect, such as religion, custom law, education, and the career choice for men and women. Aceh society may assume that men are those who obligated to work for the family and may have a negative stereotype towards working woman.

Against all the negative stereotypes towards working woman, Mrs. Riskani established a Gayo Coffee bean exporter cooperative which consists of only woman employees and become the only woman entrepreneur who actives in the coffee industry in Gayo Highland. Due to the difficulty of becoming a woman entrepreneur in Aceh society, the success story of how Mrs. Riskani establish her own business become important to be learned. The aim of this study is to know how a woman entrepreneur in Aceh can successfully establish her own business in Aceh society which have negative stereotypes towards working woman. Furthermore, this study is

intended as a reference for other potential women entrepreneurs to better understand the risk and effort required for success as woman entrepreneur in running her business and how women entrepreneurs in Aceh who has limited room for improvement could build a sustainable network. This study also intended as a reference for Aceh community to reframe the traditional gender stereotype towards working women, especially women entrepreneurs so that hopefully in the future women in Aceh society could have equal right as men in terms of career choices and the chance to express their aspirations in public. This study has two research questions to be answered, as follows: What is the nature of network activity by a woman entrepreneur in Aceh? and what are the barriers for collaboration in this network?.

METHOD

As the research questions only can be answered by understanding the story of woman entrepreneur in Aceh, therefore, this study used qualitative research method. Qualitative data was collected through in-depth interview and study comparison. The participant of this study is a woman entrepreneur from Gayo Highland, Aceh, Mrs. Riskani. The in-depth interview was conducted in KOKOWAGAYO cooperative, which is located in Gayo Highland, Aceh. The interview was conducted in language of origin (Bahasa Indonesia). The in-depth interview used an open-ended questionnaire in Bahasa Indonesia as the instrument. The Indonesian questionnaire was translated to English.

The questionnaire included items relating to entrepreneurial motivation, cultural orientation, business network and entrepreneurial barriers. The entrepreneurial motivation is intended to know the story of how woman entrepreneur in Aceh start and maintain the business. According to McClelland theory of need, there are three types of motivation that drive the willingness of an entrepreneur to start the business: need for achievement, need for power, and need for affiliation^[2]. An open-ended questionnaire was designed to seek other types of needs as the potential sources of entrepreneurial motivation as well.

Cultural orientation was designed to know how Aceh culture have an impact on woman entrepreneur in starting and maintaining the

business. This item is intended to give a clear explanation on how culture impact on the business and to clarify the theory of culture by Hofstede. Business network was designed to know how woman entrepreneur in Aceh can build and maintain the business network when Aceh society tends to limit woman's room of movement. Entrepreneurial barrier was designed to identify the barriers faced by woman entrepreneur in Aceh in creating and maintaining the business and the business network. This item is intended as a reference for future woman entrepreneur in Aceh and to seek is there any room for future improvement.

Data from this study was synthesized using biographical method. The process of data synthesizing followed several steps such as: Interview process; use of documentations; interpretation; researcher notes; and considering the ethical dilemmas^[3].

RESULTS AND DISCUSSION

1. Entrepreneurial Motivation

Bartol and Marton (1998) classified the entrepreneurial motivation factors into three categories: personal characteristics; life-path circumstances; and environmental factors^[4]. Several studies in entrepreneurial motivation showed that there are some differences between women and men motivation in terms of founding a business^{[5][6]}. The result of the studies revealed that in general, women has lesser entrepreneurial motivation than men. It confirmed why in Gayo Coffee industry is dominated by men entrepreneurs.

Entrepreneurial motivation for women is not only affected by financial gain, but also affected by several factors like the need for independence^[7], social contribution^[8], and enjoyment and job satisfaction^[9]. Hisrich and Brush (1986) classified entrepreneurial motivation into "push" and "pull" factors^[4]. The "push" includes all factors that force a woman to start her own business, such as unemployment, frustration with previous employment, etc. The "pull" includes all factors that give a choice for woman to be an entrepreneur, such as self-achievement, creative skills, self-fulfillment, etc^[10].

In this case, Mrs. Riskani's business decision making may significantly be affected by "push" factors. From the interview Mrs. Riskani

revealed that the main reason why she decided to start her own business was because she was not satisfied with her previous job which was never took an opinion from female staff. It might be affected by the culture that always put female opinion in the second place from male opinion especially in terms of business.

Being part of her previous workplace for seven years, Mrs. Riskani realized that there was no policy that favour women right, so in 2014 she decided to establish a cooperative that only consist of women employees and farmers. She began to start her business by recruited five hundred women farmers from six villages and continuous to grow almost each year. However, Mrs. Riskani's business decision making also affected by "pull" or positive factors because she stated that by establishing her own fully woman cooperative, she intends to give a big contribution to all women and children in the Gayo society. Until recently, KOKOWAGAYO Cooperative has been organised regular medical check-up for women in Gayo, provided English language training and skill training for women and children in the society.

2. Cultural Orientation

As discussed previously, the cultural orientation was designed to know how Aceh culture have an impact on woman entrepreneur in starting and maintaining the business. Questions related to respondent's education level and prior work experience were intended to know does the education level and prior work experience are important for woman entrepreneur to start and maintain the business.

A study in entrepreneurial education revealed that education level has been an important element of entrepreneurial motivation and success in wide range of economic and strategic theories^[11]. However, according to Mrs. Riskani from the interview, Mrs. Riskani is a high school graduate woman. She also does not have any formal education related to business. These findings support the statement of a study that stated that the theory about the relationship between education level and entrepreneurial success are unproven and ambiguous^[12].

However, from the interview Mrs. Riskani stated that her prior job experience plays an important role in maintaining the business. Before Mrs. Riskani started to establish her own cooperative, she worked at her family's business

that engaged in the same field. Even though she does not have any formal education related to business, her prior job experience gave her basic knowledge in business.

In other hand, Mrs. Riskani's prior job experience gave her a clear understanding about how to cope with cultural orientation in the society. As discussed before, Aceh culture tend to limit the room of movement of women in Aceh and tend to have a negative stereotype towards working woman. These conditions may be the reasons on why Gayo Coffee industry is dominated by male entrepreneur. Male domination in the Gayo Coffee industry is a significant cultural factor as it effects the opportunity for woman in this industry. From the interview Mrs. Riskani agree that cultural view plays a significant role in almost every aspects of her business. From the interview Mrs. Riskani said:

"Just like Aceh culture in general, here, women have no equal right as men in terms of carrier choice. Even though sometimes women also work in certain area, often they tend not to express their opinion because people tend to ignore women opinion especially in business area. The negative stereotypes towards working woman make most women in Aceh decided to be a housewife or coffee farmer because they have not many options in carrier choice".

This statement from Mrs. Riskani illustrated how Aceh culture plays a significant role in terms of carrier choice for women in Aceh.

3. Business Network

Before founding KOKOWAGAYO Cooperative, Mrs. Riskani already had her business network that could support her business from her previous job. This business network can help her to minimise the risk of business failure. This finding is in accordance with the result of a study that showed that women entrepreneurs tends to doing a business that related to their hobby or their previous work rely on their own family and friends' network in order to minimise the business failure^[13].

Mrs. Riskani believes that it could be more difficult for her to start her own business if she did not have any business network before she established her business, because in Aceh society, women has no equal right for room of movement. Aceh society tend to limit the interaction between men and women. It can be a

main barrier for women to build a business network, so it will take a long time to build a professional business network for women in Aceh.

Mrs. Riskani revealed that she got her professional business network from her previous job and from her husband. Because her husband is also play in the same industry, she often involved in the meeting between her husband and his business network. In addition, Mrs. Riskani said that due to the popularity of Gayo coffee both in national and international market, there are many potential customer or business network come to Gayo Island each year to buy or looking for business partner. It should be a big opportunity for potential entrepreneur to try to approach them and start to build a network among them, but most of women in Aceh often passing the chance because the limitation of room of movement for women in Aceh.

4. Entrepreneurial Barriers

Being an entrepreneur for a woman is always more difficult than man since beside working at work, woman entrepreneur also has to work at home. These double standards make the path of entrepreneurship for woman entrepreneur is always coloured by many kinds of economic, social, and cultural challenges. According to Mrs. Riskani, the lack of trust, the lack of access to capital, and culture are the main challenges she faced in her entrepreneurial process.

A gender discrimination is the main preconditions issue faced by women in Aceh. It is confirmed by Mrs. Riskani from the interview. Mrs. Riskani stated that the main challenge she faced before she started the business was the difficulties of convincing her husband and people from local government that she was capable enough to start and maintain a business. The lack of trust is the result of a gender discrimination in society's system. Most people in Aceh society believe that women were not born to be leaders.

In fact, a study about leadership style comparison between men and women showed that women outperformed men in almost every competency of leadership^[14]. The study also revealed that the reason why women outperformed men in almost every competency is because women are often more nurturing and more caring than men. The result of the study showed that while men leader more likely to dominate the employees, women leader tends to

solve the employee's problem by discussing the problem with them and try to persuade them to improve their best. However, due to the cultural issue on gender discrimination, people in Aceh society still count to men rather than women to be a leader.

The lack of trust on women issue led to the difficulty of women entrepreneurs to get access to the venture capital. Several studies on the impact of gender on access to venture capital revealed that this problem is faced by almost all women entrepreneurs in their entrepreneurial process^{[15][16]}. The studies revealed that most of funding application applied by women entrepreneurs are rejected due to the gender discrimination.

More specific, a study on the impact of gender on access to venture capital revealed that most of women entrepreneurs tend to get financial support from their families and relatives^[15]. Realised that she will facing this capital issue, beside relied on her own initial money, Mrs. Riskani took her business advantage as the one and only women cooperative in Asia that is incorporated with café femenino, to propose a funding proposal to café femenino foundation. Café femenino foundation is an independent non-profit foundation headquartered in Peru that provide grants to selected projects requested by Café Femenino's women farmers.

5. Discussion

This study seeks to broaden understanding of women's entrepreneurship by exploring issues of cultural role in entrepreneurial and networking process of woman entrepreneur in Aceh, Indonesia. Aceh is one of the Indonesian provinces which is located in the Northern part of Sumatera Island. Due to the special status granted by Indonesia government, Aceh has its own control on almost every aspect, especially in terms of controlling and applying the Sharia law/Islamic Law on Aceh society. Sharia/Islamic law plays an important role in cultural value in Aceh, especially in terms of career choice for men and women.

Gayo coffee industry is one of the most promising sectors in Aceh. The popularity of Gayo coffee both in national and international market led the emerging of start up in this sector. Until recently, Gayo coffee industry is dominated by male entrepreneur. Male

domination of the Gayo coffee industry is a significant cultural factor as it effects the opportunity for women in this industry. While in Western country women has equal right as men, women in Aceh has unequal right as men especially in terms of carrier choice. Beside the limitation of carrier choice, there is still a lot of limitation for women in Aceh, such as the limitation of expressing opinion, limitation of room of movement, and the limitation of improvement. Interestingly, this gender gap only can be seen if we already live among the society.

Mrs. Riskani is the only women who is active in Gayo coffee industry. Against all the negative stereotype towards working women and all the scepticism, in 2014 she established a fully women cooperative which is now become the one- and only-woman cooperative in Asia that is incorporated in Café Femenino foundation.

The idea of founding her own business came from when she realised that people in her previous workplace never considering women opinion. It is a common condition in Aceh since people in Aceh always rely on men in almost every aspect. It is culture which took most part in society's mindset and behaviour.

Realising that women's aspirations are also important to be heard, Mrs. Riskani and her female friends against all the negative stereotypes established a fully women cooperative named KOKOWAGAYO. She and her team started the business by recruiting five hundred farmers from six villages in Gayo Island. She also started to approach and build her own professional network with the help from her husband. Mrs. Riskani revealed that without help from her husband, it will be more difficult for Mrs. Riskani to start to build a professional business network for her business.

The result of this study shows that starting and maintaining a business is not easy for a woman in Aceh. Mrs. Riskani has to faces many challenges to start and maintain her business. Even though nowadays her business has been successfully imported its product to several countries, Mrs. Riskani and her team still facing certain problems such as financial issues. Thus, this study is designed as a reference to other women in Aceh to have better understanding on how culture plays a significant role and how to cope with the entrepreneurial barriers.

CONCLUSION

The findings conclude that culture plays a significant role in entrepreneurial process. This study confirmed that even though Indonesia government has been introduced a national plan that assure equal rights for women in Indonesia, gender discrimination still occurs in Aceh society. The gender discrimination in society impact on the lack of career interest of women in Aceh. This finding explains the outnumber of male entrepreneur in the Gayo Coffee industry. Furthermore, the findings of this study suggest that women in Aceh should have equal opportunities as men in terms of career choice because Mrs. Riskani has been proven that women entrepreneurs can provide jobs and also give a significant contribution to social and economic growth.

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Analysis The Readiness of Integrated Reporting of Mining Company in Indonesia

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ABSTRACT

The shifting reporting policy from Sustainable Reporting to Integrated Reporting requires all listing companies to provide information based on Integrated Reporting Framework. This research aims to identify the readiness of the mining company in fulfilling all elements of integrated reporting proposed by the International Integrated Reporting Committee (IIRC). This research is quantitative, testing the score value of Integrated Reporting element. The score value of Integrated Reporting elements identified from Mining Company's Annual Report, sustainability report and the information presented on the company website. This research use eight elements of the Integrated Reporting Framework which are Organizational Overview and External Environment, Governance, Business Model, Risk and Opportunities, Strategy and Resource Allocation, Performance, Outlook, and Basis of Preparation of Presentation. The population of this research is the mining company listed on the Indonesian Stock Exchange (IDX) in 2015-2018. The sample was taken by using purposive sampling method. Research data analysis using descriptive statistical analysis in tabular form. The findings show that the 80.6% IDX-listed mining companies have presented an annual report in accordance with the element of integrated reporting. This research also finds that there are 7 companies implement all element Integrated Reporting voluntarily. Those companies present their Annual Report in line with the component of Integrated Reporting proposed by IIRC consistently in fourth years' time series analysis.

Keywords: integrated reporting; mining; voluntarily; readiness.

INTRODUCTION

Information is important for stakeholder in making decisions related to the survival of a company. Financial reports become one of the media in delivering information which is a reference for reporting financial and non-financial performance of a company (Pandisari, 2010) [1]. The demand for a more complete financial statement is needed by many parties because it is expected to provide convenience for financial statements' users in obtaining information and strengthen understanding of a company Integrated Reporting is an evolution of corporate reporting that has been applied previously to date. The evolution begins with Financial Reporting, Management Reporting, Green Reporting, Sustainability Reporting (SR) and the next one is Integrated Reporting (IR).

Nowadays, non-financial information is as valuable as financial information. Integrated Reporting (IR) is a solution offered by the International Integrated Reporting Council (IIRC) to provide a direct link between financial information and non-financial information that is useful in assessing future company performance. Integrated reporting can be described as a mixture of integrated capital, human, intellectual, natural and social management thinking, strategic goals and value creation, long-term vision, transparency and trust, flexibility, avoiding complex reports, and applying technology and innovation (Farrar, 2011) [2]. The actual needs of non-financial information (sustainability, corporate social responsibility reporting) eager this research to discuss the readiness of company in implementing integrated reporting.

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Reporting in Indonesia still applies the Sustainability Reporting (SR) model whose development and measurement is managed by the National Center for Sustainability Reporting (NCSR) which is guided by the Global Reporting Initiative (GRI) standard. At present, the company is experiencing difficulties in conducting integrated reporting. Following up on this, the Otoritas Jasa Keuangan (OJK) has issued a regulation called by Rancangan Peraturan Otoritas Jasa Keuangan (RPOJK) regarding the submission of reports through an integrated reporting portal in July 2019.

Based on the shifting plan from Sustainability Reporting to Integrated Reporting, listing companies on the IDX must immediately provide the information required in IR guidelines. Level of readiness in implementing the Integrated Reporting element is the main focus of this research. So, the root problem of this research is "What is the level of readiness of mining companies in having annual reports in line with the Integrated Reporting element model?"

MATERIALS AND METHODS

1. Non-Financial Reporting and Its Development

Financial Reporting is a form of reporting that only presents information about financial items without presenting non-financial supporting items, such as information about social and environmental issues. Management Reporting complements previous reports to present financial information and other supporting information related to company management. Management reporting is one of nonfinancial reporting types used by company to disclose supporting information.

The evolution of non-financial reporting is currently developing rapidly, both in terms of regulation and in practice. KPMG found that 77% of the sample companies applied the GRI guidelines, while more than 80% issued a sustainability report (KPMG, 2008) [3]. In just one year, this number grew to around 1,400 companies which, according to Eccles & Saltzman (2011) [4] published non-financial information.

However, commitment and other forms of environmental stewardship from the company

are not outlined in the Management Reporting, so the report changes to Green Reporting. The presentation of Green Reporting which is still separate giving an impact also has not produced a continuous report from year to year so that it encourages the formation of Sustainability Report. Sustainability Reporting requires improved forms to produce more comprehensive information and is integrated with Integrated Reporting, which is a merging of annual reports and sustainability reports into one document.

2. Integrated Reporting

The development and adoption of the Integrated Reporting Framework states that Integrated Reporting provide a challenge for traditional reporting with a clearer focus between strategic relationships and value creation for investors, other users of financial statements and providers of funds for companies. Integrated Reporting is a concise communication about how the organization's strategy, governance, performance, and prospects, in the context of the external environment can create short-term, medium-term and long-term value. The aims of IR are giving knowledge about external environment affect in an organization, resources and its relationship, and on how the organization having a good interaction with the external environment to create short-term, medium-term and long-term value.

Integrated reporting has several elements that are related to each other. The elements of Integrated Reporting according to International Integrated Reporting Council (IIRC) (2011) [5] are;

1. Organizational overview and External Environment.
It provides an explanation of the organization of the company both from the vision, mission, cultural structure and activities of the company as well as external environmental conditions.
2. Governance.
This illustrates the structure of corporate governance that can support the achievement of company goals.
3. Business model.
A company system that converts inputs into outputs and outcomes
4. Risks and opportunities.

- This explain the risks and opportunities of the company that can affect the ability of the company.
5. Strategy and Resources Allocation.
This element describes the strategy and steps chosen by the company to achieve the desired goals.
 6. Performance.
Describe the company's performance in the current year which supports the company's goals.
 7. Outlook.
Explain the conditions in the future related to the company.
 8. The base of preparation and presentation.
It is a basis to disclose of elements presented by the company in the report.

LITERATURE REVIEW

Currently, non-financial information is as valuable as financial information. From an investor perspective, the value of additional financial information is starting to increase. This statement is supported by Clements & Brown (2012) [6] who claim that the integration of ESG in a long-term financial plan determines shareholder value. Radley (2012) [7] states that the current decision-making process is influenced by socially responsible investors and socially responsible investment analysts. This perspective outlines the relevance of non-financial performance in the analysis of financial and extra-financial information. In examining non-financial impacts, investors and analysts consider the following information: governance, natural, social and community resources, capital (human, intellectual). Besides, Moody's and Standard & Poor's rating agencies support sustainability reporting practices, develop sustainability ratings and indices to measure sustainability.

After a fairly extensive review of the actual needs of non-financial information (sustainability, corporate social responsibility reporting), this research will discuss integrated reporting and its relationship to sustainability. The first study was conducted by White (2005) [8] in his study of corporate reports, integrated reporting. Research on sustainable evolution is in great demand by many parties. Eccles et al. (2010) [9] explain how companies compile

integrated reports. Integrated reporting can be described as a mixture of integrated thinking, capital management, human, intellectual, natural and social, strategic goals and value creation, long-term vision, transparency and trust, flexibility, avoiding complex reports, and applying technology and innovation (Farrar, 2011) [2].

Eccles et al. (2010) [9] define integrated reporting as the process of integrating ESG into the company's annual report. Deloitte Touche Tohmatsu Limited (Deloitte, 2011) [10] explains that integrated reports are a means of presenting organizational history, and are the responsibility of the CFO and must contain elements of sustainability (Ernst & Young, 2011) [11].

METHODOLOGY

The population of this research is mining companies listed on the Indonesia Stock Exchange that publish Annual Reports. The sampling technique used in this study was purposive sampling, with the following sample criteria:

1. Mining companies registered and published Annual Reports on the Indonesia Stock Exchange in 2015 up to 2018.
2. Data is available and complete.

The data in this study are secondary data, which is obtained from the company's annual report downloaded from www.idx.co.id and company data that obtained ISRA nominations were obtained from www.ncsr.go.id as well as from each company's website. Research variables studied were 8 of Integrated Reporting (IR) elements, which are: Organizational overview and External Environment, Governance, Business model, Risks and opportunities, Strategy and Resources allocation, Performance, Outlook and Base of preparation and presentation. This variable is measured by scoring the availability of IR elements in the annual reports that have been published by the mining company. The variables valued by giving number 1 for each IR element that has been applied by the company and number 0 if the IR element is not applied in the company. The total score of each company is used to assess the level of application of IR elements in the report.

Data Analysis Models and Techniques in this study were processed using statistical descriptive analysis tools and frequency analysis. Statistical descriptive analysis is used to show the minimum, maximum, average and standard deviation of each data. While the frequency analysis is used to describe an overview the companies' readiness level presentation of implementing the all IR element.

RESULTS AND DISCUSSION

1. Descriptive Analysis

Based on the predetermined population criteria, there are 49 mining companies registered on the Indonesia Stock Exchange. Since this research applied time series analysis, so the sample uses in this research are 186 samples. Some of the mining company which did not publish their Annual reports were dropped out from the sample.

Based on Table 1 below, it shows that the implementation of Integrated Reporting done by the mining company has a minimum value of 6. It means the lowest level of mining company has applied 6 of 8 IR elements. While the maximum value of implementing IR Element is 8. It shows that some of the mining company has voluntarily presented their Annual report in line with the soul of Integrated Reporting proposed by IIRC. On average, the mining company listed in IDX had implement IR elements in the range of 7.14, with the variance 0.175. The standard deviation is 0.418.

Table 1. Descriptive Analysis

	Min	Max	Mean	Std Dev.	Variance
IR ELEMENT	6	8	7.14	0.418	0.175

2. Frequency Analysis

Based on table 2, the results of the frequency data analysis show there are 16.7% of mining companies have fulfilled all 8 elements of Integrated Reporting. Total frequency sample 31 samples within the fourth years' time series

analysis. Meanwhile, the average company as many as 80.6% of this research sample, has implemented 7 elements of IR. There is only 2.7% which implements 6 elements of IR.

Table 2. Frequency Analysis

IR Element Implemented	Frequency	Percent
6	5	2.7
7	150	80.6
8	31	16.7
Total Sample in 2015-2018	186	100

This research not only analyzes the descriptive term but also figures out the consistency of the mining company in presenting their component of the Annual Report in accordance with the Integrated Reporting Element proposed by IIRC. The movement result of implementing the IR element can be seen in table 3.

This research found that there are 7 mining companies have implemented all 8 elements of integrated reporting consistently in 4 years' time series analysis. Those are PT Aneka Tambang Tbk., PT Indo Tambangraya Megah Tbk., PT Medco Energi International Tbk., PT Bukit Asam Tbk., PT Petrosea Tbk., and PT Timah Tbk., and PT Elnusa Tbk. Among those companies, there are 5 companies which are listed in ISRA Award. It shows that in mining company, they are already presented their report in line with IIRC.

Table 3. Mining Companies Frequency in Implementing IR Element

TOTAL IR	YEAR			
	2015	2016	2017	2018
6	0	1	1	3
7	36	37	41	38
8	8	8	7	8

Research at the mining company shows that the company has well implemented the Integrated Reporting elements issued by IIRC. This is caused by the form of responsibility of the mining company to shareholders and also to the environment which has been explored.

CONCLUSION

In brief, the Mining Company listed in Indonesia Stock Exchange is ready to face a changes in policy regarding integrated reporting. Not only good in terms of financial reporting but also revealed elements of integrated reporting. This is indicated from the results of research that most mining companies have implemented integrated reporting elements of 7 elements. Besides, there are 7 mining companies who have voluntarily implemented integrated reporting for 8 elements consistently. Those are PT Aneka Tambang Tbk., PT Indo Tambangraya Megah Tbk., PT Medco Energi International Tbk., PT Bukit Asam Tbk., PT Petrosea Tbk., and PT Timah Tbk., and PT Elnusa Tbk. Among those companies, there are 5 companies which are listed in ISRA Award. It shows that in mining company, they are already presented their report in line with IIRC.

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Is Inbound Marketing the Right Choice in Industrial Revolution 4.0 Era?

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ABSTRACT

The world has entered the era of the industrial revolution 4.0 that brings change to human life. The impact of the digital industry revolution 4.0 is the development of the Internet in the industrial and commercial world so as to bring up a new system. One result of the digital industrial revolution is the dynamics of the marketing model. Traditional marketing models (outbound marketing) have shifted to inbound marketing because it is considered to be cheaper and more favorable than traditional models. But both have different audience characteristics so some industries still maintain the traditional model but combine it with digital inbound marketing model to achieve wider marketing. The new paradigm offers new options for marketing like Internet marketing mix. Initially marketing was oriented toward boosting sales, seizing and retaining customers, and is now changing for long-term marketing. This paper was written to explain the new paradigm of marketing as a result of the 4.0 digital revolution. This paper was a compilation of articles, journals and books that explained the current marketing dynamics paradigm. The results describe the dynamics of the marketing world and the emergence of a new paradigm of the marketing world of the 4.0 digital age.

Keywords: Inbound Marketing, Marketing, Revolution, Digital, Digital Marketing.

INTRODUCTION

In the early years of the Internet Age, the potential of using the Internet as a distribution channel excited business managers who believed this tool would boost sales and increase organizational performance. Research results explain that The Internet is a new technology that makes some things simpler, cheaper, and easier. It is a new way for businesses to communicate with consumers and for consumers to communicate with one another and a new way to sell products and services to consumers, but it joins other media and distribution channels as vehicles for these tasks [1]. A revolution is happening via the Internet of Marketing – one that will have tremendous impact on the world as we know it. Internet brought many changes to the way the business is done. Especially, the rapid

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growth of the World Wide Web (WWW) as dominant part of the Internet, brought revolution in the field of advertising and marketing during the last decade of the 20th century. The Internet has the potential to alter many aspects of lifestyle. More recently, case-based studies are beginning to emerge on how the Internet may alter the marketing management process [2].

One of the impacts of the internet is the existence of interactive facilitation multi-dimensional many-to-many communication. The impact of the digital industry revolution 4.0 is the development of the Internet in the industrial and commercial world so as to bring up a new system. One result of the digital industrial revolution is the dynamics of the marketing model. The inherent potential of the internet as a commercial media to quickly reach a broad market. Some businesses have been successful on the Internet, and these are widely reported in the popular media. One result of marketing changes is the emergence of marketing using digital media on the internet to advertise

something. The potential of network marketing, as a consequence of the internet, not only creates new global conditions, but also has shaped the marketing paradigm from the traditional model to the modern model. But both have different audience characteristics so some industries still maintain the traditional model but combine it with digital inbound marketing model to achieve wider marketing. Digital marketing is promoting online can use website and mobile media. In industry 4.0 is an automatic trend to carry out activities in the business field [3]. Digital advertising is increasingly profitable due to the increase of internet users. While this study only focuses on the fundamental phenomenon in which the behavior of Internet users in response to the effectiveness of digital advertising that makes this research unique. Digital marketing is a way to promote certain products/brands through internet media. Can be through advertisements on the internet, facebook, youtube, or the media other social outbound and inbound marketing.

METHOD

This paper was written to explain the new paradigm of marketing as a result of the 4.0 digital revolution. This paper was a compilation of articles, journals and books that explained the current marketing dynamics paradigm. The results describe the dynamics of the marketing world and the emergence of a new paradigm of the marketing world of the 4.0 digital age.

RESULTS AND DISCUSSION

1. Historical of Era Marketing Patterns

The world of business and trade is a world that continues to grow along with the development of science and technology. Hundreds of years ago in the past, where science has not developed, the trade is still very simple, even a payment system is still using the barter system. [4] says that marketing as an exchange process can be traced back to the times when our ancestors began to produce crops or reviews their own goods surplus to requirements and used them to barter for other things. An embryonic marketing occurred when the needs and wants of customers were identified and anticipated and the surplus was tailored to fulfil reviews these requirements. Over time the world of business

and commerce began to flourish. The increasing human needs for goods and services and the increasingly complex types of goods and services required by humans, making the world of business and commerce are always changing.

Experiencing dynamic business world in almost all sectors, ranging from preproduction, production, sale to post-production. [5] in the quotation from the article entitled "The Marketing Revolution", there are 4 era marketing patterns. The first is the production era (1869-1930), where the company focuses to manufacture goods on a large scale to form a company that can master the product. The second is a sales era (1930-1950), where the sales pattern has been supported by the market management and advertising. Furthermore, the third era is the era of marketing (1950-1960), in this era of increasingly tight business competition so companies began to pay attention to details of the overall business support component. The next era is the era of marketing control (1960 onward) which is said to be the era of revolution company because the company focuses not only on consumers but rather the overall image of the company.

Bill Gates says in one of his speech: " The future transaction are going to be done in two ways: on internet and ...on internet" So everybody has to understand that the future belongs to the internet On-line business seems to have all the advantages that a business man requires in order to be efficient, to be on time, to be compatible with the needs discovered on the market. E-Internet is the future having in view that billions of people are using it in order to be all over the world with their business, ideas and messages [6].

2. Outbound Marketing vs Inbound Marketing

Outbound marketing is what used to just be known as "marketing." Outbound marketing, also referred to as "interruption" or "push" marketing, uses tactics that get a message to a large number of people in an effort to make a sale. Traditional marketing implies pushing messages via intrusive media like TV, radio, magazines. TV and radio ads, telemarketing, banner and display ads, billboards, newspaper and magazine ads, cold calling, pop-ups and popunders, and contextual ads are all examples of outbound marketing. It's a one-way conversation

that typically focuses on the product and reasons why the audience should buy it. The biggest strength of outbound marketing is its ability to get in front of a large number of people quickly and build awareness. Traditional marketing has lost its competitiveness because of the advertising clutter, consumer inattention, and the new methods people use to block unsolicited messages. Historically, marketers tried to find consumers or markets for products or services, via tools such as advertising. In general, the outbound techniques are simpler to implement and are a faster way to reach the potential customers [7]. Traditional, outbound marketing is



pretty much dead in the water today as people are getting far better at ignoring marketing interruptions:

Figure 1. Outbound Marketing [7]

Inbound marketing is reshaping the commercial landscape because for the first time in history, it's not how much money you have to spend on marketing that counts. It's how good your content is and how savvy you are at doing things which will help you "get found" by your prospective customers. Inbound marketing changes how you do business [7].

Inbound marketing is a relatively new marketing concept where marketers attempt to "pull" in potential customers with interesting content. The idea behind the Inbound marketing is to use marketing tactics that will try to earn the interest of the prospects and pull (bring) them to the company (the company's website) rather than trying to push the advertising message to them and wait for their reaction. Also called content marketing, inbound marketing involves creating blog posts, social media, infographics, white papers, email newsletters, and other content that people actually want to read. Search engine optimization, paid discovery, and paid search help people find marketers' content. If it's engaging enough, they interact with it, reading and sharing, and come away with a positive

impression of the brand that influences later purchasing decisions. Inbound marketing is very hands-off and indirect: there's never a noticeable sales pitch. Inbound marketing nudges customers down the sales funnel by increasing their engagement with the brand. The attention of the potential customers is earned by development of high-quality content and making that content available (sharing it) through multiple online channels including search engines and social media. The term 'content' in internet marketing refers to a variety of formats, including but not limited to news, web articles, videos, white papers, e-books, infographics, case studies, how-to guides, photos, etc [8].

Today, measurably better results can be generated by using inbound marketing strategies which help people to find you using the various social media search tools of the Internet:



Figure 2. Inbound Marketing [7]

The Inbound Marketing, as an Internet marketing concept or a strategy, found its roots in permission marketing and content marketing. As a holistic approach it also incorporates other acknowledged online marketing techniques like search engine optimization (SEO), social media marketing, e-mail marketing, CRM, web automation etc. The main idea behind Inbound Marketing is to attract visitors to a website by creating and distributing useful content, convert those visitors into leads, earn their trust and then turn them into loyal customers. This approach is focused on pull marketing techniques rather than push techniques that interrupt the internet users with an advertising message. Therefore, essential for this strategy is to develop high quality and targeted content, make it available on a search engine friendly web site and share the information on the social media and by other effective means. In order to convert the incoming visitors to leads, the website should exchange free useful content (eBooks, videos, data, software, subscription, etc.) for the visitors'

contact information including their email [9]. Inbound marketing is the process of attracting the probable customers to a business before they have any intention to become customers. An effective method for inbound marketing is creation of a positive psychological business environment to attract the customers. A significant portion of traditional business environment is moving online and the new business environment is the company website [10].

Tabel 3. The Different in The Marketing Mix [8]

Inbound	Outbound
Pulls in interested readers	Pushes at everybody, regardless of interest
Written for the consumer's needs	Written for the product's needs
Interactive and fluid	Inert, one-way
Draws in customers	Seeks out customers
Is part of content consumption	Disrupts content consumption
Natural habitat: blogs, social media, opt-in emails, search, influencer marketing	Natural habitat: display ads, billboards, telemarketer scripts, magazines, TV ads

3. The Benefit of Internet Marketing Based Inbound Marketing

Marketing or advertising activities also has its own dynamics. Before the technology develops the advertising done by door to door, mouth to mouth without uses the media. Over time the company began using advertising media such as leaflets, radio and TV more effective to be used in advertising the products of a company. Even after the Internet began to emerge and evolve, the advertising world is a very significant change. [11], traditional marketing is becoming obsolete. Traditional marketing deliver the message through the media such as TV, radio, magazines but traditional marketing is no longer effective start due to several causes such chaos maarketing world, consumer indifference and methods to remove the ads. The lack of apparent reason for this method is, people are getting annoyed with ads that go but on the other hand even increased marketing costs. At first the company makes advertising with the aim to introduce their products in order to get the consumer as much as possible. This long way apart costly to manufacture advertising, also did not guarantee an increase in customers. Since the

influx of internet, advertising process becomes easier and expenditures for advertising can be minimized.

Effective exploitation of the Internet would only occur once marketers ceased viewing the technology as a mechanism for supporting transactional marketing and recognized that electronic information provides a foundation stone upon the which to build closer relationships with customers. Based on the Chaston research we can know that besides minimizing expenses, use of the Internet as an advertising medium can also create a better relationship between the company and customers. The relationship online markets, customers will be seek to purchase specific, customized products and demand close, frequent interactions with reviews their suppliers. In response, suppliers will be Able to utilize the Internet to acquire detailed understanding of specific customer needs and be orientated towards using innovation to evolve highly customized products and services. The influx of the internet is a bit much has changed in the marketing system. If the non-electronic marketing initially spiked on mass marketing, now after the entry into personalized marketing pattern internet marketing [2]. The inclusion of the Internet helped to change the system in the marketing mix 4P which are: product, price, promotion and place. The difference in the marketing mix is as follows: Now after the entry into personalized marketing pattern internet marketing [12].

Tabel 3. The Different in The Marketing Mix [12]

	Non-Internet	Internet
Product	Needs time to discovering customers needs.	Greater customisation the product.
Price	Stuck in each country standardisation .	Increasing competition and standardisation of prices.
Promotion	One direction communication.	Interactive communication with customers.
Place	Difficult to order taking and giving information.	Reduce the importance of traditional remedies.

There is no doubt that currently an attractive form of presence in the web is of utmost importance for any company. The main force driving this new revolution is inbound marketing. This revolution has a global and universal reach and affects everybody without regard to his or her social or economic status, his or her education or culture [13]

CONCLUSION

Inbound marketing is a relevant alternative to use in this digital era. Inbound marketing strategy is considered more effective and economical for use in marketing. Consumers currently have been made easier for approaching by the company through inbound marketing with the current technology sophistication facility.

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Impact of Alternative Feed Technology Utilization, Between The Increase in Feed Cost and Revenue on Rural Cattle Farming

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ABSTRACT

The use of feed technology greatly influences the decision of households in carrying out production activities, allocation of labor and consumption, so it is necessary to conduct research on the relationship between the use of technology and household decisions in carrying out their activities. By studying the impact of technology on household decisions, it can be calculated how much household income is due to the use of technology in the study area. This study aimed to analyze the role of technology utilization in increasing the income of traditional cattle farmers in South Sulawesi Regency. The study was conducted by survey research that illustrate the systematic and factual about the actual phenomenon. The results showed that: (1) The use of food technology led to an increase in production costs, but also leads to increased acceptance, resulting in an increase in household income of traditional cattle farm; and (2) Some policies can improve the production yield and can reduce the cost factor that can improve the economic of the traditional cattle farmer households. Some suggestions for policy makers based on the results of this study, which is expected to implement policies: (i) support the use of feed technology application on cattle farming; and (ii) the subsidy increase in the number of cattle ownership.

Keywords: Alternative feed utilization, household income, cattle farming.

INTRODUCTION

One of the current livestock development programs in Indonesia is a program to increase domestic beef production and provide safe, healthy, whole and halal animal food. Livestock development policies need to be based on local resource potential. The government programs and policies need to be implemented to increase the production and productivity of beef cattle breeding businesses with all the pro-people technical guidelines and implementation. The main actors in achieving the target of animal husbandry and animal health development are farmer households.

In the household economy, households act as producers and as consumers. The household allocates its workforce to produce production in an effort to increase income, then the income obtained is allocated for consumption both food consumption and non-food consumption (Chayanov, 1966 and Bernstein, 2009). The household economic model is carried out to maximize usefulness (maximize the utility) of resources with four constraints, namely a) production level, b) acceptable minimum income level (Ellis, 1989 and Harison, 1975); c) maximum number of farmer's household workdays (Chayanov, 1966 dan Chavas, Petrie and Roth 2005); and family income is influenced by the amount of man-days labor in the process of production (Osak, et al., 2015).

The use of feed technology greatly influences the decision of households in carrying out production activities, allocation of labor and consumption, so it is necessary to conduct

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research on the relationship between the use of technology and household decisions in carrying out their activities. By studying the impact of technology on household decisions, it can be calculated how much household income is due to the use of technology in the study area.

Feed given to beef cattle in South Minahasa Regency is in the form of grass, agricultural waste, and in the last few years concentrate has been processed by using local ingredients, and has been given additional feed. The technology of feed used is classified as effective technology that is simple, in addition to being able to play a role in increasing the productivity of cattle, but it causes increased business production costs and affects the household economy of farmers. Based on the background and problems, the problem is formulated, namely: How is the role of using feed technology in improving production results and increasing the business income of traditional beef cattle.

MATERIALS AND METHODS

This research was conducted in South Minahasa District. The research was conducted by survey method. The purposive sampling was selected as many as 65 household sample farmers as respondents.

Cattle production is thought to be influenced by the outpouring of labor in beef cattle, farm laborers and the amount of expenditure for animal feed, which is formulated as follows:

$$PoC = f(AoL, Eff) \quad (1)$$

$$PoC = a_0 + a_1 AoL + a_2 Eff + e_i \quad (2)$$

$$\text{Hypothesis : } a_0, a_1, a_2, > 0 \quad (3)$$

Note: PoC = Production of Cattle (IDR/year)

AoL = Allocation of Labor (hours/year)

Eff = Expenses for Feed (IDR/year)

a₀ = Constant coefficient

a₁ and a₂ = The parameter coefficients of each independent variable.

RESULTS AND DISCUSSION

Adoption of technology is an important effort to increase productivity in various production systems, namely producers benefit from the application of technology either through opportunities to reduce production costs, increase output from the same input, or by keeping the same output from input reduced.

Cattle farming in the study area is generally still appropriate technology, so the adopted technology is simple. The technology analyzed in this study is feed technology that has been used by farmers, as processing of concentrates, hay, silage and ammonia of agricultural waste. The results of this study compare respondents' calculations about costs, revenues and cattle business income can be seen in Table 1.

Tabel 1. Labour Allocation and Cattle Farming Revenues

Description	Before Technology	Feed	After Technology	Feed
Total Labour Allocation (hours/year)		107.591		215.182
1. Average Labour Allocation (hours/year/respondent)		1.655		3.310
Total Revenue (IDR/year)		323.444.552,9		392.500.004,9
2. Average Revenue (IDR/year/respondent)		4.976.070,0		6.038.462,0

The analysis results as shown in Table 1 indicate that with the adoption of technology causes an increase in the average labor supply of 1,655 hours/year before using feed technology to 3,310 hours/year after using feed technology, thereby increasing wage costs. Increased labor expenditure is done to increase productivity, namely an increase in average income from IDR4,976,070 before using feed technology to IDR6,038,462 after using feed technology.

The results of the analysis as shown in Table 2 show that with the adoption of technology an average production cost increased from IDR21.066.045 before using feed technology to IDR27.366.346 after using feed technology, but also an increase in the average profit from IDR26,042,115 before using feed technology to IDR33.404.808 after using feed technology, resulting in an increase in profit from IDR4,976,070 before using feed technology to IDR 6,038,462 after using feed technology. This means that even though the use of feed technology causes more expensive production costs, it is accompanied by a significant increase in cattle farm business revenue so that it can earn a greater profit or income than without using feed technology.

Table 2. Costs, Revenues, and Profit of Cattle Farming without Feed Technology or Using Feed Technology

Description		Before Feed Technology	After Feed Technology
1	Total Cost (IDR/year)	1.369.292.947,1	1.778.812.495,1
	Average Cost (IDR/year/ Respondent)	21.066.045,0	27.366.346,0
2	Total Revenue (IDR/year)	1.692.737.500,0	2.171.312.500,0
	Average Revenue (IDR/year/ Respondent)	26.042.115,0	33.404.808,0
2-1	Total Profit (IDR/year)	323.444.552,9	392.500.004,9
	Average Profit (IDR/year/ Respondent)	4.976.070,0	6.038.462,0

Utilization of feed technology by the respondent breeders aims to increase cattle farming productivity, namely cattle weight gain and increase in income, so that farmers prefer to use feed technology even though production costs increase but produce greater additional income.

The results of the estimation analysis of the parameters of Production of Cattle (*PoC*) in relation to Allocation of Labour (*AoL*) in Cattle Farming and Expenses for Feed (*EfF*) can be seen as follows:

$$PoC = 69.208 + 0,3696AoL + a_2EfF + e_i$$

Probability analysis results $F < 0.05$ means that simultaneously variables consisting of Allocation of Labour (*AoL*) in Cattle Farming and Expenses for Feed (*EfF*) have a significant effect on Production of Cattle (*PoC*). Partial test results using the t test show several things as follows:

(1) The Effect of Allocation of Labour (*AoL*) on Production of Cattle (*PoC*), obtained t-count value of $6.30 > t$ -table of 1.99, and Prob t of < 0.0001 ($p < 0, 05$). The results of this analysis show that partially allocation of labour (*AoL*) affect the production of cattle (*PoC*). The positive *AoL* parameter coefficient indicates that if the allocation of labour is increased, it will result in an increase in the production of beef cattle (*PoC*). These results are as reported by Hartono (2011) and Wantasen et al (2012) that the more cattles are maintained, the more efficient outflow of labor.

(2) Effect of Expenses for Feed (*EfF*) on the value of Beef Cattle Production (*PoC*), obtained t-count of $2.96 > t$ table of 1.99, and Prob t of 0.0043 ($p < 0.05$). This result shows that partially expenses for feed (*EfF*) affects the value of Beef Cattle Production (*PoC*).

The parameter coefficient of Expenses for Feed (*EfF*) has a positive sign indicating that if

the expenses for feed is raised, it will lead to an increase in cattle production or an additional value of beef cattle. The results of this study indicate the role of feed in production, because the feed given has been done by technology to improve quality. This means that the increase in livestock production will increase if an increase in the quantity and quality of feed. This result is in accordance with Hartono's (2011) research that theoretically the increase in production lies in the improvement in the quantity and quality of feed used.

The results of the analysis of this equation show that the average number of labor outflows is 107.590,75 hours/year or with an average of 1.655,24 hours/year/respondent for a year or 4,5 hours/day for each respondent. This means that the average amount of labor expenditure per unit of livestock is 607 hours per animal unit (AU) of cattle each year or 1,66 hours per AU/day. The amount of labor allocation is higher than that of dairy cattle from Ihsan, et al (2001) of 138,17 hours per AU/year or Hartono (2010) of 68,69 hours per AU/year.

Allocation of farmer workforce after using feed technology is actually higher than before they use feed technology, which seems different from Chayanov's theory, that using technology will reduce the allocation of family work hours on his farm, so as to provide leisure or leisure time for family members to recreation or other activities. This difference is due to the different characteristics of technology and employment opportunities in the Chayanov area in this research area, where technology in the study area only uses traditional technology or traditional technology with a high allocation of labour time for family human labour.

CONCLUSION

1. Allocation of Labour (AoL) in Cattle Farming and Expenses for Feed (EfF) have a significant effect on Production of Cattle (PoC).
2. The average number of labor outflows is 107.590,75 hours/year or with an average of 1.655,24 hours/year/respondent for a year or 4,5 hours/day for each respondent. This means that the average amount of labor expenditure per unit of livestock is 607 hours per animal unit (AU) of cattle each year or 1,66 hours per AU/day.
3. Allocation of farmer workforce respondents after using feed technology is actually higher than before they use feed technology. The technology in the study area only uses traditional technology or appropriate technology with a high allocation of labour time for household human labour.

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The Comparison Effect Among of Red Ginger (*Zingiber officinale* var. *rubrum*) Rhizome, Tetracycline and Stimuno Forte® on the Total Fecal Bacterial Count of Broiler Chicken on Starter Stage

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ABSTRACT

This study was aimed to determine the effect of red ginger (*Zingiber officinale* var. *rubrum*) powder as feed additive on the total fecal bacterial count of broiler chickens (starter phase) and comparing it to the effect of tetracycline (antibiotic growth promoter) and stimuno forte® (commercial immunostimulant product). A total of 100 day-old broiler chickens were divided into four experimental feed/dietary treatments groups (after 7 days of acclimatization). Group I (control) was given standard broiler feed for the whole experiment period; group II was given standard broiler feed supplemented with 2% red ginger rhizome powder; group III was given standard broiler feed supplemented with tetracycline (15 mg/Kg body weight orally); group IV was given standard broiler feed supplemented with Stimuno forte® (13.5 mg/ Kg body weight orally). The supplementation was given for 7 days (day-8 until day-14). The result showed that the supplementation of red ginger powder to the broiler feed significantly increases ($p < 0.05$) the number of total fecal bacterial count score compared to the control group at day-14 (H+14) while no significant difference of total bacterial count score ($p > 0.05$) was observed among Tetracycline and Stimuno Forte® supplemented group compared to the control group. Because the chickens were not intentionally infected with pathogenic bacteria, the result suggest that red ginger powder might have significantly increase the total fecal bacterial count by stimulating the growth of beneficial bacteria in the digestive tract of broiler chicken at the end of starter stage.

Keywords: Red ginger; feed additive; total fecal bacterial count; broiler chickens.

INTRODUCTION

The increase in animal protein demand has led to the fast development of poultry breeding sector in Indonesia [1]. In general, a considerable increase in the poultry industry has been observed in the past few decades mainly due to the utilization of a variety of modern growth promotion strategies, as well as suitable disease

prevention and control procedures. Numerous antibiotics has been used as growth promoters and added into poultry feeds for improving animal's health [2]. Among others, gut health is considered as one of the factors contributing to the maintenance of poultry productivity [3]. A large number of processes occur in the gut including digestion, nutrition absorption and various immunological processes [4]. A

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multitude of microorganisms especially bacteria also composes the gut [3]. The gut is also continuously exposed to both the favourable non-infectious as well as the deleterious infectious pathogens. Exposure by the infectious pathogens were reported to cause an imbalance which subsequently result in impaired feeding efficiency [3], severe productivity loss, intestinal diseases and immune suppression [4]. Antibiotic as growth promoters has been extensively used to fight against these infections and improve gut health [3]. But with the increasing risk of the development of resistant organisms and consumer's worries about antibiotic residue contamination in poultry products, the European Union has ban the use of antibiotics in poultry feed and advice to minimize the use of antibiotic growth promoters (AGP) have also been recommended by other countries such as the United States [4][5]. Nevertheless, this ban on antibiotic use has led to other problems such as problems in poultry performance [4]. Thus, the search of alternative growth promoters is required.

One alternative to AGP is phytogetic feed additives (PFA) which include herbs, spices and other product of plant origin. Alternatives to AGP have to be able to exert modulatory effect on the gut microorganism as well as the immune system [6]. Herbs and its phytochemical components are said to have an extensive antimicrobial activity. It reduces the activity of pathogenic bacteria in the digestive tract of poultry but stimulate the development of advantageous or favourable bacteria [7]. Red ginger (*Zingiber officinale* var. *rubrum*) is one of the medicinal plants that is widely known by the public [1]. Red ginger contains the highest essential oils content compared to the other ginger varieties which is around 2.58-3.90 %. These essential oils possesses the efficacy to inhibit the growth of microorganisms and act as antibacterial, antiseptic as well as antifungal [8]. The effect of red ginger as feed additive on the intestinal microflora of hybrid duck has been studied before and it was said to be capable of increasing the non-pathogenic bacterial population while supressing the pathogenic bacterial population [8]. Therefore, this research was aimed to determine the effect of red ginger powder as feed additives on the total faecal bacterial count of broiler chicks (starter phase) and comparing its effect with the effect of

tetracycline antibiotic and commercial immunostimulant product.

MATERIALS AND METHODS

1. Materials

Day-old broiler chicks were purchased from a local hatchery PT. Langgeng Jaya Farm Tulungagung. Plate Count Agar was purchased from Merck. Red ginger (*Zingiber officinale* var. *rubrum*) rhizome powder was purchased from UPT Materia Medica (Batu, East Java Indonesia). Tetracycline (antibiotics) and Stimuno Forte® commercial immunostimulant were obtained from local pharmacy. Other materials that was used include Phosphate Buffered Saline (PBS) and aquadest.

2. Preparation of red ginger rhizome powder, tetracycline dan Stimuno Forte®

Red ginger (*Zingiber officinale* var. *rubrum*) rhizome powder was directly mixed into the standard broiler feed in a concentration of 2% of the total feed. Tetracycline powder was mixed with aquadest at a dose of 15 mg/Kg body weight before administration. While Stimuno forte® was also mixed with aquadest at a dose of 13.5 mg/Kg body weight before administration.

3. Experimental Design

A total of 100-day old broiler chicks were reared according to the broiler chicken farming system, fed standard broiler feed and housed in a chicken coop with controlled lighting, temperature and humidity. After 7 days of acclimatization the chicks were randomly divided using completely randomized design into four treatment groups of different experimental feed/diet for a further 7 days. Each treatment group comprised of five replicates. The experimental feed/diet for each treatment is presented in table 1.

Table 1. Experimental feed/diet for each treatment

Group	Treatment
I (control)	Standard broiler feed
II	Standard broiler feed + red ginger rhizome powder 2% of total feed
III	Standard broiler feed + tetracycline 15 mg/Kg body weight
IV	Standard broiler feed + Stimuno forte® 13.5 mg/ Kg body weight

4. Feces collection and preparation

Fresh fecal samples were collected at day-0 (initiation of the experiment-H0) and day-14 (H+14) from each replicates of the four treatment groups. The collected samples were put into zip plastics and stored at -20°C until processed. The fecal samples were then suspended using sterile phosphate-buffered saline (PBS) with a ratio of 1:10. Thus, 0.9 ml sterile PBS was added into a test tube containing 0.1 gram feces and homogenized using vortex stirrer. The suspended samples were then subjected for estimation of fecal total bacterial count.

5. Assessment of fecal total bacterial count

Plate count agar medium was prepared and poured into petri dishes. The fecal samples were then carefully streaked on the medium with full streak method using sterile inoculation loop. The inoculated medium was then incubated at 37°C for 24 hours. The bacterial colonies were counted using colony counter reported as the number of colony forming unit (CFU) per ml.

6. Data analysis

The data obtained was then scored according to the rule presented in table 2 below. The means score was then analyzed using non parametric statistic Mann-Whitney test to compare between group and Paired Samples Wilcoxon to compare between time of sample collection. Statements of statistical significance were based on $p < 0.05$.

Table 2. Scoring rule

Number of bacterial colony (CFU/ml)	SCORING
>300	4
201-300	3
100-200	2
<100	1

RESULTS AND DISCUSSION

Figure 1 shows the effect of the different feed or dietary treatment on the total fecal bacterial count at both day-0 (H0) and day-14 (H+14).

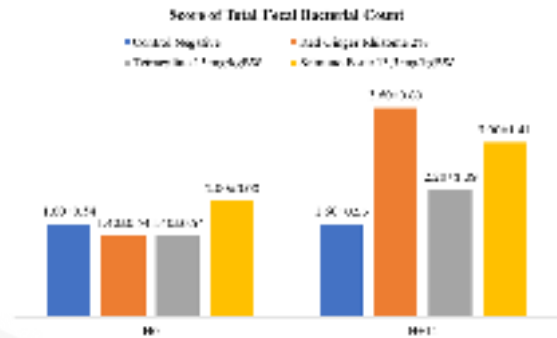


Figure 1. The score of Total Fecal Bacterial Count

While the result of the statistical analysis to show any significant differences between treatment groups is presented in table 3 and between time of sample collection is presented in table 4.

Table 3. Statistical analysis on the difference in the result between treatment groups

	Result of Asymp Sig. Mann Whitney Test	
	H-0	H+14
Group I vs Group II	0.549	0.014*
Group I vs Group III	0.549	0.339
Group I vs Group IV	0.134	0.121
Group II vs Group III	1.000	0.065
Group II vs Group IV	0.050	0.439
Group III vs Group IV	0.050	0.371

* indicate there is significance difference ($p < 0.05$)

Table 4. Statistical analysis on the difference in the result between time of sample collection

	Result of Asymp Sig. Paired Wilcoxon Test	
	H-0 vs H-14	
Group I	1.000	
Group II	0.048*	
Group III	0.102	
Group IV	0.166	

* indicate there is significance difference ($p < 0.05$)

From figure 1 and table 3 it can be observed that at day-14 or H+14 (after 7 days of supplementation), the group supplemented with 2% red ginger rhizome powder (group II) has the most number of total fecal bacterial count as indicated by the highest score. At day-14 (H+14) there was a significant increase in the number of total fecal bacterial count score in group II

compared to group I (control), but there was no significant difference between group II (red ginger rhizome powder), III (tetracycline) and IV (stimuno forte®). From table 4 it can also be observed that the number of total fecal bacterial count score in group II has significantly increase at day-14 (H+14) compared to day-0 (H0). An increase in the number of total fecal bacterial count score can also be observed in group IV on day-14 (H+14) compared to group I (control) and compared to day-0 (H0). However, the increase was not statistically significant. and still lower than that observed in group II. The number of total bacteria count score between group IV and group II was also not significant both on day-0 (H0) or day-14 (H+14).

Since the broiler chicks in this research was not intentionally infected with any pathogenic bacteria, several assumption can be made to explain the increase in the number of total fecal bacterial count score especially in group II. One assumption is the occurrence of an age-dependent development of the gut microbial population. Another assumption is that the red ginger powder supplementation stimulates the development or growth of beneficial bacterial population in the digestive tract of the broiler chicks. This is similar to the research conducted by Jatmiko *et. al.* [8] in which the supplementation of red ginger as feed additive was capable to increase the population of non-pathogenic bacteria in the intestine of hybrid duck. Herbal plants and its bioactive constituents are said to have the capability to stimulate the development of advantageous bacteria in the digestive tract of poultry [7]. The same assumptions might also be applied to group IV because stimuno forte® is a commercial immunostimulant product which contain the extract of the plant *Phyllanthus niruri* L. The result in which there was no significant difference in the number of total fecal bacterial count score between group II and IV might indicate that their potential to stimulate the development of non-pathogenic bacteria in the digestive tract of poultry was comparable.

Group III which was supplemented with antibiotic (tetracycline) also showed an increase in fecal bacterial count score on day-14 (H+14) compared to group I (control) and compared to day-0 (H0). But no statistically significant difference was observed. The increase on total bacterial count reported in group III on day-14

(H+14) was also lower compared to group II and IV. One of the reasons proposed was that tetracycline retard and delay intestinal microbial maturation and subsequently limit their development. According to Gao *et. al.* [9], antibiotic feeding to broiler chickens significantly retard and delay the maturation of intestinal microbiota.

CONCLUSION

The result suggest that the supplementation of red ginger rhizome powder as feed additive has the potential to stimulate the development of advantageous bacteria in the digestive tract of poultry as shown by the significant increase in the total fecal bacterial count score in the group supplemented with red ginger rhizome powder. The potential of red ginger rhizome powder to stimulate the development of non-pathogenic bacteria in the digestive tract of poultry was comparable to that of Stimuno Forte®.

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Morphological and Pasting Properties of Talas Beneng (*Xanthosoma undipes* K. Koch) Flour

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ABSTRACT

Talas beneng (*Xanthosoma undipes* K. Koch) is one of the indigenous carbohydrate resources in the form of taro from Banten Province, Indonesia. It is commonly found in several areas of Banten, mostly in Pandeglang Regency, both growing wild and already cultivated. Some groups of farmers utilize it to be processed into several food products, both intermediate products and processed products like chips. One of the groups of farmers is called Gapoktan Juhut Mandiri in Pandeglang, they utilize talas beneng to be processed into the flour product. To improve and optimize the utilization of talas beneng, the research is needed to be done related to the characteristics of talas beneng flour, so that it will be useful to be applied to several types of food products. This study aims to determine the morphological properties using SEM and pasting properties using RVA of talas beneng flour. This research covered the production of flour, analysis of morphological, and pasting properties of flour. The result showed that the starch granule of talas beneng flour was polygonal. The RVA test result showed that peak viscosity was 2291 cP, minimum viscosity was 1186 cP, the breakdown was 1105 cP, final viscosity was 1857 cP, the setback was 671 cP, pasting temperature was 80.05°C, and peak time was 7,8 minute. From the results, we could conclude that talas beneng flour were not resistant to heat and cooling treatment.

Keywords: talas beneng flour; morphological; pasting; amylose; Banten.

INTRODUCTION

Talas Beneng (*Xanthosoma undipes* K. Koch) is one of the local food sources of Pandeglang Regency, Banten Province. It is found in the Pandeglang area both in the lowlands and highlands. This taro has several distinctions, where the size of taro is quite large and yellowish. The name talas beneng came from these characteristics which stand for the word "big and koneng (yellowish)". Talas beneng has a tuber stem whose length can reach 120 cm with a weight of 42 kg and the size of the outer ring up to 50 cm [1]. Most people in the surrounding area of Gunung Karang, Banten still consider talas beneng as an unuseful plant, wild, very

large tuber and yellowish, have a high level of oxalic acid which causes itching when consumed [2].

Initially, talas beneng was considered as an interrupting plant for the people because the plant grows wild rapidly [3]. In the last few years, several Pandeglang community groups have begun to actively use talas beneng as a raw material for making various kinds of products, one of which is widely produced and has a fairly good market, namely flour products. One farmer group that produces talas beneng flour is Gapoktan Juhut Mandiri.

On the other hand, there have been many studies that examined the chemical content and levels of oxalic acid in talas beneng. Talas beneng contains protein 6.29%, carbohydrates 84.88%, fat 1.12%, starch 75.62%, and calories 374.69 kcal [4]. The high carbohydrates contained in talas beneng provide opportunities

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as a local carbohydrate source that can be utilized by a variety of products, one of which is flour. Flour is one of the intermediate products whose manufacturing process is easy and widely used as raw material for various products.

One of the characteristics that have an important role in the use of flour as a raw material for food products is the morphological characteristics of starch granules and gelatinization profile. The microscopic appearance of starch granules such as shape, size, uniformity, location of the hilum are characteristic for each type of starch [5]. Important pasting properties are known as indicators of how starch shifts during processing [6]. Therefore, this study was conducted to determine the morphological and pasting properties of talas beneng flour as a basis for the utilization of talas beneng flour into various kinds of products.

METHOD

1. Materials

In this study, talas beneng flour produced by Gapoktan Juhut Mandiri, Pandeglang Regency, Banten Province was used. Talas beneng taro which was used as a raw material for flour was also obtained in the same area, Pandeglang Regency. Another ingredient used was distilled water. The tools used in this study are Rapid Visco Analyzer (RVA) and Scanning Electron Microscopy (SEM).

2. Analysis of Morphological Properties[7]

Morphological analysis of talas beneng flour starch granules was performed using a scanning electron microscope (SEM) ZEISS type EVOMA10. Samples were affixed to the holder with double adhesive, then coated with gold metal under vacuum. After that, the sample was put into place in SEM then the starch granule form was observed at 2000 times magnification with a SE (secondary electron) detector, WD (working distance) 8.5 mm, and EHT 16.00 kV.

3. Analysis of Pasting Properties[8]

Gelatinization profile or pasting properties of the samples were measured using Rapid Visco Analyzer (RVA) with the AACC 61-02-01 method. The first step was 3 grams of flour weighed and dissolved in 25 mL of distilled water on the canister. Subsequently stirring was

carried out until homogeneous, and followed by installing a canister containing the sample in the instrument by adjusting the temperature, time, and rotating speed (Figure 1). Data obtained in the form of amylographic curves that showed the value of peak viscosity, minimum viscosity, breakdown, final viscosity, setback, pasting temperature, and peak time.

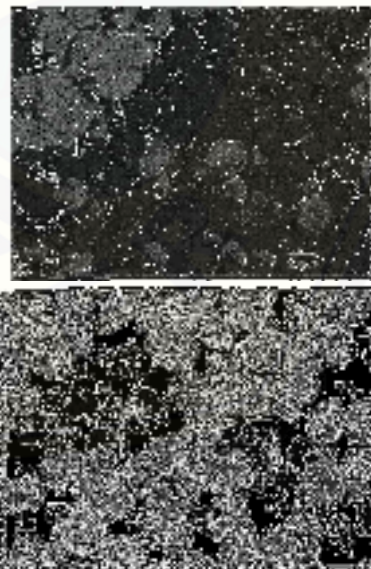
Time (minutes)	Function Type	Value
00:00:00	Temp	60
00:00:30	Speed	500
00:00:10	Speed	100
00:01:00	Temp	50
00:04:40	Temp	55
00:01:10	Temp	55
00:01:00	Temp	50
00:02:00	End	

Figure 1. Temperature, time, and rotational speed setting of RVA [8]

RESULTS AND DISCUSSION

1. Morphological Properties

Morphological properties of starch granules include the shape and size of starch granules which depend on the plant source. The morphological properties of potato starch are very large, its granular is round or oval, while rice starch is very small and polygonal. Cassava starch is round or truncated, while corn starch is polygonal as shown in Figure 2.



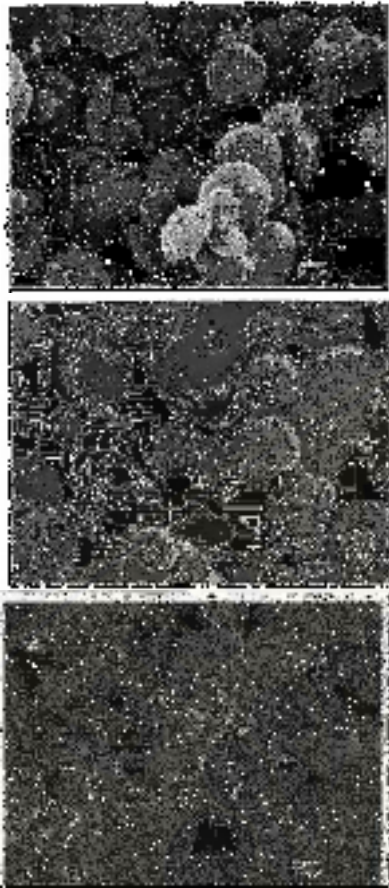


Figure 2. Starch granule shape of a) maize, b) cassava, c) wheat, d) potato, and e) rice[9]

The shape of the talas beneng starch granules observed using a scanning electron microscope (SEM) is shown in Figure 3. The shape of the talas beneng flour starch granules resembles corn starch granules with a shape of polygonal.

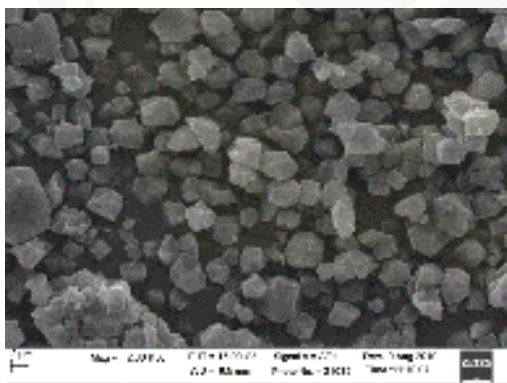


Figure 3. Starch granule shape of talas beneng

2. Pasting Properties

The gelatinization profile of talas beneng flour was measured using a rapid visco analyzer (RVA), the measurement results obtained in the

form of an amylographic curve shown in Figure 4. The viscosity data of the measurements using RVA are shown in Table 1.

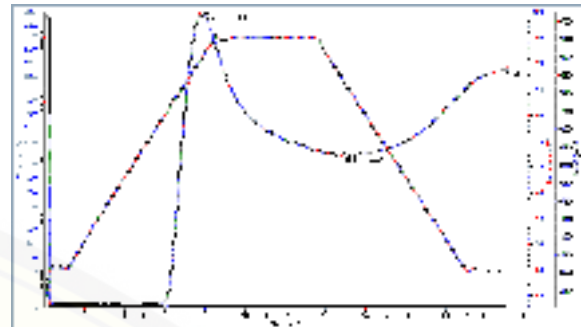


Figure 4. Amylographic curve of talas beneng flour

Peak viscosity mencerminkan tingkat pembengkakan granula pati atau kapasitas pati untuk mengikat air dan berkorelasi dengan kualitas akhir produk sejak granula membengkak dan tumpah yang berhubungan dengan tekstur pemasakan pati. Keadaan tersebut juga menunjukkan jumlah pati yang membengkak setara dengan jumlah pati yang rusak (lysis)[8]. Nilai peak viscosity tepung talas beneng sebesar 2291 cP yang nilainya lebih rendah daripada peak viscosity pati talas beneng yaitu sebesar 3899,5 cP. Minimum viscosity disebut juga dengan viskositas panas yaitu viskositas bahan setelah pemanasan pada suhu 95⁰ selama 5 menit yang menjadi tanda berakhirnya tahap holding pada suhu maksimum pada RVA.

Peak viscosity reflects the degree of swelling of the starch granules or the capacity of the starch to bind water and correlates with the final quality of the product since the granules are swollen and completely related to the starch cooking texture. The situation also shows the amount of starch that swells is equivalent to the amount of damaged starch (lysis) [8]. The peak viscosity value of talas beneng flour was 2291 cP whose value was lower than the peak viscosity of talas beneng starch which was 3899.5 cP. Minimum viscosity is also called heat viscosity, which is the viscosity of the material after heating at a temperature of 95⁰ for 5 minutes indicating the final stage of holding at the maximum temperature at RVA.

Table 1. Gelatinization profile of talas beneng
Source: ^a [10]

Parameter	Flour	Starch
Peak viscosity	2291 cP	3899,5 cP
Minimum viscosity	1186 cP	1612,5 cP
Breakdown	1105 cP	2287 cP
Final viscosity	1857 cP	2374 cP
Setback	671 cP	761,5 cP
Pasting temperature	80,05 °C	81,95 °C
Peak time	7,8 min	-

The breakdown shows a condition where the swollen starch granules begin to subside and stabilize during the cooking process [11]. An increase in the breakdown value indicating that starch is not resistant to high-temperature treatment. The higher the breakdown value, the less resistant the sample to cooking conditions. Final viscosity is a parameter that shows the ability of starch to form a thick paste or gel after the heating and cooling process, also affected by the shear forces that occur during stirring. The setback is a parameter used to see the tendency of retrogradation and syneresis of a paste [12].

Dari data pada Table 1, tepung talas beneng memiliki nilai breakdown sebesar 1105 cP yang nilainya lebih rendah jika dibandingkan sampel dalam bentuk pati. Hal tersebut menunjukkan bahwa tepung talas beneng lebih tahan terhadap proses pemasakan (pemanasan suhu tinggi) dibanding pati talas beneng. Selain itu, nilai setback tepung talas beneng juga lebih rendah dibandingkan pati talas beneng yaitu sebesar 671 cP yang menunjukkan kecenderungan tepung talas beneng mengalami retrogradasi dan sineresis lebih kecil.

From the data in Table 1, talas beneng flour had a breakdown value of 1105 cP whose value was lower when compared to samples in the form of starch. This shows that the flour was more resistant to the cooking process (rising temperature) than its starch. Besides, the declining value of talas beneng flour was also lower than its starch, which is 671 cP. This indicated that talas beneng flour have a lower tendency to retrogradation and syneresis

CONCLUSION

The shape of beneng taro starch granules resembled corn starch granules in the form of polygonal. The peak viscosity value was 2291 cP, minimum viscosity was 1186 cP, the breakdown was 1105 cP, final viscosity was 1857 cP, the setback was 671 cP, pasting temperature was 80.05 ° C, and peak time was 7.8 minutes.

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Replanting Model of Palm Oil With Paludiculture System On Peatland In South Kalimantan (Soil Physical Characteristics and Optimize Analysis)

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ABSTRAK

Efforts to accelerate the development of smallholder plantations in the plantation revitalization program are carried out through expansion, rejuvenation and rehabilitation of estate crops. however, the problem faced by farmers today is the fear of farmers losing their livelihoods if their oil palms are rejuvenated. On the other hand peat ecosystem is an ecosystem that is very important role in maintaining environmental sustainability, especially related to the issue of global warming. one way that can be taken to prevent widespread damage on peatlands and to prevent future loss of community livelihoods by applying paludiculture planted on peatlands. the paludikulture model is a multiple cropping system in peatlands that can be adopted in oil palm areas. The results showed that the status of soil fertility in the area of oil palm rejuvenation has a relatively better soil fertility status when compared to mineral material, which has a range of status from low to moderate. Whereas mineral soil material has a low soil fertility status. This is concluded, although the cation exchange capacity of this soil sample is classified as high, but the cause of the low soil is the P-total, K-total and C-organic content is classified as very low to low. The results of the analysis of farmer optimization show that the optimal cropping pattern of vegetable farmers is commodity long beans + cucumbers. With farm income at optimal conditions is Rp 4,289,944 per year or Rp 18,619,548 per hectare per year.

Keywords: Palm oil replanting model; paludiculture; Optimize analysis.

INTRODUCTION

Efforts to accelerate the development of smallholder plantations in the plantation revitalization program are carried out through expansion, rejuvenation, and rehabilitation of estate crops. The plantation revitalization program is supported by investment loans and interest subsidies provided by the government through collaboration with companies in the plantation business as development partners in the development, processing, and marketing of the results of these plantations.

Steps that can be taken to prevent widespread damage on peatlands and to prevent future loss of community livelihoods by applying paludiculture planted on peatlands. Paludiculture is defined as a cultivation of plants using swamp

or wetland plants that do not require peat water drainage, but in practice, these activities must be carried out on time (before the peatlands experience permanent/severe inundation) and the types of species to be planted adjusted to the dynamics of inundation that occur and is expected to have high economic value.

One key factor that needs attention in the context of the application of paludiculture in Indonesia is the active involvement of the community with support and capacity development, learning and success that the community has experienced about paludiculture need to be promoted, replicated and mainstreamed as the best and fair peatland management model. The management of paludiculture practices needs to be an example of oil palm plantations in their peatland management practices.

The paludiculture model is multiple cropping systems in peatlands that can be adopted in oil palm areas. Until now the paludiculture model is

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mainly in forestry plants such as sago, galam, jelutung, and wood-producing plants such as ramin. So that in this study a palm oil-based paludiculture model was built that would later provide recommendations to increase income and maintain the continuity of income of oil palm farmers, especially when rejuvenating oil palm plants

In terminology, paludiculture is a new term and is not widely known by the people in Indonesia. The word paludiculture comes from the Latin (*palus*) meaning swamp. Swamp forest ecosystems (including peat swamps) are forests that grow in areas that are always inundated, not affected by climate, but can be affected by tides. Paludiculture means productive use of swamps (and peat swamps) in ways that protect peat. Water-saturated peat and swamp conditions are maintained without drainage, even in drained conditions, efforts will be made to close drainage or waterways so that the peat will get wet again (Joosten *et al.*, 2012). Furthermore, Biancalani & Avyagan (2014) explained that paludiculture is alternative management of responsible peatlands. The paludiculture system can maintain peat conditions and produce biomass in wet and re-wet peatland conditions, maintain ecosystem services and can provide carbon accumulation. Paludiculture products can provide food, feed, fiber, and fuel, as well as wood industry raw materials.

The research aims to study the biophysical and chemical model of rejuvenation palm paludiculture system and assessment of socio-economic and models optimize the rejuvenation of palm with paludiculture system.

METHOD

1. Method of Analysis of biophysical studies

The paludiculture model experiment will be carried out on an area of 4 ha, each with an area of 2 x 1 ha of a palm rejuvenation model with a paludiculture system and an area of 2 x 1 ha of an oil palm rejuvenation model with an intercropping system on peat or peatlands. After conducting a biophysical study the land will proceed with land preparation by dividing the 4 ha area into 4 1 ha plots based on the model to be applied

The treatment will be given on a model

rejuvenation of palm oil, which is used paludiculture system and the use of intercropping systems. Paludiculture system is an intercropping system by providing OPEFB biomass/oil palm biomass before it has been composted and the groundwater level adjustment does not exceed 40 cm (SP). The intercropping system is intensive inter-crop management through inorganic fertilizer and palm oil biomass compost and groundwater level not exceeding 60 cm. The two treatments will be repeated 2 times or two trial plots with a size of 1 ha.

Water management is done by making canals and blocking (canal blocking) to maintain water availability. Water management on field trials to keep it wet is done by managing micro water systems. This water system is carried out by utilizing a micro water channel which has a dual role, namely as a drainage channel when there is excessive water and as an irrigation channel during the dry season/lack of water, where this channel will be made of water gates using pipes while functioning to regulate water levels according to treatment. Sketch of the layout of plants and water systems on 1 ha of experimental land for the paludiculture system or intercropping are presented in the Figure below.

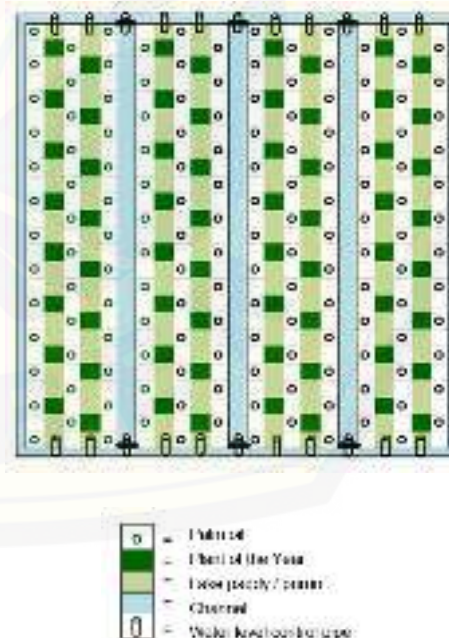


Figure 1. Planting patterns and procedures to manage water in the peat

2. Analysis of Plant Pattern Optimization

The main objective desired by farmers from farming activities is to obtain the maximum profit to improve family welfare and to develop their business activities. Efforts that can be done by farmers in maximizing their income are by choosing a combination of crop types and optimal allocation of resources. The optimal combination of plant types and resources can be obtained by analyzing the optimization using Linear Programming.

Production activities are activities producing certain types of annual crops for sale. These activities are distinguished by the planting season, ie planting seasons 1, 2, and 3. Mathematically, the linear programming model is shown in the following equation:

$$\begin{aligned} \text{Maks } Z = & - \sum_{i=1}^3 \sum_{j=1}^n C_{ij} L_{ij} \\ & - \sum_{i=1}^3 \sum_{k=1}^n U_{ik} P_{ik} \\ & - \sum_{i=1}^3 \sum_{a=1}^n O_{ia} T_{ia} \\ & + \sum_{i=1}^3 \sum_{j=1}^n H_{ij} Q_{ij} \end{aligned}$$

Where,

I	:	planting season, i = 1,2,3
J	:	type of commodity, j = 1,2,3, ..., n
K	:	type of fertilizer, k = 1,2,3, ..., n
A	:	type of labor, a = 1.2
Z	:	maximize revenue
C _{ij}	:	other costs incurred (Rp / ha) for commodity j in MT i
L _{ij}	:	land area (hectare) used for commodity j in MT i
U _{ik}	:	purchase price of fertilizer (Rp / kg) type k in MT to i
P _{ik}	:	amount of fertilizer (kg) type k purchased in MT to i
O _{ia}	:	wage rate (Rp / HOK) type workers in MT to i
T _{ia}	:	the number of workers (HOK) type a hired on MT to i
H _{ij}	:	level of the selling price (Rp) of commodities produced in MT to i
Q _{ij}	:	the number of commodities j (kg) produced in MT to i

RESULTS AND DISCUSSION

3. Interpretation of chemical properties and soil fertility status

a. Soil Texture

The soil texture in the two measured observation blocks is presented in Table 1. Soil samples in the oil palm rejuvenation area measured had the same texture class, namely dusty clay texture with sand, dust and clay composition respectively 1.21 - 12.84% sand; 41.92 - 51.31% dust and 42.10 - 50.90% clay. This condition illustrates that the area is not porous, so when the tide of land the area of oil palm rejuvenation is often flooded. This also causes a layer of peat even with a depth of less than 50 cm or the formation of a peat layer.

Table 1. Physical properties (texture) of the soil

sample number	sand (%)	dust (%)	clay (%)	Total %	texture class
TS1	1.21	47.89	50.90	100.00	dusty clay
TS2	12.84	41.92	45.24	100.00	dusty clay
TS3	6.59	51.31	42.10	100.00	dusty clay
TS4	8.32	48.86	42.82	100.00	dusty clay

b. Soil Organic Ingredients

The results of measurements of C-organic, N-total and C / N Soil content can be seen in Table 2 . The organic C content of peat soil material measured is still very high, even though the content is already far below the C-organic content of peat material in general. The existence of agricultural and plantation activities on the land causes a decrease in the content. While the C-organic content of mineral soil materials varies from very low (0.12% C-organic) to moderate (2.53% C-organic).

Table 2. The C organic, N total and C/N soil content

sample number	Soil material	depth	C organic		N total		C/N	
			%	status	%	Status	-	Status
TS1	peat soil	<30 cm	5.38	ST	0.56	T	9.61	R
TS2			8.42	ST	0.54	T	15.59	T
TS3			5.81	ST	0.42	S	13.83	S
TS4			5.86	ST	0.25	S	23.44	T
TS1	Mineral	> 1 m	2.53	S	0.11	R	23.00	T
TS2			2.13	S	0.13	R	16.38	T
TS3			0.12	SR	0.12	R	1.00	SR
TS4			0.16	SR	0.16	R	1.00	SR

c. P-total and P-available Land

The P-total and P-available content of soils in oil palm rejuvenation lands are presented in Table 3. The two soil materials in the region have different total P content if the peat soil has moderate to very high status (2.78 - 179.66 mg P₂O₅ / 100g) while mineral soils have low status (11, 77 - 17.32 mg P₂O₅ / 100g). However, when viewed from the P-content available in both soil materials, the status is very low except at one of the observation points with R status in mineral-based soils. The status of available peat material is in the range of 2.35 - 3.17 ppm P₂O₅ and mineral materials 4.01 - 10.76 ppm P₂O₅.

d. K-total and K-available Land

In Table 4, it can be seen that the total K-content of peat material ranges from 26.78 mg K₂O / 100g to 29.42 mg K₂O / 100g is of moderate status, while the total K content of minerals ranges from 11.77 mg K₂O / 100g to 46.57 mg K₂O / 100g are low to high status. The K content available in peat materials ranges from 0.11 and 0.16 me K / 100g including low to moderate status. In mineral soil material the K content available is very low to low (0.05 -0.16 me K / 100g).

Table 3. The P-total and P-available content

sample number	Soil material	depth	P-total		P-available	
			mg P ₂ O ₅ /100g	Status	ppm P ₂ O ₅	Status
TS1	Peat soil	<30 cm	26.78	S	2.57	SR
TS2			70.68	ST	3.17	SR
TS3			63.31	ST	2.67	SR
TS4			179.66	ST	2.35	SR
TS1	Mineral	> 1 m	14.77	R	4.01	SR
TS2			17.32	R	8.99	SR
TS3			12.50	R	6.21	SR
TS4			11.77	R	10.76	R

Table 4. K-total and K-available content

sample number	Soil material	depth	K-total		K- available	
			mg K ₂ O/100g	Status	me K/100g	Status
TS1	Peat soil	<30 cm	26.78	S	0,11	R
TS2			29.42	S	0,31	S
TS3			27.68	S	0,16	R
TS4			28.29	S	0,16	R
TS1	Mineral	> 1 m	46.57	T	0,09	SR
TS2			17.32	R	0,05	SR
TS3			12.50	R	0,11	R
TS4			11.77	R	0,07	SR

e. Calcium, Magnesium, and Sodium can be exchanged

The content of cations can be exchanged in the soil can be seen in Table 5 . The content of Ca and Mg can be exchanged on both soil materials, each of which has a very low status for interchangeable Ca (0.16 - 1.02 me Ca / 100g) and low status for Mg can be exchanged. While the Na content can be exchanged on peat materials ranging from 0.17 me Na / 100g (low) to 0.39 me Na / 100g (low). Na content can be exchanged on low-status mineral soils with a range of 0.22 - 0.30 me Na / 100g.

f. Cation Exchange Capacity, Base Saturation, and Aluminum and Soil Acidity

The results of measurements of cation exchange capacity, base saturation, Al saturation, and soil acidity are presented in Table 6. The second CEC for soil material in the oil pa-

-lm rejuvenation area shows the same status, which is classified as high. CEC Peat materials ranged from 29.06 me / 100g to 37.18 me / 100g material and CEC mineral materials ranged from 23.25 me / 100g to 27.26 me / 100g. On the contrary, the two KBs of soil material in the region are classified as very low. Base saturation in peat material ranges from 1.84% to 3.57% while in mineral materials 3.34% to 6.30%. This condition is suspected to have a washing process or there is a tidal movement of water in the region which causes the washing of exchanged bases. Al saturation in mineral-based soils in this region is high to very high. This is in line with the low pH value of this mineral soil material which reaches 3.65 - 4.25 (very sour status). Even though the pH of the peat material is relatively higher when compared, in general, it is still classified as very acid and sour. So that in the management of this land the ameliorant action is needed, both in the form of compost and liming.

Table 5. Content of Ca, Mg and Na can be exchanged

sample number	Soil material	depth	Ca-can be change		Mg- can be change		Na- can be change	
			me Ca/100g	Status	me Mg/100g	Status	me Na/100g	Status
TS1	Peat soil	<30 cm	0.16	SR	0.16	R	0.35	R
TS2			0.18	SR	0.18	R	0.39	S
TS3			0.45	SR	0.30	R	0.22	R
TS4			0.17	SR	0.17	R	0.17	R
TS1	Mineral	> 1 m	0.60	SR	0.15	R	0.26	R
TS2			0.45	SR	0.15	R	0.22	R
TS3			1.02	SR	0.15	R	0.30	R
TS4			0.69	SR	0.27	R	0.22	R

Table 6. KTK, KB, Al saturation and soil acidity

sample number	Soil material	depth	KTK		KB		Al saturation		pH (H2O)	
			me/100g	Status	%	Status	%	Status	-	Status
TS1	Peat soil	<30 cm	33.41	T	2.34	SR	-		4.01	SM
TS2			35.53	T	2.89	SR	-		4.10	SM
TS3			29.06	T	3.57	SR	-		4.14	SM
TS4			37.18	T	1.83	SR	-		4.69	M
TS1	Mineral	> 1 m	27.26	T	4.01	SR	30.96	T	3.65	SM
TS2			25.85	T	3.34	SR	37.21	T	3.99	SM
TS3			25.15	T	6.30	SR	137.46	ST	3.79	SM
TS4			23.25	T	5.36	SR	138.06	ST	4.25	SM

Where:: SR = very low, R = low, S= medium, T = high , ST=very high , SM=very acidity

g. Soil Fertility Status

The status of soil fertility in the area of rejuvenation of Palm Oil in both materials can be seen in Table 7. Soil peat material has relatively better soil fertility status compared to mineral material, which has a range of status from low to moderate. Whereas mineral soil material has a low soil fertility status. This is concluded, although the CEC of this soil sample is classified as high, the cause of the low soil is the total P-total, K-total, and C-organic content is classified as very low to low.

Table 7. Soil fertility status

sample number	Soil material	depth	KTK	KB	P total	K total	C-organic	Fertility status
TS1	Peat soil	<30 cm	T	SR	S	S	ST	low
TS2			T	SR	ST	S	ST	medium
TS3			T	SR	ST	S	ST	medium
TS4			T	SR	ST	S	ST	medium
TS1	Mineral	> 1 m	T	SR	R	T	S	Low
TS2			T	SR	R	R	S	Low
TS3			T	SR	R	R	SR	Low
TS4			T	SR	R	R	SR	Low

4. Optimizing Vegetable Planting Patterns

Optimization analysis using Linear Programming consists of primal analysis, dual analysis, sensitivity analysis, and post-optimal analysis. The primal analysis shows a combination of types of vegetables that can provide maximum income. The dual analysis is an assessment of resource use by looking at the value of slack or surplus. Sensitivity analysis is used to see the level of sensitivity to the changes made. While post-optimal analysis is used to see the effect of changing parameters to the optimal solution.

a. Primal Analysis

Data analysis shows that optimal vegetable planting patterns are recommended for farmers to work on. Analysis of optimal planting patterns is carried out by the broad class of farmers. Optimal cropping patterns for farmers can be seen from the reduced cost value of the cropping pattern is zero. The types of vegetables selected in the optimal scheme are vegetables that can provide maximum income with limited available resources. Planting patterns that have a reduced cost value that is not equal to zero are not recommended for farmers to apply. If the cropping pattern is applied, the farm income will

be reduced by the value of the reduced cost in each planting pattern.

Optimal cropping patterns of vegetable growers are commodity long beans + cucumbers in planting season 1 (PS1) and planting season 2 (PS2). The results of the analysis of farmer optimization show that the value of the objective function, ie farm income under optimal conditions is Rp. 4,289,944 per year or Rp. 18,619,548 per hectare per year. The primal analysis shows the number of costs incurred for each activity in the optimal scheme as shown in table 8

Table 8 Vegetable farming receipts per hectare farmer in the study area

No	Description	revenue (Rp/Ha)
1	Long Beans -PS 1	10.810.730,82
2	Cucumber -PS 1	4.897.922,49
3	Long Beans -PS 2	8.349.000,00
4	Cucumber -PS 2	3.719.230,44
Total Revenue		27.776.882,75

Optimal farm income can be obtained by reducing farm receipts by the total farm costs. Based on the results of the analysis it was found that the total farmer vegetable farming income was Rp. 18,619,548 with an R / C ratio of 3.03.

The reduced cost value of each crop that is not included in the optimal scheme shows that control of one hectare of land on the plant will reduce income by the value of the reduced cost. The reduced cost value for plants that are not included in the optimal planting pattern can be seen in table 9.

No	Planting Season	Types of Plants	Reduced Cost
1	1	Long Beans + Beans	3.340.280,00
2	1	eggplant	10.999.310,00
3	1	Corn	11.440.350,00
4	2	Long Beans + Beans	2.727.692,00
5	2	eggplant	3.520.982,00
6	2	Corn	3.872.172,00
7	2	Long Bean + Tomato	3.880.391,00
8	3	Corn	920.583,00
9	3	Cucumber	3.136.667,00
10	3	eggplant	3.346.643,00

Based on Table 9, it can be seen that there are several types of plants that are not recommended for farmers to work on. Types of plants that are not recommended for broad farmers are long beans + beans in -PS I, eggplants in -PS I, corn in -PS I, long beans + beans in -PS II, eggplants in -PS II, corn in -PS II, long beans + tomatoes in -PS II, corn in -PS III, cucumber in -PS III, and eggplant in -PS III. The reduced cost value of the crop shows that the profits of the farmer will be reduced by the value of the reduced cost if the crop is still being cultivated.

b. Dual Analysis

The dual value of a scarce or limiting resource is the shadow price of that resource. The addition of one unit of resource will cause a change in the value of the destination in the amount of the shadow price. Resources that are the main obstacle are resources that have the largest shadow price.

The analysis showed that the biggest dual price value for vegetable farmers was land constraints in the first planting season, which amounted to Rp 11,427,200.00. This value indicates the addition of one hectare of land will increase farm income by Rp 11,427,200.00. Optimal analysis results show that land constraints are a limiting resource for vegetable farmers. The available land is used up in two growing seasons, namely PS I and PS II. The value of the dual prices of land constraints for the broad farmer's group for PS I and PS II is Rp. 11,427,200.00 and Rp. 7,192,352.00, respectively.

Fertilizer resources are scarce or limited resources for vegetable farmers. The value of dual prices of fertilizer resources in the three growing seasons of vegetable farmers is not equal to zero. This shows that the available fertilizer is used up or is a limited resource.

Labor resources for vegetable farmers are excessive resources. For large farmers, there are excess labor resources in PS I of 64.998726 and 67.42144 in PS II, and 100.00 in PS III. There are excess capital resources for vegetable farmers of IDR 16,255,160 in PS I, IDR 16,941,930 in PS II and IDR 18,642,760 in -S III. Excessive capital resources indicate that there is a waste in allocating agricultural resources.

CONCLUSION

Soil fertility status in the rejuvenation area of Palm Oil in both materials can be seen that the soil peat material has a relatively better soil fertility status compared to mineral material, which has a range of status from low to moderate. Whereas mineral soil material has a low soil fertility status. This is concluded, although the CEC of this soil sample is classified as high, the cause of the low soil is the P-total, K-total and C-organic content is classified as very low to low.

Optimal cropping patterns of vegetable growers are commodity long beans + cucumbers in planting season 1 and planting season 2. The

results of the farmer optimization analysis show that the value of the objective function, ie farm income under optimal conditions is Rp 4,289,944 per year or Rp 18,619,548 per hectare per year with an R / C ratio of 3.03.

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Exploring Antibacterial of Pulutan (*Urena lobata* Linn) Leaf Extract to Acne-causing Bacteria

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ABSTRACT

Pulutan (*Urena lobata* Linn) leaf extract has been proven that it has antioxidant, antibacterial, and antifungal effect. However, there has been no research reported the potential for antibacterial against bacteria that cause acne. Therefore, this study aims to explore the antibacterial activity against bacteria that cause acne. Extraction was carried out using the Ultrasound-Assisted Extraction (UAE) method using 3 concentrations of ethanol solvents then carried out the analysis of yields, testing the antibacterial activity against *Propionibacterium acne*, *Staphylococcus aureus*, and *Staphylococcus epidermidis* using disk diffusion method, and identification of active compounds using GC-MS. One way ANOVA statistical analysis shows that ethanol extract has a significant effect on yield. Ethanol extract does not provide an antibacterial effect on *P. acne* but give antibacterial effect through *S. aureus* and *S. epidermidis* at concentration 250mg/mL. Ethanol extract 90% gives the highest antibacterial effect compared to other extracts but is still lower than the control (clindamycin). The types of active compounds identified by GC-MS also differ in which 30% ethanol extract is dominated by 56.93% *scyllo inositol*, 60% ethanol extract has 29.76% *4H-Pyran-4-one*, *2,3-dihydro-3,5 -dihydroxy-6-methyl-*, and 35.1% *Stigmasta-3,5-diene* in 90% ethanol extract.

Keywords: antibacterial; *Urena lobata* L; GC-MS; UAE.

INTRODUCTION

Pulutan (Sundanese: pungpurutan, Makassar: poyo-poyo, *Urena lobata* Linn) has been used by the Indonesian people as a remedy for various diseases including influenza, cough, tonsillitis, malaria, rheumatism, vaginal discharge, swelling, ulcers, bleeding wounds, broken bones and snake bites [1]. The content of pulutan leaf extracts are flavonoids [2], alkaloids, cardioglycosides, tannins, terpenoids, and saponins [3]. The bioactive component in the extract has its own role and mechanism in inhibiting bacteria and can only inhibit certain bacteria.

Testing the antibacterial properties of pulutan leaf extracts has been carried out including *Escherichia coli*, *Staphylococcus aureus*, *Enterococcus species*, and *Klebsiella species* at concentrations of 50 mg / mL [3]. In addition, there are also studies [4] which found that ethanol extracts from the leaves of pulutan can inhibit the bacteria *Staphylococcus aureus*, *Klebsiellapneumoniae*, *Pseudomonas aeruginosa*, and *Bacillus subtilis* at a concentration of 6.25 mg / mL. As for research on antifungal properties, fungal species such as *Botrydiplodia theobromae* and *Rhizopus species* can be inhibited by ethanol extracts from pulutan leaves at a concentration of 6.25 mg / mL [3]. Some of these studies indicate the existence of antimicrobial activity from the extract of the leaves of pulutan, only until now there has been no research on the potential of the extract of the leaves of the pulutan as an anti-acne, so it is necessary to do research related to its inhibition against acne-causing bacteria such as *P. acne*, *S.*

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aureus and *S. epidermidis* as an alternative treatment for acne. In addition, this study also aims to identify the active compound in the extract.

MATERIALS AND METHODS

The *Urena lobata* L leaf powder with certificate number 074/027/101.8/2015 from Materia Medika Batu Malang. 30 g of the powder extracted by branson 1510 sonicator bath in 300mL 30% ethanol, 50% ethanol, and 90% ethanol for 20 minutes separately. Then, evaporated using rotary vacuum evaporator and resulted 3 type of extract, namely 30% ethanol extract (I), 60% ethanol extract (II), and 90% ethanol extract (III). Calculate the yield of the extracts, Identification active compound using GC-MS Agilent 7890A/5975C, and analyze the antibacterial activity using disk diffusion method trough *P. acne*, *S. aureus*, and *S. epidermidis*.

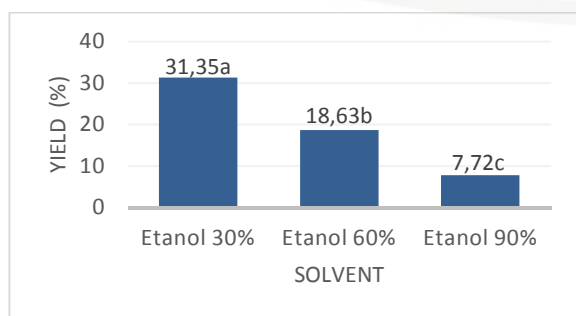
RESULTS AND DISCUSSION

1. Yield Analysis

The yield is influenced by several factors, one of which is the solvent. The choice of the solvent used in the extraction process is adjusted to the component of the active compound which is the target of the extraction, in this case the component has antibacterial properties. The active compounds which are thought to have antibacterial properties that cause acne are flavonoids, alkaloids, essential oils, phenols and tannins [5]. In this study, 30%, 60%, and 90% ethanol was used, this solvent was chosen based on the ethanol's safe or non-toxic nature. Ethanol is also known to dissolve polar and nonpolar compounds so that it is expected to extract more active compounds.

Figure 1. Effect of solvent concentration trough the yield of *U. lobata* L leaf extracts

Ethanol dilution can increase the permeability of solvents into cells so that it is easier to extract secondary metabolites. The number of extracted compounds does not indicate the number of types of secondary metabolites, because the type can vary in each extract depending on the level of polarity. Adding water to ethanol can increase the permeability of solvents in the extraction of secondary metabolites [6].



2. Identification of Active Compound Using GC-MS

Table 1. Active Compounds in 60% Ethanol Extract of *U. lobata* L Leaf

Number	RT	Quality	Name of The Compound	Peak Area (%)
1	29.596	87	<i>n-</i>	1.03
2	32.064	43	<i>Hexadecanoic acid</i>	10.82
3	32.230	56	<i>1,2,3,4,5-Cyclopentanepentol 6H-Furo[2',4':4,5]oxazolo[4,2-a]pyrimidin-6-one, 4-(acetyloxy)-2,4,4a,9a-tetrahydro-2-[[[(trimethylsilyloxy)methyl]-[2R-(2.alpha.,4.beta.,9a.beta.)]-6H-Furo[2',4':4,5]oxazolo[4,2-a]pyrimidin-6-one, 4-(acetyloxy)-2,4,4a,9a-tetrahydro-2-[[[(trimethylsilyloxy)methyl]-[2R-(2.alpha.,4.beta.,9a.beta.)]-6H-</i>	11.35
4	32.395	60	<i>L-Lyxose</i>	7.91
5	32.492	46	<i>Scyllo-Inositol</i>	33.19
6	32.809	49	<i>Scyllo-Inositol</i>	11.54
7	32.899	43	<i>Scyllo-Inositol</i>	12.2
8	32.926	38	<i>Stigmastan-3,5-diene</i>	2.48

Tabel 2. Active Compounds in 60% Ethanol Extract of *U. lobata* L Leaf

Number	RT	Quality	Name of The Compound	Peak Area (%)
1	3.89	37	<i>Formylhistamine</i>	2.54
2	4.573	53	<i>Urea, Trimethyl-4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-1,2-</i>	2.68
3	5.076	47	<i>Ethanediol, 1-(2-phenyl-1,3,2-dioxaborolan-4-yl)-Erythritol</i>	1.14
4	6.924	64	<i>Erythritol</i>	11.21
5	7.138	64	<i>Erythritol</i>	2.78
6	7.276	64	<i>Erythritol</i>	6.67
7	8.938	96	<i>4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-</i>	22.91
8	9.22	91	<i>4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-</i>	5.71
9	14.013	93	<i>2-Methoxy-4-vinylphenol</i>	11.5
10	15.447	96	<i>Phenol, 2,6-dimethoxym-Guaiacol</i>	15.31
11	28.196	38	<i>3-Benzylheptane-2,6-dione</i>	1.89
12	28.362	14	<i>1,1'-Biphenyl, 2-methyl-</i>	1.48
13	29.113	83	<i>n-Hexadecanoic acid</i>	2.04
14	19.334	91	<i>Ambreinolide (cis-A/B)</i>	4.61
15	30.437	38		1.15

Table 3. Active Compounds in 90% Ethanol Extract of *U. lobata* L Leaf

Number	RT	Quality	Name of The Compound	Peak Area (%)
1	8.924	81	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	3.38
2	25.742	93	(S)-4-(1-Acetoxyallyl) phenyl acetate	7.6
3	25.824	60	Benzoic acid, 2,4-dimethyl-	1.15
4	27.176	96	((3S,3aR,6R,8aS)-7,7-Dimethyl-8-methyleneoctahydro-1H-3a,6-methanoazulen-3-yl) methanol	8.58
5	29.617	90	n-Hexadecanoic acid	16.13
6	30.792	90	Cyclopentadecanone, 2-hydroxy-	14.87
7	35.429	25	Ethyl 2-(2-chloroacetamido)-3,3,3-trifluoro-2-(3-Fluoroanilino) propionate	12.54
8	37.043	99	Stigmast-3,5-diene	35.1

The results of identification in the table indicate the existence of various types of active compounds, including *n-hexadecanoic acid* which is known to have anti-inflammatory, antispasmodic, anticancer, anti-cancer, antiviral, antihyperglycemic, antifungal, antihelmintic, and inhibit the growth of *Bacillus cereus* [7, 8]. There are also several phenol compounds, such as *2-Methoxy-4-vinylphenol* which have antioxidant, antimicrobial and anti-inflammatory properties [9]. *Phenol*, *2,6-dimethoxy-syringol* and *m-Guaiacol* have higher antioxidant properties than vitamin C and can inhibit the bacteria *Staphylococcus aureus* [10], *1,1'-Biphenyl, 2-methyl-* used in antimalarial products [11]. *(S)-4-(1-Acetoxyallyl) phenyl acetate* isolated from *Alpinia galanga* has strong antibacterial properties against *P. acnes*. In addition, several other research results show that this compound also has anti-tumor, anti-inflammatory, antifungal, and antioxidant

properties [12]. As well as *benzoic acid, 2,4-dimethyl-* which is thought to play a role in fighting the bacteria *Shigella sonnei*, *Mycobacterium tuberculosis*, and *Streptococcus pneumoniae* [13].

Other compounds are Flavonoids such as ((3S, 3aR, 6R, 8aS) -7,7-Dimethyl-8-methyleneoctahydro-1H-3a, 6-methanoazulen-3-yl) Methanol or *kushimol / kushenol* at concentrations > 500 µg / mL which can inhibit *S.aureus* and antifungal bacteria [14]. *4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-* which is antioxidant, antiproliferation and proapoptosi against cancer cells [15]. In addition, this compound is also present in the ethyl acetate fraction of *Glycyrrhiza glabra L.* extract and belongs to the category of strong antibacterial in inhibiting *Bacillus cereus* [8].

Also identified alcohol sugar compounds including *L-lyxose* which has anti-tumor effects [7] and scillo-inositol are known in the treatment of allergic diseases and Down's syndrome, prevention of premature babies and lung cancer. In addition the presence of this compound in mulberry fruit essential oil is thought to play a role in inhibiting the bacteria *Listeria monocytogenes*, *Salmonella typhimurium*, *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus cereus* [16,17]. Whereas *Erythritol* is effective in reducing dental plaque, it can inhibit the growth of *Staphylococcus mutans* bacteria, and reduce the number of dental caries [18].

3. Analysis of Antibacterial Activity

Table 4. Diameter Inhibitory of *S. epidermidis*

Extract	Concentration (mg/mL)			
	62,5	125	250	500
I	0	0	7	8
II	0	0	9	12
III	0	0	10	12
Clindamycin	20	20	20	20

Table 5. Diameter Inhibitory of *S. aureus*

Extract	Concentration (mg/mL)			
	62,5	125	250	500
I	0	0	8	9
II	0	0	12	14
III	0	0	13	15
Clindamycin	17	17	17	17

Table 6. Diameter Inhibitory of *P. acne*

Extract	Concentration (mg/mL)			
	62,5	125	250	500
I	-	-	-	0
II	-	-	-	0
III	-	-	-	0
Clindamycin	-	-	-	17

The results showed that the extract could not inhibit *P. acne* bacteria but could inhibit *S. aureus* and *S. epidermidis* bacteria at concentrations of 250 mg / mL and 500 mg / mL. Consequently, the highest amount of antibacterial compounds was found in III > II > I. Inhibition of all extracts was still lower than clyndamicin. At a concentration of 250mg / mL, the inhibition is in the medium category with a 10-15 mm inhibition except 30% ethanol extract is still in the weak category <10 mm. The inhibition of extracts against *S. aureus* and *S. epidermidis* bacteria is due to the role of active compounds. The compounds thought to play a role in inhibiting the growth of these bacteria are phenol, flavonoid, steroid, and fatty acid compounds contained in pulutan leaf extract.

CONCLUSION

The identification of active compounds with GC-MS showed that the compounds contained in the extract of the pulutan leaf came from the monoterpenes, phenols, flavonoids, fatty acids, ketones, amino acids, polyols (sugar alcohol) and steroids. The ethanol extract of pulutan leaves can inhibit the bacteria that cause acne *S. aureus* and *S. epidermidis* but cannot inhibit *P. acne*. Ethanol concentration significantly affected yield, types of active compounds, and bacterial inhibition.

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Learning Development Model Of Pandhalungan Community Empowerment Program Through Training In Summersari District, Jember City

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ABSTRACT

Researcher obtained a description of the community in Summersari Jember Village had various kinds of empowerment or strengthening. This can be the basis for researchers to develop a learning model which is a series of business training development activities in an urban area based on improving the quality of life of the Pandhalungan family. The objectives of this study are to know (1) the development model of community empowerment learning through training that is currently being implemented, and (2) the supporting and inhibiting factors for the development model of community empowerment learning through effective, valid, and practical training so that it has an impact on empowerment or strengthening the community. Research design and analysis is use qualitative descriptive. Data collection uses interview, observation, and documentation techniques. While the stage of analyzing research data used in this study includes the stage before in the field, the phase while in the field, and the conclusion /verification stage of the data. The initial findings of the study show (1) learning development activities through training are carried out using ADDIE design starting from the analysis, design, development, implementation, and evaluation, and (2) supporting factors there is support from the role of government, community participation in implementation of training activities, the existence of good relations between communities, the need, trust, and open in the implementation of learning development models through training. While the inhibiting factor in the implementation of learning development through training in Summersari is the inadequate quantity of human resources.

Keywords: learning, community empowerment, training

INTRODUCTION

Based on the results of previous studies with the title Identification of Learning Needs Based on Socio-Economic and Cultural Conditions in Pandhalungan Community in Jember Regency in 2018, that the Pandhalungan community in Summersari village in economic, social and cultural conditions, especially those who are unable to need skills training programs that can

add experience with the hope that the results of the training can be used as an effort to supplement their income. This can be seen from their enthusiasm when participating in activities organized by the PKK (PESAT Keris Research Report, 2018).

Community empowerment activities are actually efforts to change the pattern of community behavior to improve their ability and independence through four aspects namely, social protection, capacity building, increased accessibility and utilization of local potential.

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Because the community empowerment policy that has been implemented so far is not limited to the concept of adoption of programs and activities, but the most important is to adapt the concept to the community.

Community empowerment, commonly known as community empowerment, is considered as an alternative strategy in development that has developed in a variety of literatures and thoughts, although in reality it has not been maximally implemented. Community development and empowerment is a matter that has been widely discussed by the community because it is related to the progress and change of this nation going forward especially when it is associated with community skills that still greatly inhibit economic growth itself.

At present, an empowerment policy has been developed in the fields of social and economic protection, capacity building, and utilization of local potential. In the field of social and economic protection, community empowerment policies must be directed at tackling natural disasters, people with social welfare problems and assistance to the poor, including the establishment of BUMDes and the development of rural areas.

While in the area of capacity building, community empowerment policies must address the problems of the resources of the village government apparatus and BPD, health, education, welfare and supporting infrastructure issues. For the area of increasing accessibility, it must be directed to provide access to resources, access to technology and access to finance.

Furthermore, in the field of exploiting local potentials, community empowerment must be able to provide a set of appropriate technologies in line with local potentials, the provision of markets for the creation of community economic activities as well as the infrastructure management group facilities. Mardikanto (2014) explained that community empowerment activities are efforts to provide empowerment or strengthening to the community.

Community empowerment is also defined as the ability of individuals who are united with the community to build the empowerment of the community concerned so that it aims to find new alternatives in community development. So it can be formulated that the Pandhalunga community needs a training development program in community empowerment which is

one of the poverty reduction activities that is quite effective in accelerating community empowerment efforts through human resource capacity building and collective behavior change in government officials and community groups at the village level. To be able to improve the economic resilience of the Summersari village community, creating an empowered community that has superior quality and plays a role as the main actor in development, education and training is certainly the main key in it. The design of a model for developing community empowerment through this training is expected to be able to provide a high contribution to increasing the empowerment and welfare of the Pandhalungan community in the Summersari district of Jember district

Based on the background that has been described, raised the problem as follows (a) What are the stages of the learning development model of community empowerment programs through training conducted in Summersari sub-district, Summersari sub-district, Jember district, and (b) What are the supporting and inhibiting factors in the learning development model of community empowerment programs through training conducted in Summersari sub-district, Summersari sub-district, Jember district?

MATERIALS AND METHODS

1. Materials

1) Learning Development

Learning is a system that has integrated components. The components that compile a learning can be in the form of instructors, students, materials, learning activities, delivery systems, and learning environment and performance. Each component interacts with each other and works together to achieve the desired learning goals. Changes in one component can affect other components and certainly learning outcomes.

Development of learning as a common sense planning to identify learning problems and seek to solve these problems by using a plan for the implementation, evaluation, testing, feedback, and results. Learning development as a systematic way to identify, develop, and evaluate a set of learning materials and strategies with the aim of achieving certain goals.

Severa learning development models that have been known in the development of learning are (a) ASSURE Model, (b) ADDIE Model, (c) Jerold E. Camp Model, et al, (d) Dick & Carey Model, (e) IDI Model, (f) Gerlach & Ely model, and (g) Bela H. Banaty Model.

From these models, the ADDIE model was chosen and appropriate in answering the research problem. ADDIE model is an easy-to-apply model in which the process used is systematic with a clear framework producing effective, creative, and efficient products (Angel Learning in Siwardani, 2015). ADDIE model is a design / learning model that can facilitate students in developing scientific processes, is cooperative, flexible, adapts to structure and implementation. The ADDIE model can improve critical thinking skills because the learning steps / syntax that is owned by this model is in accordance with indicators of critical thinking skills that are formulating problems, conducting induction, evaluating, and deciding. The activity formulating the problem is carried out in the analyze step, where in this step students first analyze the problem through the identification of problems that are contextual in nature.

Then transform in the form of problem formulation and make a hypothesis as a temporary answer. Induction activity is carried out by students to design problem solving in the form of scientific activities in the form of experiments and discussions and develop the design based on relevant information obtained both in the selection of tools, materials, data collection techniques, and data analysis. Deciding activities are carried out when students implement a design that has been developed in the form of discussions and conclusions related to experiments that have been carried out as a form of lab inquiry. Evaluation activities are carried out at the end of the activity where students evaluate (evaluate) theories and facts based on the results of the activities.

This research belongs to the type of development research (R&D) with the ADDIE model (Analysis, Design, Development, Implementation and Evaluating) but is limited to the Implementation stage (Mulyatiningsih: 2012). Because in this research development only assesses the appropriateness of the product being developed, not to assess the effectiveness of the product.

2) Pandhalungan Community Empowerment

Community empowerment is a development process in which the community takes the initiative to start the process of social activities to improve the situation and condition of oneself [1]. Community empowerment can only occur if the community itself participates. An effort can only be successfully assessed as "community empowerment" if the community group or community becomes an agent of development or also known as the subject. Here the subject is a driving force, and not just beneficiaries or objects.

Community empowerment has been described by Payne (in Adi, 2012) that community empowerment is intended to help clients gain the power to make decisions and determine the actions that he will take related to themselves, including reducing the effects of personal and social barriers. In addition, the meaning of empowerment is seen as an effort to enable individuals or communities. Where the granting of authority or power aims to make the community become independent. In terms of language empowerment comes from the word "power" which means strength or ability to do business. Anwas (2013) states that empowerment is a concept related to power.

Theoretically, the East Java region can be divided into 10 cultural regions, namely Java Mataraman, Panaragan Java, Arek, Samin (Sedulur Sikep), Tengger, Osing (Using), Pandalungan, Madura Island, Madura Bawean, and Madura Kangean (Sutarto and Sudikan , 2004). Pandalungan communities are scattered in the areas of Pasuruan, Probolinggo, Lumajang, Jember, and Bondowoso, while the Madurese live in Madura Island and surrounding islands. Pandalungan is an identity that is likened to a 'big pot' where the gathering of various ethnicities and cultures. This understanding is the same as the concept of the United States-style melting pot which is used as a formula for regions with cultural diversity.

3) Training

Training is an effort to improve the quality of human resources. Training helps employees understand a practical knowledge and its application, in order to improve the skills, skills and attitudes needed by the organization in an

effort to achieve goals. Training is the process of systematically changing employee behavior to achieve organizational goals. Training deals with the expertise and ability of employees to carry out current work. Training has a current orientation and helps employees to achieve certain skills and abilities in order to succeed in carrying out their work (Rivai, 2013: 213).

According to Putra Pratama (2011: 753) The aim of the training is to improve the technical, theoretical, conceptual and moral abilities of employees so that later employees are able to achieve optimal work results so that employees are eager to work at the company. ability and skills in accordance with their area of duty. Training for employees is one of the most important investments made by an organization in smoothing the course of development activities. According to Kaswana (2011: 2), the purpose of the training is to provide adequate skills, knowledge, and attitudes in order to effectively run the wheel of life and the needs in developing human resources in the organization. Benefits and Impacts The training is intended to improve the mastery of various skills and specific work implementation techniques, in detail and routine. Each activity must have the intended direction, both short term and long term. The intended direction is a plan that is stated as the result achieved. The expected benefits and impacts of the training must be clearly formulated, not ignoring the ability and capability of the agency.

According to Hasibuan, (2010: 75), factors affecting training included participants, trainers / instructors, training facilities, curriculum, and training funds. Training indicators according to Melmambessy Moses (2011: 69), including (1) Type of Training, (2) training material, and (3) training time. Type of Training is the type of training provided to employees according to organizational needs, funds which is budgeted in the time available. The training material is always related to the type of training that is followed. And training time.

2. Methods

This research was designed with a qualitative descriptive research design. Data collection uses interview, observation, and documentation techniques. Data collected using descriptive qualitative analysis. documentation. While the

stage of analyzing research data used in this study includes the stage before in the field, the phase while in the field, and the conclusion / verification stage of the data.

RESULTS AND DISCUSSION

1. Preliminary Analysis of the Stages of Community Empowerment Learning Development Through Training conducted by Summersari Village, Summersari District, Jember Regency

The development model offered in community empowerment through training, is based on field findings and theoretical studies relating to the training process. Based on field studies, the main weakness in training is the absence of problem analysis methods and training needs, in preparing training plans and follow-up of training, there has been no involvement of business actors that functioned as technical informants from the planning, implementation, and evaluation stages of activities, so that the learning community unable to develop the skills possessed by entrepreneurship independently there is no real follow-up.

The development model used in the development of learning through this training is ADDIE. This model is one of the systematic learning design models. The selection of this model is based on the consideration that this model is developed systematically and rests on the theoretical foundation of training design. This model is programmed in a systematic sequence of activities in an effort to solve learning problems related to meeting the needs of life.

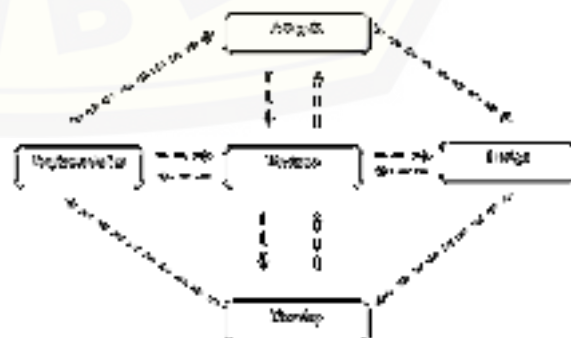


Figure 1. Model program in a systematic sequence of activities

The offer of this model is oriented towards perfecting the model that has been carried out so far as has been explained above, with modifications starting from analyzing, designing, developing, implementing and evaluating training activities from mentoring management, marketing, and extracting government assistance activities. It is possible for the mastery of life skills to be provided in accordance with the training participants' abilities and opportunities to be developed. Thus the independence of the training participants to develop life skills that have been mastered become a hope for the training organizers, because this is one of the markers of the success of life skills training conducted.

Based on the diagram it can be stated that community empowerment through training with a variety of training such as making clutch bags and ornamental corn skin is directed at the stages that exist in the method so that the formation of entrepreneurial character of trainees is characterized by real activities in the form of business development and at the same time marketing business results. The formation of entrepreneurial character through training follows the main activity flow as follows:



Figure 2. ADDIE Model

a) Analysis.

The design phase of the analysis focuses on the target audience. At the analysis stage, defining instructional problems, instructional goals, learning objectives and identifying the

learning environment and knowledge possessed by learning citizens are adjusted to their learning needs.

b) Design

The design phase is related to goal setting, assessment instruments, exercises, content, and analysis related to learning material, learning plans and media selection. The design phase is carried out systematically and specifically.

c) Development

In developing the development, the creation and incorporation of content that has been designed at the design stage. In this phase, storyboarding, content writing and graphic design are required.

d) Implementation

In this phase, procedures are made for the training of the trainees and the instructor / facilitator. Training for facilitators includes curriculum materials, expected learning outcomes, delivery methods and testing procedures. Other activities that must be carried out in this phase include the duplication and distribution of other supporting materials and materials, as well as preparation for technical problems and discussing alternative plans with students.

e) Evaluation

Each stage of the ADDIE process involves formative evaluation. This is multidimensional and an important component of the ADDIE process. This assumes formative evaluation form in the development stage. Evaluation is carried out during the implementation phase with the help of instructors and students. After the learning process is completed, a summative evaluation is carried out to improve learning. The designer of all stages of evaluation must ascertain whether the problems relevant to the training program are resolved and whether the desired objectives are met.

2. Analysis of Supporting Factors and Obstacles to Development of Community Empowerment Learning Through Training conducted by Summersari Village, Summersari District, Jember Regency

Answering the second problem formulation are the supporting and inhibiting factors, while the factors that are supporting and inhibiting the learning development model of community empowerment activities through training programs in the village of Summersari, Jember Regency, as follows:

a) Supporting Factors

Supporting factors are the factors needed in an empowerment process, these supporting factors are needed to support the smooth and successful empowerment of women.

- (1) The Government, the Office of Education in particular as a facilitator for training participants in providing motivation.
- (2) The government provides training and counseling on capital, administration and bookkeeping through a training program participated by batik artisans.
- (3) Training by sending delegations for comparative studies to other regions, in order to improve the quality of human resources both to the craftsmen themselves and products.
- (4) The existence of promotional facilities by the Ministry of Industry and Trade, motive updates, and cooperation.
- (5) The active participation of craftsmen to participate in exhibition events to promote their products so that they can expand their market share.
- (6) There is a good relationship between members, a sense of togetherness, mutual need, trust, and openness.

b) Inhibiting factors

There are also several obstacles experienced in the development of learning models through this ministry, one of the efforts to empower the Summersari village community. This obstacle is especially in the inadequate quantity of human resources. Residents learning as trainees lack initial skills in training such as not understanding the importance of utilizing corn husk which turns out to have uses in improving quality of life. There are indeed some learning people who can use or have skills in processing utilizing corn husk well but cannot see the potential market using social media. In fact, social media has become one of the strategic media to promote the

results of skills and conduct online trading transactions.

The entrepreneurship spirit that is still low also impedes the development of the results of the training. Plus their position as parents or grandparents who every day take care of children and families, they do not have much time to practice operating social media. The promotion and marketing of products carried out so far is mostly spread by word of mouth and business cards, while the internet is actually done but not yet maximized. Another obstacle is the development of motifs in making crafts.

CONCLUSION

Conclusions from these results are as follows

- (1) learning development activities through training are carried out using ADDIE design starting from analysis, design, development, implementation, and evaluation, and (2) supporting factors for the development of learning through training are the support of the role of government, community participation in the implementation of training activities, the existence of good relations between communities, the need, trust, and openness in the implementation of learning development models through training. While the inhibiting factor in the implementation of learning development through training in Summersari is the inadequate quantity of human resources.

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Politeness-Oriented Teaching Materials of L2 Indonesian for Foreign Learners

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ABSTRACT

This paper is aimed at contributing to the new teaching method for L2 Indonesian for foreign learners with an emphasis on politeness. The said materials consist of eight unit: (a) expression of salutations; (b) self-introduction; (c) greetings people; (d) asking for help; (e) saying thank you; (f) congratulating; (g) request for permissions; and (h) table manners. The expected outcome is not only that the learners will be able to use Indonesian, but also behave like Indonesians. It is shown by the test results of the effectiveness of the materials. The learners always greets when entering and leaving a class room. Instead of using second person pronouns, the learners use a more polite form of greeting, such as *Bapak* 'sir' or *Ibu* 'maam'. The learners also call themselves with a more formal first singular pronoun 'saya', rather than 'aku', which is considered a nonformal and less polite form. Moreover, the learners always ask for permission for anything during a learning session. They always use the word *tolong* 'please' if asking for help and say *terima kasih* 'thank you' afterwards. They also use their right hand to eat, to give, and to receive anything from other people.

Keywords: politeness; teaching materials; L2 Indonesian for foreign learners.

INTRODUCTION

Language is a reflection of one's personality and even wider, it reflects a way of communication in a country. Politeness is an important value in Indonesian culture. It is used and implemented in the daily basis communication [1]. Some aspects that are considered impactful in the use of language include intonation, word selection, gestures, eye contact, etc. These kinds of behavior are affected by socio-cultural aspects within the community. A saying in Javanese culture: *Ajining diri gumantung ana ing lathi* which means 'one's self-esteem is very much determined by his or her words' reflects how important it is to have manner in an Indonesian cultural setting. Generally, the Indonesian people are very concerned about one's manner. It determined acceptance and respects towards one another.

Generally speaking, Indonesian people have two motivations in using politeness for their daily communications: self-esteem and respect others. Thus, politeness has two dimensional perspectives: the speaker and the speaker's partner. The first dimension is usually the focus of one's motive. If the speaker is able to maintain his or her dignity and self-esteem during the speech, he or she will be able to respect others. As a result, others will give back his or her respect towards the speaker.

Language politeness is something that must also be understood and mastered by learners of L2 Indonesian. This paper argues that Indonesian L2 teaching materials should consider politeness in its presentation. The existing material, called the *Indonesian Language Book for International Communication for A1 Level* published by the Indonesian Ministry of Education and Culture does not consider the levels of politeness. For example, the use of second person singular high *Anda*, which cannot be used in all type of

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communication, is not well-given as examples in the said book. It is properly used to address an older person or a respected person, but not to a friend, for instance. This is why politeness aspect is very important to be considered in the preparation of L2 Indonesian teaching materials.

Teaching materials play an important role in learning, including Indonesian L2 (BIPA) learning. Teaching materials can serve as knowledge, communication skills, or attitudes in order to achieve competency standards that have been determined. A publication by Indonesian ministry of education [2] states that teaching materials should consist of knowledge (facts, concepts, principles, and procedures), skills development, and attitudes or values of Indonesian culture. Teaching materials as all forms of material used to assist teachers in carrying out learning activities. Teaching materials can be either written material or unwritten material. Proper teaching materials allow learners to be able to learn a complete and integrated language skills [3].

Teaching materials must display authentic materials that allow learners to use of such language contexts outside of the classroom or in the real world. Generally speaking, teaching materials have two objectives, namely providing information and data about things learned and presenting data on socio-cultural contexts. There are several things that must be considered in selecting and compiling teaching materials. There are four things that must be considered in compiling teaching materials [4].

The characteristics of L2 learners. This relates to the suitability of the level of difficulty of teaching materials with the level of language skills of learners, how teaching materials can challenge learners without frustrating them, and how teaching materials can accommodate learners' needs and interests. Learner characteristics that need to be known include: age, average ability in accordance with learning material, skills that have been possessed, and attitudes. In addition, socio-cultural and socio-economic characteristics also need to be understood in designing teaching materials.

Consideration of learning objectives. This concerns how teaching materials support the achievement of competencies specified in the curriculum, how teaching materials improve students' knowledge and understanding, and how teaching materials support students to be

responsible for their own learning. The ultimate goal of learning has been outlined in the curriculum as in the standards of competence and basic competencies.

Teaching purposes. Consideration of teacher's interest relates to the issue of how teaching materials can explore and without limiting the teacher's skills. Teachers certainly have their own limitations and interests. However, the teachers or instructors may not avoid material that is not mastered and uninteresting. All material contained in the curriculum must be taught according to its necessity.

Consideration of practicalities and prevalence. These considerations are related to the criterion that teaching materials must have. These criterion must be imaginative, attractive, and effective. They should also allow all Indonesian L2 learners to be involved in their use.

In addition to the these four points, the preparation of teaching materials must also consider a number of relevant principles. They are consistency and the adequacy of high exploitation. The principle of relevance means that the learning material should be related to the achievement of standards of competence and basic competencies. The principle of consistency includes a point that the focus of language learning must be directed at the development of predetermined competencies. The choice of topic or theme is adjusted to its interests and usefulness. The principle of sufficiency means that the material taught is adequate in helping learners master the basic competencies taught. The materials may not be too little and may not be too much. The principle of exploitation means that it can be utilized to develop other abilities. Learning topics must be chosen in order to develop all potential students such as cognitive, creativity, and multiple intelligences.

The teaching of BIPA is not just to produce students who are able to speak proper Indonesian, but also as a vehicle to understand the social values of the Indonesian people [5]. BIPA learning should be accompanied by providing knowledge about the character or identity of the Indonesian nation. This is reflected in the preparation of teaching materials that are inseparable from the character of the Indonesian nation that is diverse and rich in natural and cultural resources [6].

BIPA learners in general are adults, usually over 17 years old [7]. There are several traits that must be considered in developing BIPA teaching materials. *First*, adults already have enough knowledge and insight so that their needs and the needs of adults are no longer the same to the needs of children. Therefore, the actual topics they want to learn are general topics such as environmental problems, human relations, world events, and so on. *Secondly*, that foreigners like to express themselves, present something, express opinions so that assignments outside the classroom or make a simple project will be very interesting. Finally, to accommodate interests and needs that may differ from one to the other, varied material needs to be prepared [8].

The description of the form of BIPA learning can be viewed in terms of BIPA learning goals. The BIPA learning objectives are closely related to the problem of meeting needs. In line with this problem, Mackey and Mountford [7] explain that there are three needs that encourage a person to learn a language, namely (1) work-related needs, (2) the need for vocational training programs, and (3) needs to learn. In accordance with that opinion, Hoed [7] states that the BIPA program aims to (1) attend classes at Indonesian universities, (2) read books and newspapers for research purposes, and (3) communicate verbally in daily life in Indonesia. Each of these three objectives can still be expanded into a number of specific objectives, for example, to study in higher education in Indonesia requires knowledge of Indonesian in accordance with the fields of study (social sciences, engineering, economics, etc.). Likewise for research purposes depending on what field will be studied. Learning with the purpose of oral communication and in direct interaction with local Indonesians is also require a consideration on the use of formal or informal style.

Some emphases on BIPA teaching need to be differentiated according to the objectives to be achieved. The purposes of teaching BIPA were (1) to be able to conduct daily communication with local Indonesians (general purpose), and (2) to explore Indonesian culture with all its aspects (specific objectives). The first goal is to emphasize the mastery of everyday language that can be used for practical purposes, such as greeting, bidding, refusing, inviting, thanking, asking permission, inviting, complaining,

praising, introducing self, and saying goodbye. Characteristics of language for this purpose are: (1) non formal style, (2) non-standard vocabulary, (3) omission of affixes, and (4) simple sentences. The characteristics of the language for the second purpose are the use of (1) standard word forms, (2) technical vocabulary, (3) complete affixes, (4) correct writing rules, and (5) standard sentence arrangements [9].

BIPA teaching should use the students as the center of learning (*learner centered*) [10]. Focusing attention on students in language learning is a characteristic that distinguishes language teaching for foreign speakers with language teaching for native speakers (which distinguishes BIPA from those who not BIPA). Therefore, BIPA teaching materials must use some functional materials [11].

Fraser describes four politeness views. They are (1) social norm-based politeness (*the social norm view*), (2) politeness-based conversation maxim (*the conversational-maxim view*), (3) politeness based on the concept of face salvation (*the face-saving view*), and (4) contractual-*contract view* [12].

The research conducted by Astuti (2012) entitled "Differences in the level of politeness in the aspects of speaking and writing learning outcomes using Indonesian and Indonesian Language Books (BSE) in Class VII SMP students with Class Meeting Model" concluded that students that were taught using a polite way of Bahasa Indonesia teaching books show that the level of politeness of speaking and writing students is higher compared to them who were taught by using Indonesian textbooks (BSE). This trend indicates that language politeness-oriented textbooks significantly influence the politeness of Indonesian language learners [1].

Based on research conducted by Cabansag (2013) about student writing skills it is known that the use of words, the use of tenses, and the use of capital letters do not significantly influence students' writing skills. The most influential thing in writing is the skill to write the main ideas, explain explanatory sentences, and elaborate sentence details. Perseverance is the dominant supporter of L2 learning [13].

METHOD

The method used in this study is the method of research and development (*R & D*). Based on the description above, this study aims to produce products in the form of BIPA teaching materials. Results from year one have succeeded in describing the condition of BIPA teaching materials that have been used and analyzed. It also generates the needs of BIPA organizers and learners for politeness-oriented BIPA teaching materials. In particular, the second year research aims to develop politeness-oriented BIPA teaching materials and test their effectiveness.

This development aims to produce a prototype of politeness-oriented BIPA teaching materials by considering several things, including: (1) benefits; (2) practicality; (3) economics; (4) objectivity. Development of politeness-oriented BIPA teaching materials is carried out for 5 months, starting from October 2018 to March 2019. Pilot prototypes of politeness-oriented BIPA teaching materials are conducted in December 2018 and February 2019. The parties involved in developing this teaching material are foreign students who are studying BIPA, BIPA teachers, BIPA experts and researchers. Students act as users of instructional materials as a basis for implementing data analysis. Lecturers are people who are tasked with using teaching materials in teaching foreign students and providing input on the conduct of research. The researcher is responsible for carrying out the analysis and synthesis of the development results. Experts act as *expert judgment* who are tasked to provide input on the prototypes developed and/or suggesting improvements in the development of teaching materials. The type of data in this development stage is qualitative data. Qualitative data comes from the results of observations, interviews, and analysis of documents during the trial. The output of this development stage is a draft of politeness-oriented BIPA teaching material that is process tested (*feasible / applicable*).

The purpose of the testing phase is to test the effectiveness of politeness-oriented BIPA teaching materials that have been developed after testing. The question that needs to be answered is whether BIPA teaching materials are politically oriented and effectively improved. Is the language politeness and behave as foreign students as BIPA students. The testing is carried

out by implementing politeness-oriented BIPA teaching materials in the class of foreign students categorized as BIPA 1 who are learning BIPA. Testing the effectiveness of politeness-oriented BIPA teaching materials developed was carried out at the Universitas Muhammadiyah Surakarta. The test was conducted at the beginning of March 2019. Parties involved in testing are BIPA program students, BIPA lecturers, and researchers. The type of data in the testing phase is observational data sourced from student language behavior after being taught using politeness-oriented BIPA teaching materials. Data collection techniques used are documentation techniques, observation and interviews. BIPA students observed language behavior before and after being taught using politeness-oriented BIPA teaching materials, the language behavior of BIPA students was also documented. In addition, students were also interviewed in relation to understanding their concepts of politeness and Indonesian culture. Data analysis techniques are carried out by interactive analysis techniques. The data analyzed is data from results interview, observation and documentation. The output of the testing phase is BIPA teaching materials that have been processed, tested (development stage) and produced (testing phase). In terms of process, the BIPA teaching materials can be applied well; and from the product side, the BIPA teaching materials have a positive effect on the implementation of BIPA learning.

RESULTS AND DISCUSSION

1. Results of Development of Politeness-Oriented BIPA Teaching Materials

The politeness-oriented BIPA teaching material which was developed titled "Language and Culture" was developed into eight units, namely: (1) greeting; (2) getting acquainted; (3) greeting; (4) asking for help; (5) say thank you; (6) congratulate; (7) ask for permission; and (8) eating dough.

Unit 1 Greeting People

Unit 1 contains material about greeting. This unit aims to make students to have the habit of saying greetings according to context. Saying greetings to this unit is distinguished in two situations, namely the formal situation and the familiar situation. In the formal situation, there

are several greetings that can be used, namely: (1) Assalamualaikum; (2) good morning; (3) good afternoon; (4) good afternoon; and (5) good night. In a familiar situation, there are two greetings delivered, namely (1) hi and (2) hello. Differences in greetings in these two situations can provide understanding to BIPA students not to say hello to the lecturer/teacher with the words "hi" or "hello" while seeing each other.

Unit 2 Self Introduction

Unit 2 is introduction by describing three important things, namely introducing oneself, and introducing others. When acquaintance is exemplified that people who are acquainted despite meeting with people of the same age, the person pronouns used are "me" and "you", not "me" and "you". The material about introducing oneself was also exemplified by the use of the word "I", not "I" to show that the person pronoun "I" was more polite than "I". The material about introducing others is also exemplified by the use of the words "he", "father", and "mother" which indicate the selection of words that are more polite than "he" / "he" and "you".

Unit 3 Greeting People (2)

Unit 3 describes different ways of greeting Indonesians by greeting several people from different countries. Greeting is something that is important when meeting other people. However, how to greet Indonesian people can be different from how to greet people from other countries. In this material, there are several ways to greet, namely: (1) shake hands; (2) kissing on the cheek; (3) hands cup; (4) bowing down; and (5) applaud.

Unit 4 Requests for Help

Unit 4 contains material about asking for help. This unit is equipped with examples and some contextual exercises asking for help. In this unit, students are also asked to simulate asking for help from their friends. At the end of the material presented a pearl of wisdom "one of the reasons why God gives us strength is so that we can help others" as a form of strengthening the importance of helping.

Unit 5 Thank You

Unit 5 contains material about thanking you. The material in unit 5 is very closely related to the material presented in unit 4, which is

asking for help. Saying thank you is usually delivered after someone asks for help, is helped, or gets help.

Unit 6 Congratulating People

Unit 6 presents material about congratulating people. Congratulations are usually delivered to someone who is celebrating a happy day or success. In Indonesia congratulations are usually given to people who are celebrating their birthday, people who are celebrating religious holidays, people who are married, and people who are blessed with children.

Unit 7 Requests for Permission

Unit 7 contains material about asking permission. Requesting permission is usually conveyed by someone who wants to do something other than the ongoing activity. In the context of learning, usually asking permission is conveyed by students who cannot attend learning (not entering the class), students who arrive late, or students who want to leave the classroom when the learning process takes place. For example, students who are not in class/arrive late should notify/ask permission from the teacher. Request permission can be sent to a friend's letter. In the current context, permission requests can be sent by short message. Even though through text messages, language politeness when asking for permission must also be considered. In the context of learning, students often have to leave the classroom for a while to go to the toilet. Before leaving the class, students must ask permission from the teacher.

Unit 8 Table Manners

Unit 8 is about table manners. Materials in this unit are not only explained in terms of eating ethics, but also related to eating places in Indonesia, eating utensils, how to eat, and eating ethics. Regarding the place to eat, this unit describes the difference between eating in a shop and in a restaurant/cafe. The difference in the menu in the *warung* and the menu in the cafe. Thus, BIPA students who usually come from different countries that do not necessarily have stalls can understand and distinguish places to eat in Indonesia, especially between warungs and restaurants / cafes. Cutlery and eating methods are also explained in this unit so that BIPA students understand that how to eat Indonesian

people is very different from how they eat in their country. For example, eating using a spoon with a fork, eating using chopsticks, eating with *pulukan*, eating with leaf-made spoon, and eating using a fork and knife. Eating/eating ethics is delivered so that BIPA students can adjust the way of eating Indonesian people, especially polite eating methods. Indonesian eating habits: (1) washing hands before eating;(2) pray before eating; and (3) eating while sitting/not standing. Besides table manners, in this unit also explained about the prohibition when eating, namely: (1) eating while standing;(2) eat using your left hand; and (3) eating too full.

2. The Effectiveness of Politeness-Oriented BIPA Teaching Material Test Results

The effectiveness of politeness-oriented BIPA teaching material entitled "Santun Berbahasa dan Berbudaya" has been tested by being implemented in the BIPA class. The effectiveness of politeness-oriented BIPA teaching materials is concluded based on the results of observations by comparing the language behavior of foreign students of BIPA students before and after being taught with developed teaching materials. The results of the observations are verified with the interview data.

Table 1. Student Speaking Behavior Before and After Using Orientation-Oriented BIPA Teaching Materials "Fine in Language and Cultured"

Before	After
Say hello to the teacher with the words "hi" and "hello".	Say hello to the teacher with the words "good morning" and "good afternoon".
Calling the lecturer by directly mentioning the name, for example: "Laili".	Calling the lecturer with the nickname "Maam", for example: "Mrs. Laili".
Calling the teacher as "Teacher", for example: "Teacher, I want to ask!".	Calling the teacher with the nickname "Bu", for example: "Maam, I want to ask."
Greet the teacher waving.	Greet teachers with shakes (especially female students), students from Laos usually by clasping their hands.
Get acquainted with friends using pronouns "aku" and "kamu", even get acquainted with teachers also using the words "I" and "you".	Meet friends using pronouns "saya" and "Anda"; introducing self with the teacher using the words "saya" and "Ibu/Bapak".

Introducing yourself by using pronouns "I".	Introducing self by using the pronoun "saya".
Introducing other people (parents, siblings, heads of state, famous people in their country) by using the word "he/she".	Introducing other people (parents, siblings, heads of state, famous people in their country) by using the word "he".
Directly ordered to sign the assignment, then say a word of help.	Say the word help when asking for the assignment to be signed.
Leave immediately after being helped.	Say thank you after being helped.
Receive something using left hand.	Receive something using right hand.
Asking whether you have breakfast yet or not.	Greet by saying "Good morning BuLaili." And wish with the phrase "May you always be healthy."
-	When the teachers returned fromUmrah, students say welcome back to Indonesia.
Bring food equipment from the country of origin "chopsticks" when eating rice.	Can eat rice with <i>pulukan</i> .
Eat and drink by standing.	Eat and drink by sitting.
Eat using left hand.	Eat using the right hand.
Say that food is not tasty.	Say that food is good.
Taking lots of food, finally not being eaten.	Try a little food to be eaten first, add more if you want, and finish the food that has been taken.

Based on the table, it can be seen that there are differences in the behavior of BIPA students between before and after using politeness - oriented BIPA teaching materials entitled "Good Language and Culture". Students experience behavioral changes in a positive direction. The results of interviews conducted by researchers to students of BIPA students revealed that the previous language behavior of students was obtained from the results of reading textbooks in which did not explain the different uses of greetings and different cultures in their home countries. How to greet, how to get acquainted, and how to eat every student is different. However, whether or not they want to learn, BIPA must be willing and able to adjust the rules and culture that exist in Indonesia because they learn Indonesian in Indonesia.

CONCLUSION

The politeness-oriented BIPA teaching material entitled "Santun Berbahasa dan Berbudaya" was developed into eight units. The eight units are: (1) greeting; (2) getting acquainted; (3) greeting; (4) asking for help; (5) say thank you; (6) congratulate; (7) ask for permission; and (8) eating dough. The results of the effectiveness test on politeness-oriented BIPA teaching materials in "Language and Culture" show that BIPA teaching materials developed are effective in developing the language behavior of foreign students who learn BIPA toward positive behavior.

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Developing Visual-Novel Based Learning Application “简单故事” to Enhance Mandarin Vocabulary Skill

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ABSTRACT

The growth of China influences the development of Mandarin strictly. It increases the demand of learning Mandarin. However, there are a lot of differences between Mandarin and Bahasa Indonesia such as pronunciation, tones and the characters (汉字 *hànzì*). Bahasa Indonesia uses alphabetic characters, while Mandarin uses the orthographic ones. Therefore, it makes students face difficulties in learning Mandarin. Many learning applications have been developed to enhance students' Mandarin skill, but none of them are exactly suitable with the syllabus in senior high school. This paper aims to propose an application that can fulfill students' needs by developing an application that suitable with the school curriculum. By playing this game, students are expected to learn vocabularies in more attractive way. The developed game uses visual novel (视觉小说 *shìjué xiǎoshuō*) game genre. The research design used in this paper is Research and Development (R&D) by Borg and Gall. There are 10 participants selected by random sampling to try this application. The participants involved in this research are students from 10th grade of SMK Maharani Malang. The result showed that the application is considered valid and suitable for the students of SMK Maharani Malang in grade 10. It is proved by the score from media expert (75%), content expert (95%), and the students (94,6%). This application is still under the process of development. The application will be revised by considering the evaluation from students.

Keywords: Learning Mandarin; Vocabularies; Game; Visual Novel.

INTRODUCTION

China has developed rapidly. Its economic growth showed the second rank in the world. It influences the development of Mandarin. Tran [1] in NYTimes stated that the rise of China increases the demand of learning Mandarin. Its increase is also shown in Indonesia as many schools provide Mandarin learning program. But, since Chinese has huge differences with other alphabetic writing words, it makes Chinese believed as one of most difficult yet challenging languages especially for learners whose first language is more closely alphabetic. Linguist from China, Lu Shuxiang, stated that Chinese is difficult to recognize, difficult to write, the number of Chinese characters is very big, and there are a lot of crossing relation among the

shape, pronunciation, meaning, they are easily to be mistaken [2]. It might make Indonesian students face difficulties in learning Mandarin. It can make them bored to learn Mandarin.

Technology can be the solution to attract students to learn Mandarin. Nowadays, technology is an important part of human's life. It significantly helps people in doing their activity. Technology is also applied to help people in learning language through applications, such as dictionary, game, etc. Many applications have been developed to help learners to learn Mandarin more easily. The application can be easily accessed and downloaded, for example through Appstore (iOS) and PlayStore (Android). Some games applied a visual-novel based learning to learn language, but none of them is applied in Mandarin learning application. Besides, in the case of school learners, the available applications are still not integrated with the school curriculum

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and student needs.

Previous paper has conducted research on learning language by using a visual-novel based learning application on grade 10 of senior high school [3]. The application is in a form of game that focused on learning expression in English based on curriculum 2013. Other previous papers have conducted research on developing Mandarin application [4] [5] [6], but most of them developed in android-based. While not all the schools in Indonesia allows their students to access mobile phone in school hours, one of them is in SMKF Maharani Malang. Therefore, the learning application that can be accessed during school hours is needed to be developed to attract students' attention in learning Mandarin, especially inside the school.

The aim of this research is to propose an application that can fulfill students' needs by developing an application that suitable with the school curriculum. The application developed in this paper is “简单故事”. It is a game that provides students to learn Mandarin in a more attractive way, that is by reading a novel. By playing the game they can learn Mandarin's vocabularies. It might be able to make them feel more interested in learning Mandarin. In this game, students would be asked to answer the questions after reading a story. It is expected to make students enjoy in learning Mandarin.

METHOD

This study uses the theory of Research and Development by Borg and Gall [7]. According to Borg and Gall, the research and development model is “a process which is used to develop and validate educational products”. This model has 10 stages: 1) Research and Information Collecting; 2) Planning; 3) Develop Preliminary Form of Product; 4) Preliminary Field Testing; 5) Main Product Revision; 6) Main Field Testing; 7) Operational Product Revision; 8) Operational Field Testing; 9) Final Product Revision; 10) Dissemination and Implementation. This research only focused on stage 1-6 (see figure 2.1), because this application is still prototype and under the process of development. It is possible for the researcher to complete the stages in the future.

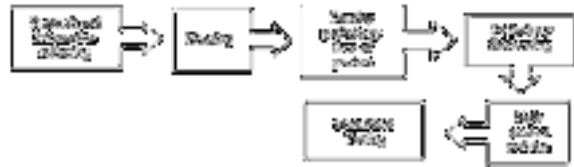


Figure 2.1 The Stages of Research and Development Methods Used in this Research (Source: Borg dan Gall, 1989:786)

In the stage 4 and 6, which are testing stages, the researcher used the validity score from Arikunto [8] below.

$$Score = \frac{Total\ score}{Maximum\ score} \times 100\%$$

Table 2.1 Media Eligibility Criteria

No	Score in %	Category
1.	<21%	Very low
2.	21-40%	Low
3.	41-60%	Medium
4.	61-80%	Decent
5.	81-100%	High

RESULTS AND DISCUSSION

1. Research and Information Collecting

In this stage, the researchers observed the Mandarin learning process to identify students' needs and problems in the classroom. The researchers investigated it through the score of mid-term examination from the students of grade X ($\bar{x} = 38,17$), XI ($\bar{x} = 79,6$) and XII ($\bar{x} = 76,1$) in SMKF Maharani Malang on October 2019. The result showed that the students of grade X have the lowest score. Therefore, the researchers focused on investigating grade X only (N=48). The analysis was done by giving them questionnaire. The questionnaire is about students' difficulties in learning Mandarin.

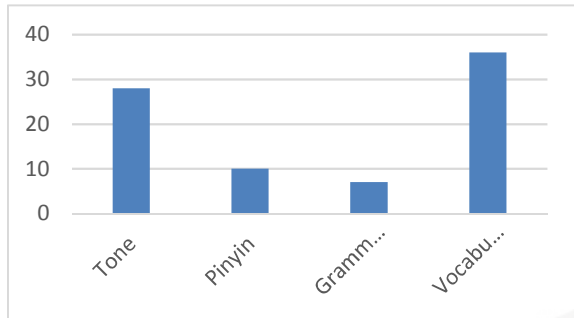


Figure 3.1 Students' Difficulties in Learning Mandarin

As can be seen from the Figure 3.1, the dominant difficulty faced by the students is vocabularies (75%; N=36). The students said that, it is hard to memorize the vocabularies. Because in Mandarin, when the speakers say a word, they automatically have to use the right tone and right pronunciation. Therefore, learning vocabularies means that the learners have to master tone, and hanyu pinyin first. In other word, learning vocabularies is the way more complicated for them.

2. Planning

In this stage, the researchers arranged the content of the application that is suitable with the syllabus based on the identified problems/difficulties from the previous stage. The result showed that the dominant problem faced by students is memorizing Mandarin's vocabularies. The researchers discussed with the teachers to investigate the way that can attract the students to learn Mandarin. Therefore, the researchers proposed visual-novel based learning. This application prototype is made by considering KD (*Basic Competency*) 3.3, KD 3.4 and KD 3.5.

3.3 Applying the way to tell and ask information related to self-introduction (个人信息) including name (名字), age (岁), address (地址), phone number (电话号码), email, living place, grade (班级) and school (学校生活) related to the content by figuring out the social function, text structure and linguistic feature of the spoken and written text.

3.4 Applying the expression related to the topic of the day's name (星期), date (日), month (月), year (年), and time (点 / 时间) in a spoken way to give and ask information based on the

context by figuring out the social function, text structure, and linguistic features of the spoken and written text.

3.5 Identifying name, attitude or condition, amount of people, stuff, animal, and public building that are close to the term in the daily life in a spoken way to give and ask the information related to the context by figuring out the social function, text structure and linguistic features of spoken and written text.

KD 3.3 is the basic competency to develop chapter *self-introduction*, KD 3.4 to develop chapter *time*, and KD 3.5 to develop chapter *transportation*.

3. Develop Preliminary Form of Product

In this stage, researchers developed the planned product by working with a programmer. The contents of the product are adjusted with the KD 3.3, KD 3.4 and KD 3.5. Besides the material, the researchers also proposed all the supporting contents including the color and image, back sound, gameplay and instruction. Then, the programmer designed it by using Unity. As explained in the previous subchapter, the game contains of three themes, those are, self-introduction, time and transportation with the same character/player. There are 15 questions in each theme.



Figure 3.2 简单故事 Application Display (Conversations and Questions)

4. Preliminary Field Testing

This stage is the implementation of the expert validation test from media experts and material experts. The expert validation was tested by a lecturer of education and technology and a Mandarin teacher to get a valid product. The following tables are the result of the score:

Table 3.1 The score of the Media Expert Validation Questionnaire

Questions	Assessment				X	X1	(%)
	SA	A	D	SD			
	4	3	2	1			
Selection of attractive colors according to the target and visualization of clear images.		√			3	4	75%
The type, font, writing of the text in accordance with the contents of the story in the game and its proportional layout.		√			3	4	75%
Backsound matches the theme of the game.		√			3	4	25%
Gameplay according to the type of game (visual novel genre).	√				4	4	100%
Game instructions are very clear, easy to understand and interesting.			√		2	4	50%
TOTAL					15	20	75%

The results of the questionnaire showed that, the mean score is 75% which means that this application is considered valid. However, there were some aspects that can be more improved, such as the colors, fonts, sound, and game instruction. Suggestions from media experts are as follows:

1. The backsound used is little bit boring so it must be changed with something more cheerful, therefore the students do not get bored.
2. Writing format (font) must be bigger, the color must be more varied.

Game instructions should be more interesting, and it must be displayed at the beginning of the game so that students directly read instructions and know the purpose of this game.

Table 3.2 The score of the Content Expert Validation Questionnaire

Question	Assessment				X	X ₁	(%)
	SA	A	D	SD			
The writing and <i>hànzì</i> are correct and the writing of <i>pīnyīn</i> is precise and clear according to <i>shēngdiào</i> .	4	3	2	1	3	4	75%
The series of stories are in accordance with the syllabus of Mandarin grade X of vocational high school.	√				4	4	100%
The series of stories are connected.	√				4	4	100%
Missions in a visual-novel game support students to be easier in learning Mandarin vocabulary.	√				4	4	100%
<i>Hànzì</i> used in the game is in accordance with the target learning class of Mandarin grade X, namely HSK 1 level.	√				4	4	100%
TOTAL					19	20	95%

The result showed that the material was very good. The mean score is 95% which means that this application is considered valid. However, some errors in the writing of *hànzì* and pinyin were found. Therefore, it needs correction. The missions of questions on the visual-novel game should be mixed with Bahasa Indonesia that can help students to play the game while facing difficulty in reading *hànzì*.

5. Main Product Revision

In this stage, the researchers did the revision process that was adjusted to the results of validation, revision and input from media experts and material experts. The following figures are some revision that has been already done by the researchers.

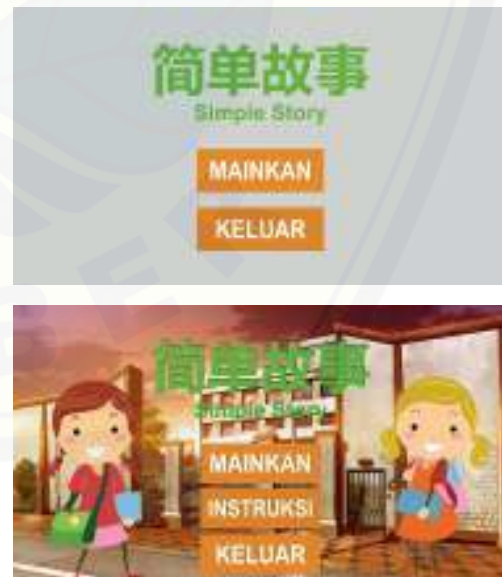


Figure 3.3 Game Instructions Before Revision (Left) and After Revision (Right)

The figures above show that the initial media is still simple, the background is still simple and monotonous and there is no instruction selection icon. The addition of background is needed. Whereas the results after revision, game instruction is displayed directly in the first time when the students open the game, therefore it is possible to be read by all students. Then the background display is revised to be more interesting and there is additional icon for instructions button.



Figure 3.4 Game Display Background Before Revision (Left) and After Revision (Right)

The figures above show the initial media background which is very simple and without any picture. Button choices are inconsistent there are buttons that use both *hànzì* and Bahasa Indonesia, but there are some icons that only use Bahasa Indonesia. While the revised media shows the background has been improved with a background image of the Great Wall of China which is a famous tourism destination in China. All the buttons are also changed in both *hànzì* and Bahasa Indonesia. Backgrounds from the game have also been improved to be more suitable to the students.

6. Main Field Testing

The next stage is main field testing. The researchers tested 简单故事 *jiǎndān gùshi* application to the object of the research, 14 students of grade 10. The students were selected through random sampling.

Table 3.3 Score of Field Testing

Indicator		SA	A	N	D	SD	X	X ₁	%
		5	4	3	2	1			
Display	Interesting	60	8	-	-	-	68	70	97,1%
	Suitable	50	4	9	-	-	63	70	90%
	Alphabetic and Pinyin	45	20	-	-	-	65	70	92,8%
	<i>Hànzì</i>	30	28	3	-	-	61	70	87,1%
User Friendly	Understandable instruction	55	12	-	-	-	67	70	95,7%
	Easily operated	60	8	-	-	-	68	70	97,1%
Contents	Suitable with school curriculum	55	8	3	-	-	66	70	94,3%
	Helpful contents	70	-	-	-	-	70	70	100%
	Applicable	60	8	-	-	-	68	70	97,1%
TOTAL							596	630	94,6%

The result shows that the students are mostly agree with the three aspects tested, which are display, user-friendly, and the contents. The mean score is 94,6% which means that this application is considered valid. All the students are agreed that this application is helpful (100%; N=14) in terms of the contents for learning Mandarin.

CONCLUSION

This research concludes that 简单故事 (*jiǎndān gùshi*) application is considered valid and suitable for the students of SMKF Maharani Malang in grade 10. It is proved by the score from media expert (75%), content expert (95%), and the students (94,6%). This application is still under the process of development and will be continued to the next R&D stages.

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Indonesian Undergraduate EFL Students' Challenges in Writing Research Proposal

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ABSTRACT

In order to prepare students' skill of research writing, English Department requires the students to attend the Thesis Proposal Writing (TPW) class in order to make the students familiar with preparing research activity before facing the undergraduate research. The students faced some challenges such as writing the research proposal in English, selecting the right topic, and selecting the right method. This study aimed to examine students' challenges in writing research proposal. Survey research design using questionnaire as the instrument was employed to conduct this study. The result showed that the students perceived some challenges in writing research proposal and the course helps them to improve the understanding of writing research in several factors.

Keywords: challenges; research proposal writing; undergraduate EFL students.

INTRODUCTION

Undergraduate research is an activity which undergraduate students learn the process of research as necessary as their disciplines. Imafuku, Saiki, Kawakami, & Suzuki (2015) states that a series of research activities is able to build up undergraduate students' basic skills and attitude that is useful for their next professional field. Research activities involve writing skills that are useful for compiling ideas expressed in a research proposal. The basic in writing a research proposal is the writing itself. Writing ability is not a born ability, but it is an outcome of a step by step development [1]. Thus, it is an important growth for undergraduate students to experience writing competence in order to have a better writing skill.

A proposal research is a very important step for students, because it is their first experience to write a research proposal as the first step to graduate from college. A study on undergraduate ESL students who have been trained how to write a research proposal showed that there were several challenges on writing research [9]. It is shown that the students were preferred to write the research in their L1 rather than L2 (English). Also, they encountered some challenges such as topic selection, choosing the right method, finding the references, lack of motivation, interest, and time.

Writing is a difficult skill to be mastered as a study by Ratnawati, Faridah, Anam, & Retnaningdyah (2018) explored the Indonesian undergraduate EFL students' needs of academic writing that to write an academic writing, such as research, was difficult for students, especially in using the proper grammar and connect the idea coherently [7]. Moreover, a study by Husin and Nurbayani (2017) examined Indonesian undergraduate EFL students' thesis quality. It turned out that it those theses, it still found the grammatical error also the shallow explanation

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of theoretical framework and methods [3]. It parallels with research by Hamamah (2017) which in Indonesia the challenge of academic writing in higher institution deals with the problem in writing using academic English and the pressure of writing for international journal [2].

It is important to have training for the student to guide them on how to write a research. The importance of research writing training is conducted in several studies. A study by Noortyani (2016) reported that a writing course for research article was really cherished by the graduate EFL students [6]. By that course, the students got the clear explanation of each part article writing, and they were really helped with the lecturer's guidance. Another study by Cahyono and Amrina (2016) found out that doctorate EFL students were assisted by the writing research articles [1]. In that course, the students got the clear instructions, guidelines, and explanation on how to develop an abstract into research article. Therefore, by looking at all the results of previous studies, research writing training is a massive aid for the students to get the lecturer's guideline, to know more on how to write the abstract and develop it into research article.

This study explored undergraduate students' challenges in writing a research proposal in Indonesian undergraduate EFL students. Before they write the full research, first of all they need to select a topic that is interesting and worth enough to be discussed. In selecting the topic, they must read a sufficient amount of related studies and theories in order to find the gap, the research trend, and the background of the study. They also need to study which research design is used, how to collect and analyze the data. As it is an important part of a research, this study aimed to examine the challenge in writing research proposal. Therefore, the question of this study is 'what are the challenges in writing proposal faced by undergraduate students?'

MATERIALS AND METHODS

This study employed survey as the research design in order to collect the information from every individual in a certain groups through questions. The participants of this study were 12 students (8 females and 4 males) of 6th semester of English language

education study program in Universitas Brawijaya. The researchers focused on the students who have done the learning process of proposal writing in the Thesis Proposal Writing (TPW) course. In TPW course there are 16 meetings mainly talked about outline and proposal writing, explanation for chapter 1, chapter 2, and chapter 3 by the lecturer, consultation, and students' proposal presentation.

Open ended questions were used to collect the data from the participants. The open ended question distributed through the Google form after the students completed the final examination of TPW course. The questions are about the general challenges in writing research proposal, challenges in writing in English, the challenges in topic and method selection, and the proposal writing course.

The data was analyzed through some steps. First, the researchers needed to read all the Google form responses. After that the researchers compiled the answer based on the questions. In order to make the analysis deeper, the researchers compiled again in more detail based on the similarity answer (it can be two or three groups with the same answers). The last, the researchers compared those answers. The dependability is established by described in detail about the data collection and derived the categorization. The credibility of data analysis is examined by triangulation with other source in which this study compares the data analysis with the field notes.

RESULTS AND DISCUSSION

From the data, it was found that there are several challenges faced by the students as factors that influence the students' such as, (1) writing the research in English, (2) they have to read a lot of previous studies and book as a base of their research, therefore they can find the gap and problem they need to solve as their research problem, (3) they have to think about the right method to collect the data, constructing the instrument, and process the data, (4) how to convey the author's idea in their own words (paraphrasing), grammar, and word choices, (5) consultation with their supervisors, and (6) their own insecurities.

The participants of this study are undergraduate EFL students; therefore it is a

must for them to write in English and to be fluent in English in every skill. The results showed, as shown in Figure 1, that 5 students stated that it is easy to write proposal in English, 3 stated that it is quite difficult, and 4 students said it is difficult to write a proposal in English.

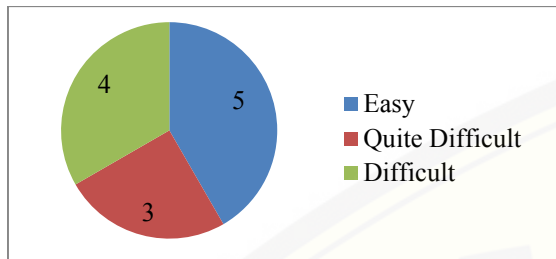


Figure 1. Students' difficulties in writing proposal in English

It is more than half the participants said that they have difficulties in writing in English despite they already passed basic skills courses. This result is in line with the result of Qasem and Zayid (2019) that the students were facing a language barrier in writing research in L2 [9]. Although writing in English is a basic skill that need to be mastered by EFL students, this shows that writing in English is still difficult for them. As stated by (Singh, 2019) that the student lacked ability is in expressing the idea in academic English and writing as academic structure [8]. Moreover in writing a research, students might encounter new vocabulary, term, and had to write the research in a logical and coherent way.

Another reason behind why it is challenging for the students to write research in English, as they stated that it is a challenge to convey the author's idea in their own words (paraphrasing), use the right grammar, and choose the right word. This result is in line with a study by Ratnawati, et al. (2018) and Husin and Nurbayani (2017) that academic writing is hard for EFL learners because it needs students' ability to unify from one source and rewrite it in their own words coherently [7] [3].

The next challenges are the topic and method selection as the students stated that have to read a lot of previous studies in order to find the gap and think about the right method to collect the data, constructing the instrument, and process the data. To select the topic they like and they mastered, as presented in Figure 2, most of the participants said it was easy for them to select the topic (9 students) meanwhile. However, 3

students have difficulties in choosing the desired topic. This leads to difficulties in identifying the gap, objectives, research question and even the methodology [5].

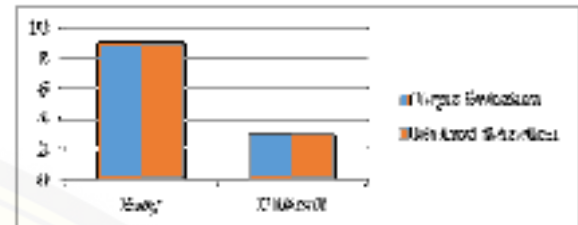


Figure 2. Students' difficulties in choosing a topic and method

The same results also go to the methodology selection (Figure 2). Most of the participants also said it was easy for them to select the right methodology as it was a continuation of topic selection. As choosing the topic is in line with mastering or getting to know about the methodology. In finding the gap or stating based on the field notes by the teacher took, students tended to read a lot of studies and wrote the method also the findings, but forgot to evaluate what was missing or lacking, and the excellence of that study. So in here, to read a lot of references are not the problem, but to read in a smart way, therefore we can find the gap of the research and state our problem that needed to be solved.

Another obstacle is consultation with their supervisors. The perspectives of students about the consultation is that the comment in the proposal draft is lack detail and guidance in which consist of line without any explanation and the negative comment with the simply wrote as "wrong" [5]. Though, the students have to realize that they do not have to depend on the lecturer notes. The students have to explore the literature review and take part in the discussion related to the topic that noted by the lecturer [8]. The students also need to establish a relationship with their lecturer before starts the research writing. The most important thing of all challenges is the students' own insecurities. Sometimes students feel insecure about their own intelligence and feeling anxiety. However, the students should have the motivation in which came from their internal in order to complete their proposal research writing as a dedication of their own hard work.

Throughout the challenges faced by the students, 12 students admitted that proposal writing course help them write a better proposal. Proposal writing course helps them in: (1) it pushes them to read a lot in order to write the introduction part, literature review part, and research method part, (2) the deep explanation of the content of each part, (3) the consultation, and (4) the simulation of proposal presentation at the end of semester helps us to have a real simulation on how thesis proposal seminar is presented. These results coherent with the results of Noortyani (2016) that guidance by lecturer helps the students to have a clear image of what to write and what to do in every chapter. Some advices are given by the students for proposal writing course, they expect to get an interesting strategy in learning writing and to have more personal consultation and peer-reviewing. That way, the students can evaluate ourselves and see others perspective on our thesis proposal [6].

CONCLUSION

The result showed that the students encounter the challenges of writing research proposal in using academic English, selecting the topic and methodology, building relationships with the lecturer during the consultation, and motivating themselves to complete their writing. Hereby, those challenges are the process that the students' need to come through as it helps them to write a good research proposal.

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Performance Accuration Method of Machine Learning for Diabetes Prediction

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ABSTRACT

Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning (ML) techniques allow us to obtain predictively, the dataset we are testing is pima-indian-diabetes with a dataset of 765 raw data with 8 data features and 1 data label we developed a method to achieve the best accuracy from the 5 methods we use with the stages of separation training and testing the dataset, scaling features, parameters evaluation, confusion matrix and we get the accuracy of each method, and the results of the accuracy we get with these 5 methods *Gradient-boosting* is best with an accuracy score of 0.8, *Decision Tree* 0.72, *Random Forest* 0.72, next is *Logistic Regression* 0.7, and then followed by *K-NN* method with a score of 0.65.

Keywords: Machine Learning Prediction Diabetes, Performa Accuration Method , Supervised Learning, AI (artificial intelligence).

INTRODUCTION

Diabetes is a long-lasting or chronic disease and is characterized by high blood sugar (glucose) levels or above normal values. Glucose which accumulates in the blood due to not being absorbed by body cells properly can cause various disorders of the body's organs. If diabetes is not well controlled, various complications that can endanger the lives of patients can arise [1]. Machine Learning (ML) is one branch of the discipline of Artificial Intelligence (AI) which discusses the development of systems based on data. Many things are learned, but basically there are 4 main things learned in machine learning [2]. 1. Supervised Learning, 2. Unsupervised Learning, 3. Semi-Supervised Learning, 4. Reinforcement Learning [3].

Classification techniques in this research produces more accurately such predictive models are one of the most common applying research Machine Learning (ML) techniques train the data and make the function inferred, which is can be

used to map new or invisible examples. The main purpose of classification techniques is to accurately estimate the target class for each case in data. Classification algorithms generally require that class is defined based on data attribute value.

The dataset we tested this time we took from pima indian diabetes specification data features 8 raw and data labels, the amount of data we tested amounted to 785 datasets, for learning process in this time we apply several stages to see the performance of the accuracy of the method we will test the steps we use.

This trial first 1. Raw data, 2. Feature extraction, 3. Hyperparameter and Tuning, 4. Confusion matrix and result accuration. For more details can be seen in Figure 1. In this research, we have studied the performance of five different models to compare the accuracy of the model, model 1. Gradient Boosting, 2. K-Nearest Neighbor (K-NN), 3. Decision Tree, 4. Logistic Regression, 5. Random Forest [3].

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METHOD

1. Proposed Methodology

In this model, we have used 5 methods; 1. Gradient Boosting, 2. Random Forest, 3. Decision Tree, 4. Logistic Regression, 5. K-NN for comparison of accuracy, the main focus in this research is knowing how accurate the method we will use so we can find out which methods will produce the best accuracy and which is the worst accuracy among the 5 methods. For the dataset there are a total of 768 rows and are divided into 2 classes: diabetics and non-diabetics with eight feature data, eight features are 1. Pregnancy, 2. Glucose, 3. Blood Pressure, 4. Blood Pressure, 5. Insulin, 6. BMI (Body Mass Index), 7. Diabetes Pedigree Function, 8. Age, and we include the flow of the algorithm performance process in the learning process as shown in Figure 2.

Figure 2. Flow Proses

This research we made a split test with parameter constraints like the following `train_test_split (X, y, test_size= 0.25, random_state= 42)`, where we made a test data of 0.25 from testing data and supplying data with parameters 42.

2. Gradient Boosting

In the gradient boosting algorithm this time we use the adjusting development threshold Gradient Boosting Classifier (`learning_rate= 0.05, max_depth= 3, max_features= 0.5, random_state= 42`), result this accuracy on training set: 0.882, accuracy on test set: 0.750 and obtain the matrix confusion results as in Figure 3 [4].

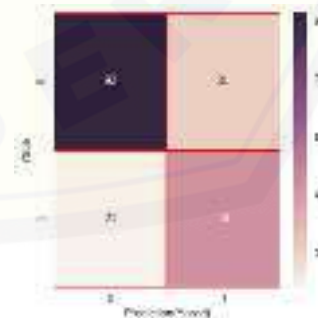
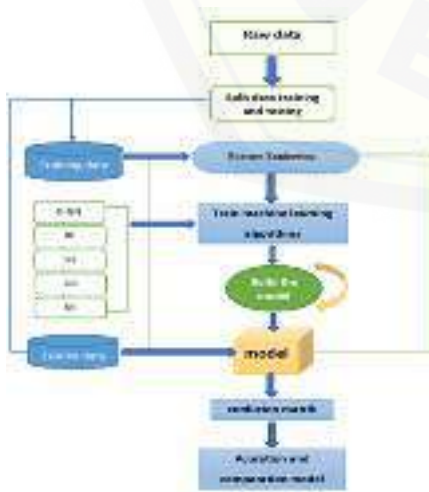


Figure 3 Confusion Matrik Gradient Boosting

3. Random Forest

Random Forest algorithm we use the customize development threshold Random Forest Classifier (n_estimators= 100, criterion= 'gini', max_depth= 6, max_features= 'auto', random_state= 0), produce accuracy on this training set: 0.917, accuracy on the test set: 0.745 and get the results of the matrix confusion as shown in Figure 4 [7]



Figure 4. Confusion Matrik Random Forest

4. Decision Tree

The Decision Tree algorithm we use the customize development threshold Decision Tree Classifier (max_depth= 6, max_features= 4, min_samples_split= 4, random_state= 42), produce accuracy on this training set: 0.852, accuracy on the test set: 0.729 and get the results from the confusion matrix as shown in Figure 5.



Figure 4. Confusion Matrik Decision Tree

5. Logistic Regression

Logistic Regression algorithm we use the Customize development threshold logreg_classifier = Logistic Regression (C = 1, penalty = 'l1'), produce accuracy on this training set: 0.783, accuracy on the test set: 0.724 and get the results from the confusion matrix as shown in Figure 6 [6].

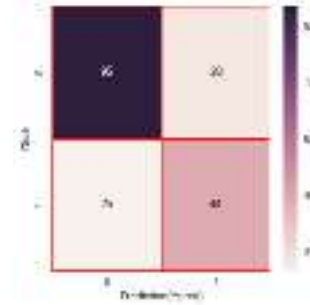


Figure 5. Confusion Matrik Logistic Regression

6. K-NN

K-NN algorithm we use the customize development threshold Kneighbors Classifier (algorithm= 'auto', leaf_size= 30, metric= 'minkowski', metric_params= None, n_jobs= 1, n_neighbors= 5, p= 2, weights= 'uniform'), produce accuracy on this training set: 0.77, accuracy on the test set: 0.71 and get the results from the confusion matrix as shown in Figure 7.

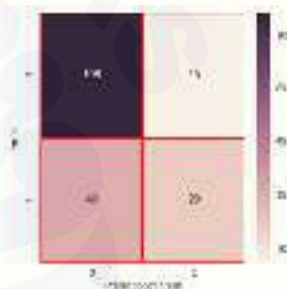


Figure 6. Confusion Matrik K-NN

RESULTS AND DISCUSSION

1. Complete Bouguer Anomaly

The final results of the trial have been done as the table above, there you can see that the best level of accuracy is the Gradient Boosting method with accuracy (0.81) and for the method with the worst accuracy is K-NN (0.64), followed by the results of the Logistic Regression method with accuracy (0.705), Random Forest (0.72) and Decision Tree (0.72).

From the results we can analyze why the Boosting Gradient method is more accurate because there are several things that are affected as follows:

1. The effect of cross-validation techniques that are determined by the same data split and data testing. Here we can know the difference when entering the cross-validation stage the results of the confusion matrix show the number of results from the gradient boosting method with

the TP result "true positive" highest than the other methods "48" although the Decision Tree method also produces the same number on the TP results, However, in the Decision Tree FN method "false negative" or miss more accuracy than the Gradient Boosting method [11].

2. Described in one of Jordan Ferry's journals, Amaury Habrard, Marc Sebban, Olivier Caelen, and Liyun He-Guelton, entitled "Efficient top-ranking optimization with increased gradients for detection of supervised anomalies" in the journal also proves that for searching the method with the most efficient and accurate supervised learning technique is the boosting technique and from the method I used above to compare the accuracy of the boosting technique there is the Gradient Boosting method [14].

CONCLUSION

Based on the results of trials of supervised learning techniques with a comparison of 5 methods namely K-NN, Logistic Regression, Random Forest, Decision Tree, Gradient Boosting we can see the results of the accuracy of the 5 methods, that the most accurate method for prediction of diabetes with supervised learning techniques is Pima -Indian is the Gradient Boosting method and for the worst accuracy the accuracy is the K-NN method, and for the prediction results of the decision tree method, logistic regression, and random forest results, it is almost the same. Henceforth, we should use more data to train the model because it is in the machine learning the more data used in training the model, the better the model will be. You can see the detailed output a curation method of the results of the experiment like the diagram below.

ACKNOWLEDGEMENT

This research presents his sincere appreciation goes to works have provided motivation, advice, and support. On this occasion, we would like to thank everyone, especially the 17 August 1945 Surabaya University, Faculty of Informatics, supervisors who have helped him patiently complete this undergraduate thesis by giving advice, guidance, and correction until the completion of this thesis. this undergraduate thesis is far from perfect, but

is expected to be useful in the future, not only for researchers but also for readers and junior at the 17 August 1945 Surabaya University.

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Sentiment Analysis on Ratu Boko Temple Tourist Perceptions Based on Review Content on Tripadvisor Website

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ABSTRACT

The presence of the internet in human life makes it easy for people to access the information needed. Traveling as a second priority for Indonesians is also influenced by social media. One application to help tourists on vacation is TripAdvisor. TripAdvisor is the largest travel site in the world that helps tourists to plan and book their trips. Yogyakarta as an region that rich in natural beauty and historical tourism has made it become the biggest tourist destination in Indonesia after Bali. One of the historical attractions in Yogyakarta is Ratu Boko. Considering the importance of the information contained in the opinion to explore information from it, this study wants to know the tourists opinion about Ratu Boko Temple that can be used as information related to the lack of interest of tourists visiting. To get results that can be seen clearly, sentiment analysis of the tourist opinions in this study is used the SVM method. The data of tourist opinion of Ratu Boko Temple were obtained using web scrapping technique. The data used in this study is the review data of the Ratu Boko Temple on the TripAdvisor website from January^{1st}, 2018 to November 16th, 2019. Based on the results of the analysis it is known that tourists sentiments are positive. The component that is commented relates to the beauty of the sunset at Ratu Boko temple while negative comments include expensive entrance fees and temple cleanliness.

Keywords: Ratu Boko Temple; Review; Sentiment Analysis; SVM; TripAdvisor.

INTRODUCTION

The development of information technology, especially the internet, has changed the way humans communicate. In facing the ASEAN free market where the dynamics of the development of the world of tourism will be faced with increasingly fierce competition both in marketing and product development and diversification, promotion through online media or social media is believed to be the most effective way to introduce a country's cultural and tourism wealth to the world. Traveling as a second priority for Indonesians is apparently also influenced by social media. The famous site to help tourists on vacation is TripAdvisor.

TripsAdvisor is the largest travel site in the world that helps tourists plan and book trips. Yogyakarta as an area with rich natural beauty and historical tourism has made Jogja the biggest tourist destination in Indonesia after Bali. One of the historical attractions in Yogyakarta is Ratu Boko.

Considering the importance of the information contained in the opinion to explore information from the opinion, the researcher wants to know the opinions of tourists about Ratu Boko Temple that can be used as information related to the lack of interest of tourists visiting. To get results that can be seen clearly, sentiment analysis the SVM method. This research aims to provide a general description of tourists who provide comments on the Ratu Boko temple, the

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components that are commented on, and overall sentiment. This research is expected to be a tool in the improvement and development of Ratu Boko Temple tourism based on the classification of opinions both good and bad opinions. The results of this study can also be used as an evaluation to improve the quality of tourist services in Ratu Boko Temple.

Research (Saraswati, 2011) entitled "Text Mining with the Naive Bayes Classifier Method and Support Vector Machines for Sentiment Analysis" classifies opinion on positive and negative classes on English and Indonesian data using the Naive Bayes Classifier and Support Vector Machine methods. The results of the classification data experiment show that the SVM method provides better performance than the NBC method in sentiment analysis. Research using the Support Vector Machine method for sentiment classification was conducted by (Abtohi, 2017) on hotel review data at TripAdvisor site. The results of the classification of reviews using the SVM method show an accuracy rate of 95.27% for English language reviews and 95.00% for Indonesian language reviews. In this study sentiment analysis will be carried out using the Support Vector Machine method on the Ratu Boko Temple review data on the Tripadvisor site.

MATERIALS AND METHODS

The population in this study is the TripAdvisor website database, which contain all of the customer satisfaction review data on the services and facilities of Ratu Boko Temple. Whereas the sample used was a review of customer satisfaction about the services and facilities of Ratu Boko Temple on the Tripadvisor website, which was from January 1, 2018 until the third week of March 2019 which the researchers took online. Retrieval of website data online is called webscraping or scrapping data.

1. Web scraping is the process of retrieving a semistructured document from the internet, generally in the form of a web page in a markup language such as HTML or XHTML, and analyzing the document to retrieve certain data from that page for other purposes. (Turland, 2010). Josi, et al.

(2014) in his research explained that web scraping steps are create scraping template, explore site navigation, automate navigation, and extracted data in database tables or tables.

2. Text mining is the process of finding information or new trends that were not previously revealed by processing and analyzing large amounts of data. In analyzing some or all of the unstructured text, text mining tries to associate one part of the text with another based on certain rules. The expected result is new information or "insight" that was not revealed clearly before. (Adiwijaya, 2006). The stages are carried out in general in text mining there are four main processes, there are spelling normalization, case folding, tokenizing, and filtering
3. Sentiment analysis or commonly called opinion mining is one branch of Text Mining research. Opinion mining is computational research on opinions, sentiments and emotions expressed textually. If given a set of text documents that contain opinions about an object, opinion mining aims to extract the attributes and components of the object that has been commented on in each document and to determine whether the comment is positive or negative (Shelby, 2013).
4. The Support Vector Machine (SVM) was developed by Boser, Guyon, Vapnik, and was first presented in 1992 at the Annual Workshop on Computational Learning Theory. One of the tasks and expertise and strengths of Support Vector Machine is to make predictions. Being able to classify and regress in a case is an ability possessed by SVM. In its application, SVM has a basic principle of linear classifier, the explanation of which is a linearly separable case, but currently SVM has also been developed so that it can also work on nonlinear problems by adding

kernel concepts to high-dimensional workspaces. Linear SVM is data separation according to linear. The best separator can not only separate data, but also margins. Furthermore, SVM can separate data that is not only linearly, so SVM will be modified (Taylor, 2000).

RESULTS AND DISCUSSION

1. Description Analysis

Ratu Boko Temple has a various tourism from the other country, the descriptive analysys below is about the general information.

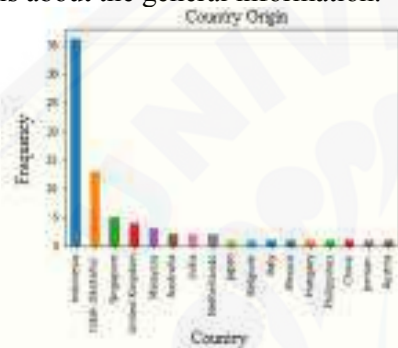


Figure 1. Country of Origin Analisis



Figure 2. Rating Analisis

From Figure 1, there are 76 reviews, 36 of them are from Indonesia and 13 of them have unknown origin. Then proceed with Singapore with 4 reviews, UK with 3 reviews, and Malaysia with 2 reviews. While other countries each have 1 review.

From Figure 2, as many as 76 visitors with existing reviews, 44.7% of visitors gave a 5-star rating. Then 34.2% gave 4 stars, 6.6% gave 3 stars, 3.9% gave 2 stars, and the proportion of 1-star giving is known to be 10.5% of all reviews.

2. Text Preprocessing

The Ratu Boko Temple review data available on the Tripadvisor.com website is

unstructured text data, text data will be processed using text mining methods to obtain information that can be useful for various parties. This process is a stage carried out to transform data from unstructured data into structured data so that it is easy to analyze further. Steps being taken include tokenization, case folding, spelling normalization, and filtering.

2.1 Spelling Normalization

Spelling Normalization is the initial stage in the text process that is done to correct misspelled words or abbreviated words.

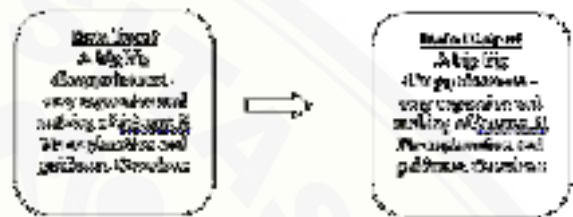


Figure 3. Spelling Normalization

2.2 Case Folding

The process of changing letters into one form in a text document, for example changing from a capital form to lowercase or vice versa. So this process is a uniform form of data that will be processed in one form. The Case Folding Process is shown in Figure 4 The process of uniforming data forms in the example is changing the text data into lowercase, the letter "a" in the word a, the letter "n" in the word no will be changed to lowercase to match the shape of the text to be analyzed.

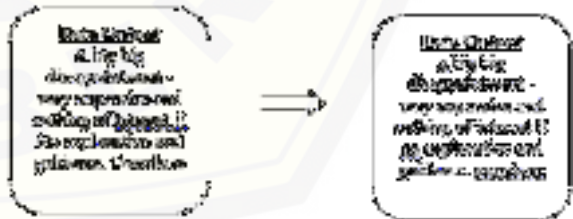


Figure 4. Case Folding

2.3 Tokenizing

Text data that has been uniform or the same is then carried out tokenizing process, is the process of separating text into pieces of words called tokens. The purpose of this process is to get the words that will become entities that have

value in the matrix of the text document to be analyzed.

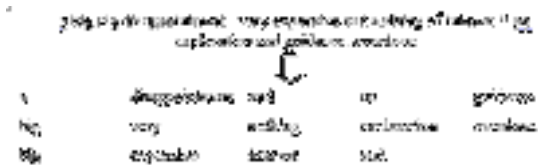


Figure 5. Tokenizing

From Figure 5. All text data will be separated into word for word which acts as a token which will become a valuable entity in the next process.

2.4 Filtering

The number of application reviews that have been collected from all tripadvisor.com website users causes many phrases and punctuation that are not uniform and not appropriate so that it will cause the performance of data processing in the next phase not to be optimal, so that inappropriate words will be eliminated in the filtering process. Words and punctuation that are of no value or meaningless will be eliminated such as urls, numbers, punctuation marks, hashtags, conjunctions, pronouns and others. Choosing meaningful words using the StopWord algorithm (eliminating less important words). Researchers use stopwords in English. From Figure 6. the abolished words are A, and, no and very.

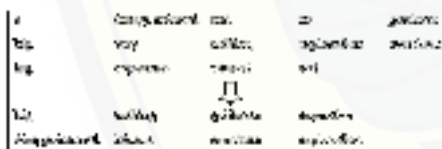


Figure 6. Tokenizing

3. Model Representation

After the data goes through the preprocessing stage, the data needs to be modeled so that the data which is still in the form of data words are processed and calculated. The score will be calculated based on the word dictionary and then labeled sentiment class. Sentiment score calculation is only based on the number of words detected in the lexicon dictionary and has not detected at the phrase or sentence level.

4. Sentiment Score Calculation

Based on user reviews "a big big disappointment very expensive and nothing of interest no explanation and overdone guidance" the sentence in Figure 7 is classified into a negative sentiment score. The sentiment score calculation formula used in this process is the number of positive words subtracted by the number of negative words. From Figure 8. the scoring results from the user review "a big big disappointment very expensive and nothing of interest no explanation and guidance overdone" is -1.

Review	Positive Words	Negative Words
"a big big disappointment very expensive and nothing of interest no explanation and overdone guidance"	big interesting	expensive nothing overdone
Total	2	3
Count	score = 2-3 score = -1	

Figure 7. Scoring

5. Sentiment Class Labeling

At the stage of labeling will be carried out into three classes of sentiments namely positive sentiment, neutral sentiment and negative sentiment shown in Figure 8. Data will enter the positive class if the score obtained > 0, will enter the negative class if the score obtained < 0 and if the score = 0 will enter the neutral class.

Sentiment	Total
Positive	57
Neutral	10
Negative	10

Figure 8. Labeling

Neutral class will be reduced because the researcher will only use two labeling sentiment classes, namely positive sentiment and negative sentiment. Labeling neutral sentiment classes will be done manually by researchers with several considerations, namely:

- a. If the review is not identified positive or negative words will be classified in the positive class
- b. If the number of positive or negative words is the same, it will be classified as a negative class with the consideration that the related parties can see the problems that occur in the application after the application is launched and used by the public.

Sentiment	Total
Positive	67
Negative	10

Figure 9. Sentiment classification

From Figure 9. The results of labeling sentiment class regarding the Ratu Boko temple review are positive reviews higher than negative reviews.

6. Sentiment Classification

After the words are converted into vectors then given a value and weighting for each word and then processed using a prediction algorithm.

6.1 Vector Machine Support Classification

In the classification process using the SVM algorithm the method used is the kernel to obtain the classification with the best accuracy. The kernel method used is the Linear kernel, Polynomial, Radial Base Function (RBF), and Sigmoid. The classification experiment using the Ratu Boko temple review data yields the accuracy of each kernel method as follows:

Kernel	Accuracy
Linear	85.10%
Polynomial	76.22%
Radial	86.50%
Sigmoid	86.15%

Figure 10. Accuracy Comparison

Based on Figure 10. comparison of the results of several kernel methods, shows that the Radial Basis Function (RBS) kernel has the highest level of accuracy among other kernel methods. Thus this classification process will use the RBS kernel with the SVM algorithm. Evaluate the model to determine the results of the classification accuracy formed using the confusion matrix. This study uses cross validation to test machine performance in forming classification, so that a 5-fold cross validation is formed. From the five machine learning, the highest accuracy value from each review application is chosen. The results of each machine learning experiment using the SVM method are as follows:

Machine Learning	Accuracy
1	82.10%
2	85.71%
3	84.13%
4	84.13%
5	84.13%

Figure 11. Machine Learning Comparison

From the 5 machine learning shapes in Figure 11 each review produces the highest accuracy value of 90.10% in machine learning 2.

Prediction	Actual	
	Positive	Negative
Positive	58	9
Negative	2	8
Accuracy	85.71%	

Figure 12. Confusion Matrix

In Figure 12. Confusion matrix that was formed using the support vector machine method on the Ratu Boko temple review on the TripAdvisor website obtained prediction results that in the negative class, from 10 negative reviews there were 8 reviews that were correctly classified while the remaining 2 reviews were classified as positive. Predictions in the positive class of Ratu Boko temple review on the TripAdvisor website were 58 classified classifications correctly entered in the positive class while the remaining 9 reviews were in the negative class of a total of 67 positive reviews. The accuracy value in the Ratu Boko Temple visitor review classification was 85.71%.

7. Visualization and Interpretation



Figure 13. Positive Wordcloud Sentiment

Wordcloud visualization results in Figure 13. Ratu Boko temple review on the TripAdvisor website on the positive class can be clearly seen words that are often used by users to provide reviews. The greater the word size illustrates the higher frequency the word is used by users as a

topic of positive ratings on the Ratu Boko temple review on the TripAdvisor website. Wordcloud in the picture above shows that the most positive words are "sunset". This relates to the beauty of the sunset or sunset in the temple of Ratu Boko. Whereas the words in red are the words with the most frequency after after the word "sunset" that is "beautiful", "good", "view". This is related to the beauty of the scenery in the temple of Ratu Boko.

Meanwhile, negative reviews which only amounted to 10 out of a total of 77 reviews that were in the time span of sampling each word has the same frequency of 1. So that it cannot be visualized in the form of WordCloud. The following is a list of negative words from visitor reviews shown in Figure 4.15.

expensive
dusty
unclear
disappointed
messy
far away
less clean
ambiguity
road directions
concern

Figure 14. List of Negative Sentiments

Associated with negative comments given by customers, the complaints include expensive entrance fees, less clean, far away, feeling disappointed, and the existence of ambiguity that can be in the form of road directions. This can be a concern for the management of Ratu Boko temple as a solution to problems including maintenance of the temple, cleanliness of the temple tourism area, providing accommodation for tourists such as temple trains or bicycles, as well as directions or other directions regarding the temple tourism area as supporting information for tourists.

CONCLUSION

Based on the analysis and discussion of the Ratu Boko temple review data on the TripAdvisor website, the conclusion is Components commented by tourists include, a positive component related to the beauty of the sunset or sunset at the Ratu Boko temple, there are also the words "beautiful", "good", "view" relating to the beauty of the scenery in the Ratu Boko temple. As for the negative component that

is commented on "dissapointment," mess "," dusty "," expensive "," unclare ".

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Analyze Clustering Province Based on Indicator of Social Welfare Using Self Organizing Maps (SOM) Clustering Algorithm

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ABSTRACT

The population of Indonesia from year to year has increased. However, the increase in Indonesia's population must also be accompanied by increased economic growth. The increase in economic growth is characterized by a reduction in the amount of poverty in Indonesia, jobs creation, and an increase in social welfare indicators. Improving social welfare can't be separated from the accuracy of government targets for determining policies and programs to get an overview of the problems of social welfare in Indonesian. This research to analyze the clustering province was conducted based on social welfare indicators using the Self Organizing Maps (SOM) clustering algorithm. The data used are indicators of social welfare in 2017 obtained from the Badan Pusat Statistik include population density (KP), percentage of poor population (PPM), growth rate (LP), infant mortality rate (IMR), life expectancy (AHP), school participation rate (APS), labor force participation rate (TPAK), the open unemployment rate (TPT), and the average capital expenditure (RPP). There are four stages, which are collecting 34 provinces based on welfare indicators in Indonesia, normalizing data, clustering using Self Organizing Maps (SOM) algorithm, and analyzing clustering results. The results are three clusters: low cluster level (C1), medium cluster level (C2), and high cluster level (C3). The results of the cluster C1 were 9 provinces, Kep. Riau, Kep. Bangka, Kalimantan Tengah, Kalimantan Selatan, Riau, Banten, Sulawesi Barat, Papua Barat, and Maluku Utara, clusters C2 is DKI Jakarta, and clusters C3 are 24 provinces. Based on the results of the clustering can be input for the government to improve the welfare of the people in Indonesia.

Keywords: Data Mining; Social Welfare; SOM; Clustering.

INTRODUCTION

The increase in the population of Indonesia occurs from year to year. The increase in the population of Indonesia is followed by increased economic growth. Increased economic growth is characterized by reduced poverty, job creation and increased indicators of people's welfare. Increasing the welfare of the community can not be separated from the accuracy of government targets in determining policy and program. To get a picture of the problem of community welfare in the Indonesian province, this study conducted a provincial clustering analysis using the Self Organizing Maps (SOM) clustering algorithm. SOM method is one of the methods in the Neural Network method which is suitable for

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visualizing high-dimensional data into two-dimensional space [1].

There are also several similar studies related to cluster analysis with Self-Organizing Maps and Welfare including research conducted by [2], using the SOM analysis approach aimed at identifying the similarities of several countries and grouping them into clusters based on the components of the Human Development Index (HDI). The similar research was done by [3], in their research the SOM method was used to analyze MDG's data from 3 world regions including Africa, Asia, and Latin America which were divided into 3 periods from 2000-2008 by using 20 variables where the missing value data is calculated using interpolation. Whereas in this study, the measurement of welfare used as the People's Welfare Indicator (Inkestra) in 2017 obtained from the Central Statistics Agency [4]. The community welfare indicators include population density (KP), percentage of poor

population (PPM), growth rate (LP), infant mortality rate (IMR), life expectancy (AHP), school participation rate (APS), labor force participation rate (TPAK), the open unemployment rate (TPT), and the average per capita expenditure (RPP) with 34 provinces in Indonesia.

METHOD

1. Data Mining

Data mining is one way of finding the information contained in data. Data mining is generally used in large-scale data, so data mining can be used in various fields such as industry, bioinformatics, finance, and so on. There are two main objectives in data mining always related to prediction and description [5]. One method that can be used in data mining is clustering, which is grouping variables that have similarities. So, the data can be described using the clustering method.

2. Normalization

The data used in the study have values that vary from values that are too small to values that are too large. To avoid data dimensions that are too large or too small, the data normalization process is carried out. Data normalization is done by using min-max normalization [6]:

$$\text{normalized}(x) = \frac{\text{minRange} + (x - \text{minValue})(\text{maxValue} - \text{minRange})}{\text{maxValue} - \text{minValue}} \quad (1)$$

3. Clustering

Clustering is a collection of data with similar data collected into one cluster and dissimilar data collected to other clusters. The clustering process can be divided into 5 stages: pattern representation, measuring defined differences, clustering, data abstraction, output assessment [7]. The clustering method is divided into two methods, namely hierarchical clustering, and partitioning clustering. However, the most widely used method is the partitioning clustering method, which is a method that aims to group data by optimizing certain objective functions that can improve the quality of partitioning a clustering. There are various partition methods, namely the K-Means method, Self Organizing Maps (SOM), Partitioning Around Medoid (PAM), and others. In this study, the partitioning

method used is Self Organizing Maps (SOM).

4. Self Organizing Maps (SOM)

The Self Organizing Maps (SOM) algorithm was first introduced by Teuvo Kohonen in 1982. The SOM algorithm is a partitioning method. SOM is a method that uses the method of unsupervised learning so that it is efficiently used on large data. Following are the steps in the SOM algorithm [8]:

Step 0 : initialization of weighting w_{ij} with a random value. Set the learning rate parameter (α), reduction learning rate (β) and Max Epoch.

Step 1 : If the conditions have not been fulfilled, do the following steps:

- a. For each j ($j = 1, \dots, n$), calculate:

$$d_j = \sum_{i=0}^{n-1} (x_i - w_{ij})^2$$
- b. Search index j that make d_j minimum
- c. Change w_{ij} value with the certain value, namely:

$$w_{ij} = w_{ij}(\text{old}) + \alpha(x_i - w_{ij}(\text{old}))$$
- d. Update the learning rate $\alpha = \alpha \cdot \beta$
- e. Test the stop condition.

Note:

x = input

j = indeks node input

d_j = Euclidean's distance

α = learning rate ; $0 < \alpha < 1$

w = weight

β = reduction learning rate

The steps of the SOM algorithm in the points a through e can be illustrated in the following flow chart:

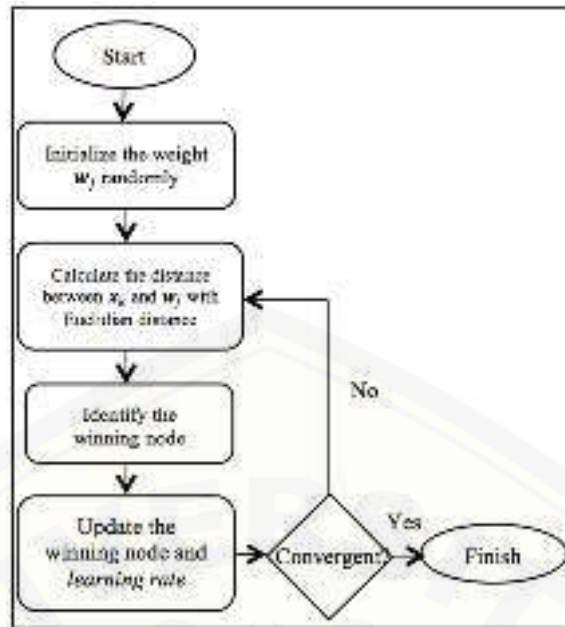


Figure 1. SOM Algorithm Flow Chart

5. Methods

The approach in this research is a quantitative descriptive literature study. In the literature study is conducted by collecting library materials that support this research, while the descriptive approach is done by processing data, analyzing, and representing data according to research needs.

6. Research Variable

The data in this research are data on the people's welfare in 2017 obtained from the Central Statistics Agency. The data on people's welfare is taken from 34 provinces in Indonesia with eight influencing indicators namely [4].

- a. The population density variable (KP)
- b. The percentage of poor population variable (PPM)
- c. The growth rate variable (LP)
- d. The life expectancy variable (AHH)
- e. The school participation rate variable (APS)
- f. The labor force participation rate variable (TPAK)
- g. The open unemployment rate variable (TPT)
- h. The average per capita expenditure variable (RPP)

welfare are processed using the R program where the data is a weight that will be inputted into the SOM algorithm. The statistical test results can be seen in Table 1 and for the data distribution's graph can be seen in Figure 2 that the data obtained still have values that are too high and too low.

RESULTS AND DISCUSSION

7. Complete Bouguer Anomaly

The data obtained in the form of 34 provincial data with eight indicators of people's

Table 1. The Statistical Data Test Results

Measurement	KP	PPM	LP	AHH	APS	TPAK	TPT	RPP
Min	9	3.780	0.640	64.38	63.35	60.18	1.485	681,481
Q_1	53	6.518	1.292	67.65	68.62	63.18	3.784	905,349
Median	100.5	9.380	1.675	69.59	72.99	67.49	4.484	980,067
Mean	727.2	10.951	1.760	69.43	73.88	66.94	5.102	1,063,852
Q_3	250.2	13.9400	2.138	70.95	78.49	68.86	6.426	1,138,869
Max	15624	27.760	3.900	74.76	87.61	76.94	9.287	1,997,446

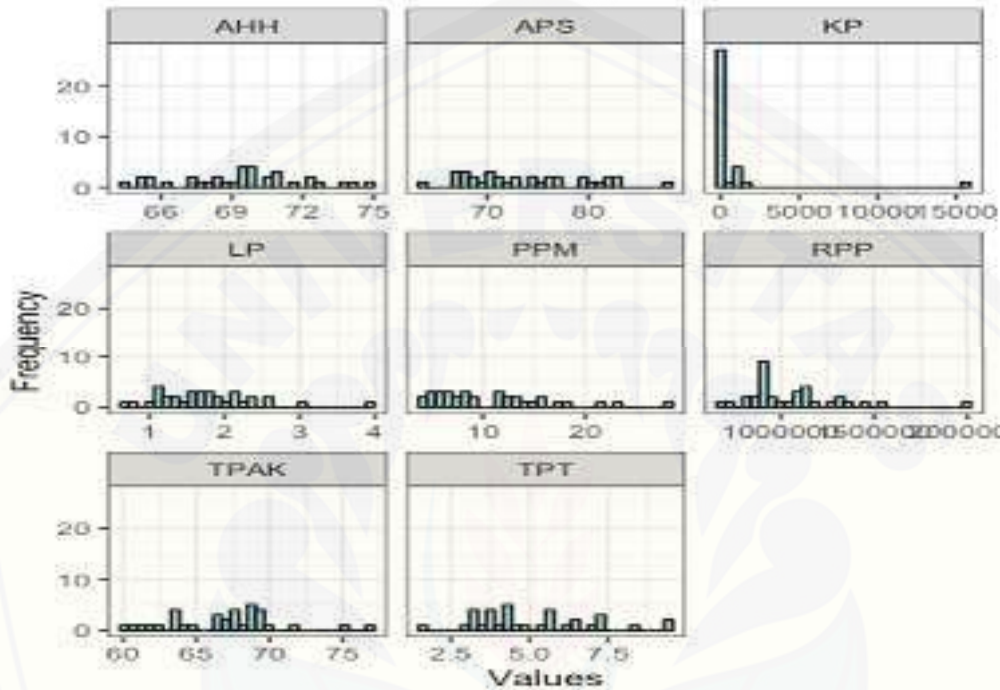


Figure 2. The distribution data of People's Welfare Indicators from 34 provinces in Indonesia

Due to the data, there are still values that are too high and too low, so do the data normalization process first. Data normalization is done by using min-max normalization. After data normalization, the data is normal so that the clustering process can be carried out. The learning rate used in the SOM clustering algorithm in this research is $\alpha = 0.05$ with $\beta = 0.01$. Weights included in the SOM algorithm are 34 provinces that have been normalized. The following is data that has been normalized data using min-max normalization:

	KP	PPM	LP	AHH	APS	TPAK	TPT	RPP
1	5.187320e-05	0.50625521	0.41104294	0.50168512	0.7749382	0.21231501	0.6511435	0.16832629
2	1.191107e-02	0.27935700	0.28245399	0.36601531	0.5577017	0.51921049	0.52079316	0.17351109
3	7.558819e-05	0.12385321	0.19330088	0.42082118	0.6842045	0.38431405	0.5254559	0.28292534
4	4.354787e-05	0.15147615	0.59280454	0.59980619	0.5428989	0.22700204	0.6679437	0.34994125
5	3.905000e-05	0.17180984	0.39269125	0.51001444	0.3375927	0.43763135	0.30625215	0.21865449
6	5.187320e-05	0.35865721	0.24339177	0.46750120	0.2349547	0.55966530	0.3726816	0.18493163
7	5.635067e-05	0.49249374	0.31390202	0.40942947	0.6179802	0.51432469	0.2894318	0.23513217
8	1.472943e-02	0.38615513	0.16564417	0.53923929	0.2753704	0.45652130	0.5644886	0.12751612
9	4.935197e-05	0.83318616	0.47750264	0.54820271	0.1500412	0.39014111	0.2917395	0.51635905
10	1.560804e-02	0.80790633	0.72099187	0.49350824	0.6017412	0.37154368	0.7272018	0.67129806
11	1.000000e-08	0.00000000	0.12576287	0.75152624	0.5159459	0.10666678	0.7215767	1.00000000
12	8.639125e-02	0.16882074	0.26939165	0.78237843	0.1347898	0.18818768	0.8625786	0.32896623
13	6.628212e-02	0.35237698	0.84296479	0.93598387	0.2114392	0.53251856	0.3968315	0.11879712
14	7.633636e-02	0.35773617	0.16257609	1.00000000	1.0000000	0.67658047	0.1972576	0.34853202
15	5.200517e-02	0.38947452	0.00000000	0.61482986	0.3123561	0.51280904	0.3279706	0.19551528
16	8.190047e-02	0.87547957	0.47852761	0.49547610	0.1821929	0.17787901	0.9994444	0.43551484
17	4.870027e-02	0.81880283	0.17570315	0.88238345	0.7788887	0.88844628	0.98888888	0.98491914
18	1.852237e-02	0.48897698	0.21474233	0.18784786	0.5485787	0.40931008	0.2346670	0.10885777
19	6.404025e-03	0.71394495	0.31081840	0.16417910	0.4657873	0.55135177	0.2294289	0.00800000
20	1.536944e-03	0.17814178	0.29754681	0.59683197	0.1723001	0.58916624	0.3688347	0.18818908
21	5.123279e-04	0.06171810	0.51226994	0.58264805	0.1347898	0.45877814	0.3514369	0.34461101
22	6.211976e-03	0.01836530	0.34662577	0.34505090	0.2040396	0.56950788	0.4211843	0.36195726
23	1.216779e-05	0.89991526	0.51720994	0.98176142	0.7407755	0.21296816	0.6947869	0.57938147
24	0.000000e-08	0.15201051	1.00000000	0.77407901	0.4851006	0.48892910	0.5104518	0.47287212
25	1.052221e-02	0.17180984	0.14417178	0.84471938	0.3094229	0.65981147	0.7298188	0.42315107
26	2.497508e-05	0.43536630	0.30081595	0.28928941	0.4748357	0.41361088	0.2974831	0.17999380
27	1.133525e-02	0.23769008	0.13496393	0.53298826	0.2968458	0.04793991	0.5281135	0.18715789
28	3.776418e-03	0.34153461	0.46012270	0.59171883	0.3953009	0.58839443	0.2327768	0.13085220
29	6.83694e-03	0.55713094	0.29754681	0.27296989	0.2663438	0.27445344	0.3583890	0.16482163
30	4.482609e-05	0.30873049	0.59578552	0.20820820	0.1979101	0.40416641	0.2713452	0.65176382
31	1.793148e-05	0.02988757	0.54969125	0.10755176	0.6483924	0.88800000	1.00000000	0.16918284
32	1.267180e-05	0.11092577	0.49785321	0.38524795	0.5259207	0.28647305	0.4026498	0.10641102
33	0.000000e-08	0.80850542	0.50815251	0.00070053	0.7118470	0.45492742	0.6419115	0.33668620
34	6.404025e-05	1.00000000	0.39570552	0.08184852	0.0000000	1.00000000	0.2733447	0.38272683

Figure 3. Data Normalization

The next step is cluster data using the SOM algorithm with the R program. Iteration is carried out as many as 150 iterations so that the results obtained are convergent. Thus, the results obtained with three clusters namely low cluster level (C1), medium cluster level (C2), and high cluster level (C3) which can be seen in Figure 4



Figure 4. Plot of the codebook vectors of the 5 by 5 mapping of the Social Welfare data

Table 2. Clustering Results of Social Welfare Data

No	Cluster to-	Cluster Members
1	1	Kep. Riau, Kep. Bangka, Kalimantan Tengah, Kalimantan Selatan, Riau, Banten, Sulawesi Barat, Papua Barat, Maluku Utara
2	2	DKI Jakarta
3	3	Aceh, Suamtera Utara, Sumatera Barat, Riau, Jambi, Sumatera Selatan, Bengkulu, Lampung, Kep. Bangka Belitung, Jawa Barat, Jawa Tengah, DI Yogyakarta, Jawa Timur, Bali, Nusa tenggara Barat, Nusa Tenggara Timur, Kalimantan Barat, Kalimantan Timur, Kalimantan Utara, Sulawesi Utara, Sulawesi Tengah, Sulawesi Tenggara, Gorontalo, Maluku, Papua

Table 2 shows the results of clustering 34 provinces in Indonesia based on indicators of people's welfare. Clustering results show that there are three clusters to-1 consisting of 9 provinces where the 1st cluster shows a low cluster level (C1). The second cluster consists of one province where the second cluster shows a medium cluster level (C2). Meanwhile, the 3rd cluster consists of 24 provinces where the 3rd cluster shows a high cluster level (C3). The low cluster level (C1) is influenced by a high growth rate (LP), high open unemployment (TPT), and a high percentage of poor population (PPM), while the medium cluster level (C2) is influenced by the value of population density that is high (KP), high average per capita expenditure (RPP), and high life expectancy (AHH), then the high cluster level (C3) is influenced by high school participation rates (APS) and the level of work participation high (TPAK).

CONCLUSION

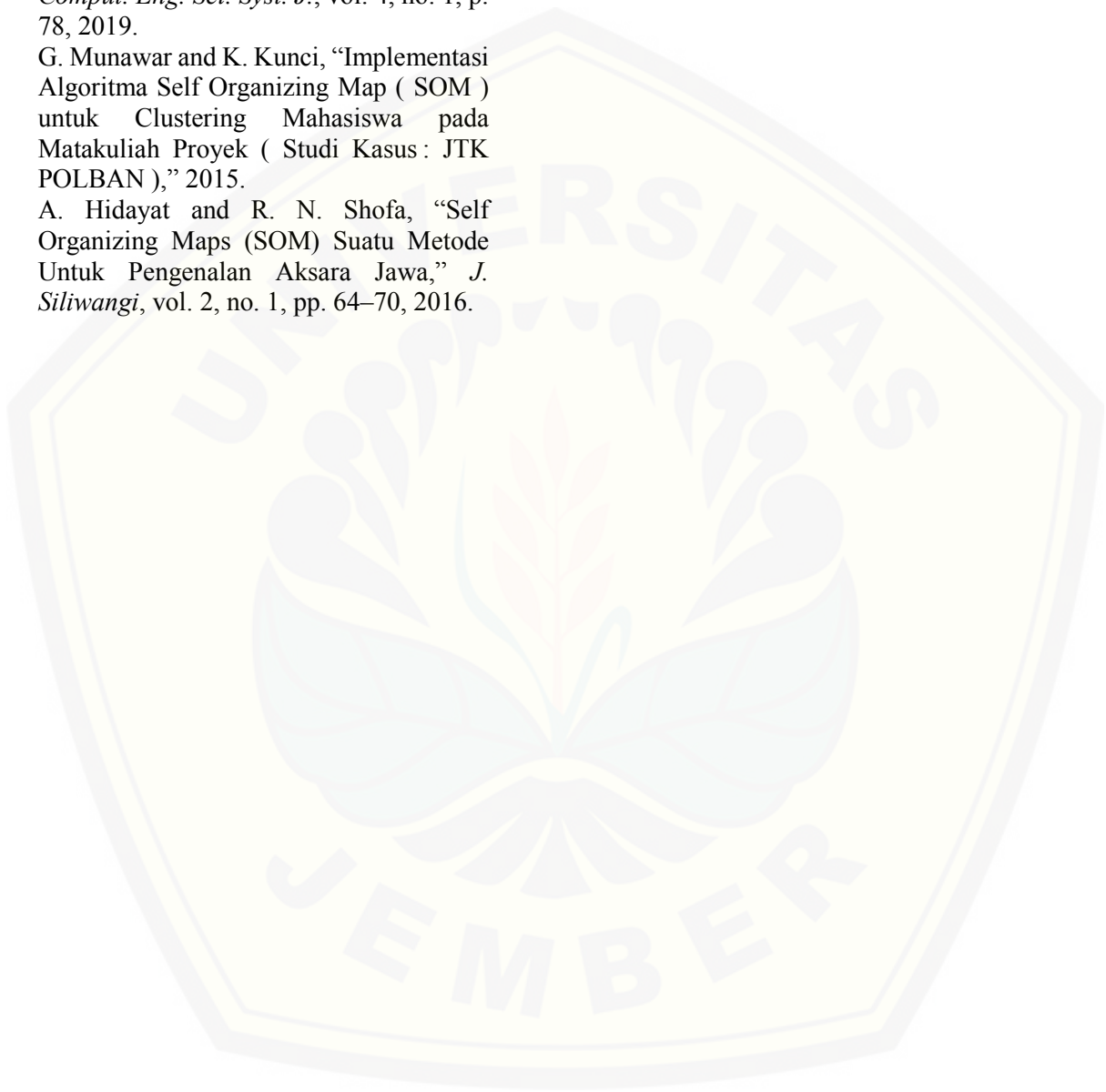
This research aims to analyze private clustering based on indicators of people's welfare using the Self Organizing Maps (SOM) Algorithm. The variable used is an indicator of public welfare consisting of 8 variables. The results of this study are that there are three clusters namely low cluster level (C1) consisting of 9 provinces namely Kep. Riau, Kep. Bangka, Central Kalimantan, South Kalimantan, Riau, Banten, West Sulawesi, West Papua, and North Maluku, for medium cluster level (C2) is DKI Jakarta province, and high cluster level (C3) consists of 24 provinces namely Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, Lampung, Kep. Bangka Belitung, West Java, Central Java, DI Yogyakarta, East Java, Bali, West Nusa Tenggara, East Nusa Tenggara, West

Kalimantan, East Kalimantan, North Kalimantan, North Sulawesi, Central Sulawesi, Southeast Sulawesi, Gorontalo, Maluku, and Papua. Based on the results of this study can be input for the government in improving the welfare of the people in all provinces in Indonesia.

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Development of Digital Document Centralization System by Utilizing Cloud Technology

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ABSTRACT

The high availability of physical documents in a company forced to increase the storage media in the form of hardcopy. Along with the development of technology that offers various kinds of convenience to users, it provides the possibility to create a multiuser accessible system with unlimited storage limits that can store various kinds of documents in digital form so as to facilitate user access and improve document security. The development of cloud technology is one solution that can be utilized to accommodate this research. Unlimited access with rules of access rights combined with unlimited unlimited storage makes this research feasible to develop. This research raises a case study in a private tertiary institution that has many units with a variety of physical documents available, on the other hand it requires coordination both internally and with other cross-units. This research aims to produce a system that is able to accommodate these needs without involving many resources.

Keywords: Digital Document, Centralization, Cloud Technology, Physical Document, Unlimited Storage.

INTRODUCTION

The development of the digital world is increasingly creating new spaces for researchers to deepen knowledge and create new things. This is comparable to the challenges that are born to be conquered with the latest innovations. The digital world is closely related to data attachment. Data is a very vital requirement now. Many companies who are aware of the importance of data are willing to spend fantastic funds to produce a collection of data. Of course this requires a large space to be utilized as much as possible.

The concept of cloud computing that has been raised since 2005 has triggered the enthusiasm of business people to improve the performance of their companies by relying on more practical and economical IT solutions. With Software as a Service content, Platform as a Service, and Infrastructure as a Service offered, Cloud Computing service providers try to target the academic market that has a large enough data usage frequency[7].

Cloud Computing in the future will become a trend in the IT field that provides bright prospects for industry players. But to get optimal performance, the right strategy is needed for academics in Indonesia to adopt Cloud Computing technology effectively and efficiently in order to transform the world of education in a better direction. Academics always uphold data attachment, because that is the key to discipline. So it is appropriate to

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implement a system that is integrated with cloud computing to gain several benefits over a long period of time. This is the background of the author in starting this research. Cloud computing is a powerful technology with growth performance that is able to penetrate into more complex discussions such as the study of big data [1].

In several studies related to document management, it offers a variety of solutions that can be used to maintain the consistency of information stored in the document, one of which is a study conducted by Chawan entitled "Document Management System" concludes that the need for document digitalization is currently very high. given the increasing number of documents that must be processed is not proportional to the number of workers who have to manage it. [3]. Application of cloud computing is very beneficial to the public sector, this is due to the availability of abundant resources, in a journal entitled "Cloud Computing in the Public Sector: Public Manager's Guide to Evaluating and Adopting Cloud Computing" explains there is a phenomenon of shifting patterns of thought and patterns work in the public sector. Some countries have changed their regulations towards cloud computings [4].

Based on some of the above discussion it can be concluded that the need for digitizing documents is really needed as the growth of the resulting document is welcomed with the availability of easy cloud access, combining cloud technology with an application that puts forward access restrictions and data centralization into a new solution that can be offered to the need for digitizing and centralizing documents.

MATERIALS AND METHODS

1. Cloud Computing

Cloud computing (cloud computing) is a technology that makes the internet as a center for data management and applications, where computer users are given access rights (login). The application of cloud computing is currently carried out by a number of leading IT companies in the world. Call it among them is Google (google drive) and IBM (blue cord initiative)[5].

Clouds is a distributed technology platform that utilizes advanced technological

innovations to provide a highly scalable and resilient environment that can be used remotely by many organizations in many powerful ways. To successfully build, integrate with, or even create a cloud environment requires an understanding of shared mechanics, architectural layers and models, as well as an understanding of business and economic factors resulting from adoption and real-world use [2].

2. Digital Document

Digital document is a concept of collecting, storing and managing information in printed form or electronic drawing that can be used as evidence or information. The use of digital documents which are considered more efficient in sending documents related to the delivery time, data completeness and ease of access, makes digital documents an alternative used in the administration process of educators or lecturers owned by the government, such as in the lecturer database and several other applications. The use of digital documents in several government-owned applications is a motivation to build an application that is used to organize digital documents of Tri Darma Higher Education activities of each teaching staff both in the process of storing and retrieving easily and safely[6].



Figure 1. How to get digital document

The picture above explains how to obtain documents digitally by utilizing the Adobe Scan application and Adobe Document Cloud which can be accessed free of charge via <https://acrobat.adobe.com/us/en/>.

3. Method

Broadly speaking the method used in this study uses the waterfall method including the following steps: Analysis, Design, Code, Testing, Implementation, and Maintenance.

1. Analysis is a step in analyzing researchers can conduct research in primary and secondary ways, primary here researchers conduct interviews and observations to the objects to be studied and obtain results in the form of research material that researchers use is in the form of book information, member information, and book borrowing information . Secondary data obtained by the literature and taking pictures of objects and the data needed in research
2. Design The design process will explain to a software design. This process will focus on: data structure, software architecture.
3. Coding and testing this stage is the coding stage, if it is finished then testing will be done with the aim of finding errors and then carried out repairs.
4. The application of this stage is the final stage in making a system.
5. Maintenance in this stage the software is ready to function to adjust to the environment (system requirements).

RESULTS AND DISCUSSION

1. Screenshoot

- a. Login
This page is used as a security for this system, each user is required to do the login process which consists of a combination of username, password.



Figure 2. Login Page

- b. Home
On this page displays a summary of crucial data in graphical form so that it is easy to understand.



Figure 3. Home Page

- c. Department
This page is used to enter all data department contained in STMIK Nurdin Hamzah.

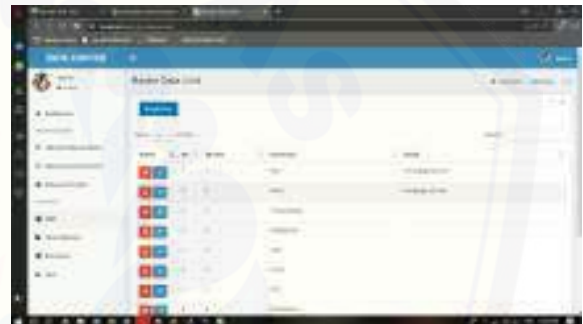


Figure 4. Department

- d. Employee
This page is used to add data to employees who can later access this system.



Figure 5. Employee

- e. Upload New Document
This page shows you how to add a new document that you want to archive. There are two types of documents, namely internal, used for documents that can only be accessed by internal units. The second type of document is public,

which can be used on documents that can be accessed externally.



Figure 6. Upload New Document

All attachments that you want to upload via DCS must first be uploaded to the web cloud (Google Drive or Adobe Cloud) using a gmail account that has been registered with DCS. This is done to maximize the function of cloud computing and ease campus server storage.

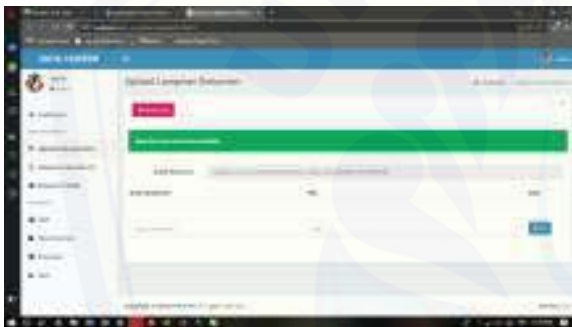


Figure 7. Show attachment

f. Internal Document

This menu displays all documents uploaded by internal units.



Figure 8. Internal Document

g. Public Document

This menu displays all documents uploaded by units that are set with public document types.



Figure 9. Public Dokument

CONCLUSION

This application provides solutions to institutions in making file management more efficient by providing a system that can be accessed privately or publicly. Utilization of free applications and storage makes this system low-cost, of course, so it is expected to be easily implemented and even adapted by other institutions. In the long run, this application is expected to be able to make a positive contribution to improving file management discipline which is expected to simplify the accreditation process.

ACKNOWLEDGEMENT

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Design Simulation of Multi-Cell Hexagonal Crash Box with Holes Under Frontal Load

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ABSTRACT

Crash box is a passive safety device located between the bumper and the frame on the car. The crash box was developed to reduce the absorption energy. Crash box models have been developed with variation of rectangular, square, circular, hexagonal and octagonal cross-section. In this study, hexagonal cross-section using two components namely the inner wall and the outer wall called multi-cell hexagonal crash box is investigated. The addition of holes in the crash box is designed to facilitate reduce the buckling load and more folding. The purpose of this study was to determine the effect of hole position distance on deformation patterns and energy absorption under the frontal loading model. The method used is crash box modelling by utilizing computer simulations with ANSYS 18.1 software based on the finite element method. The hole position distance are varied by 37.5 mm, 75 mm and 112.5 mm. The upper rigid wall moved downwards with a constant velocity of 7.67 m/s for distance of 100 mm. The results showed that the hole position distance produced the difference on absorption energy. The hole position distance on 112.5 mm can absorb much more crash energy than other hole position distances. All models produce the similar deformation patterns. Based on the force-displacement curve, it can be denoted that the initial peak load on 112.5 mm hole position distance produce lower value connected with the first folding is occurred on the hole.

Keywords: Multi-Cell hexagonal crash box; Hole position distance; Deformation patterns; Energy absorption.

INTRODUCTION

Over the past few years, crash box geometry models have been developed. Crash box functions is an energy absorber through a deformation pattern to reduce the risk of the driver [1]. The crash box is a passive safety system on vehicles, especially cars that are located between the bumper and mainframe, crash box generally tubular or thin-walled structures [2]. Based on Kokkula [3], obtained data types of traffic accidents based on the direction of the collision. Front-vehicle accidents (frontal) are around 64%, this is very dominant compared to oblique and roll-over accidents (Figure 1).

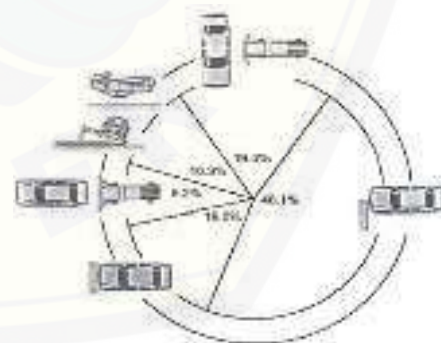


Figure 1. Percentage of collision of vehicles based on the direction of the collision [3]

The form of a crash box cross-section which is widely developed is a rectangular, square, circle, hexagonal and octagonal cross-section [4]. The hexagonal cross-section has the capability of crashworthiness performance and absorbs high

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energy in the oblique loads' test [5,6]. Apart from the single-cell concept, multi-cell crash box has also been considered as alternative solutions to improve energy absorption performance [7]. Multi-cell crashworthiness can be strengthened by the interaction between the inner and outer walls to stabilize the folding development during the collision [8]. Chen and Wierzbicki [9] presented a theoretical solution for calculating the mean crushing force of single-cell, double-cell and triple-cell columns, that energy absorption, double-cell, and triple-cell columns are higher than single-cell columns.

Crash initiator need to optimize energy absorption in a crash box, a crash initiator is a variation in the shape of the crash box wall that is expected to increase energy absorption and deformation patterns. Crash initiator form consists of holes, diamonds, beads and rib [10]. The adding holes in different locations on both the inner and outer walls of the bi-tubular profiles crashworthiness performance can increase crush force efficiency and energy absorption [11]. Crash box with square cross-section which is done numerically and experimentally, with the addition of holes the characteristic of absorption of impact energy in progressive buckling can be increased due to plastic deformation starting from the hole, as well as resulting in peak crush force decreasing but not exceeding the limit that can injure the rider during a collision accident frontal direction [12]. In this study hexagonal crash box cross-section geometry with the addition of holes as an initiator crush produces good performance when a collision occurs. The purpose of this study is to determine the effect of hole position distance on deformation patterns and energy absorption under the frontal loading of quasi-static tests.

METHOD

The modeling method is used to engineer the design of the crash box by utilizing computer simulations with ANSYS 18.1 software based on the finite element method. The geometry model used in this study is a multi-cell hexagonal crash box, which consists of 2 components, namely inner hexagonal and outer hexagonal. This research, multi-cell hexagonal crash box with the addition of 2 opposite holes. therefore, variations are only made at the hole position distance as shown in Figure 2.



Figure 2. Distance position holes of multi-cell hexagonal crash box

Multi-cell hexagonal crash box has an outer hexagonal diameter geometry = 39.4 mm and an inner hexagonal diameter = 29.5 mm, an outer hexagonal and an inner hexagonal have the same thickness = 3.2 mm, hole diameter = 7.6 mm, variations hole position distance = 37.5 mm, 75 mm and 112.5 mm. in this research the multi-cell hexagonal crash box material used is aluminium type AA 6061-T4 and the impactor material uses structural steel, which has mechanical properties (Table 1):

Table 1. Material Properties of Crash Box and Impactors

Properties	Unit	Crash Box	Impactor
Material			
Density	(kg/m ³)	2790	5,2436 x 10 ⁵
Modulus Elastisitas	(MPa)	70000	2 x 10 ⁵
Poisson Ratio		0,33	0.3
Yield Strength	(MPa)	145	240
Tangent Modulus	(MPa)	450	1450
Specific Heat	(J kg ⁻¹ C ⁻¹)	896	434

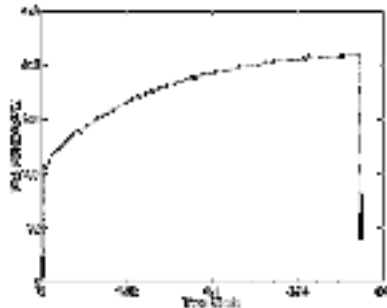


Figure 3. Curve Stress-strain of material aluminium AA 6061 T4 [13]

Material modeling in the multi-cell hexagonal crash box as Bilinear Isotropic Hardening. The impactor uses structural steel material is assumed as rigid body.

Modeling loading using the frontal crash test method. In this modeling, the Impactor position has no distance from the crash box or the impactor will hit the crash box with a velocity of 7.67 m / s which is deformed to a distance of 100 mm. The impactor mass is 103 kg. The element size used in the multi-cell hexagonal crash box in this test is 2.0 mm and the impactor component is set by default from the software.

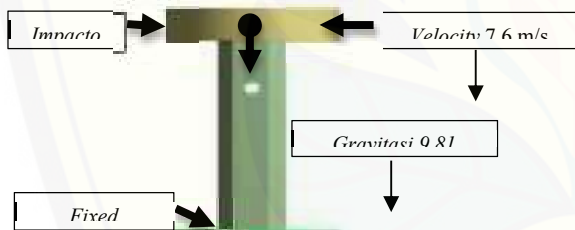


Figure 4. Modeling loading of multi-cell hexagonal crash box with holes loading

RESULTS AND DISCUSSION

Deformation patterns obtained from numerical simulations with three different variations of the hole position distance. Figure 5-7 shows some folding from the beginning of loading to the end of displacement of 100 mm. Deformation patterns that occur in a crash box due to frontal load have three opportunities for deformation patterns that can affect the energy absorption capacity, namely concertina mode (axisymmetric), diamond mode and mixed-mode. Based on the analysis of the multi-cell hexagonal crash box deformation pattern, the simulation results are visually performed. The deformation pattern that occurs in the three

variations in the distance to lay the hole is the mixed-mode (axisymmetric/diamond).

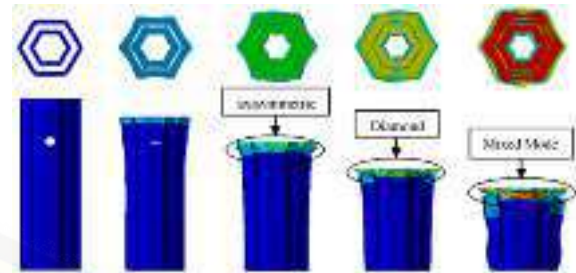


Figure 5. Multi-cell crash box deformation pattern with distance holes 112.5 mm

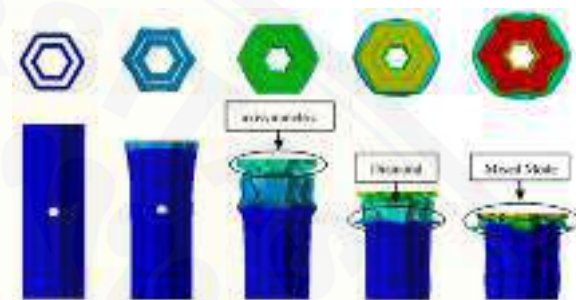


Figure 6. Multi-cell crash box deformation pattern with distance holes 75 mm

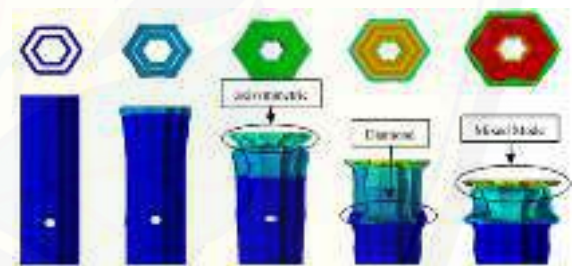


Figure 7. Multi-cell crash box deformation pattern with distance holes 37,5 mm

Figure 5-7, when given a loading process, occurs folds starting from the top of the crash box that is directly related to the impactor. Effect of hole distance used as initial fold (where folding is expected to occur). The addition of holes as initial folds causes the concentration of stress around the hole, thereby facilitating folding. The beginning of the folding multi-cell hexagonal crash box forms a concertina deformation pattern and until the end of the loading occurs a mixed-mode (axisymmetric / diamond) deformation pattern. Crash box with a hole distance of 112.5 mm, it is easier for the initial folding to occur due to the position of the hole adjacent to the

impactor.

The impactor hits the crash box, plastic deformation that occurs due to the collision between the impactor and the crash box occurs because the absorption of impact energy which can be called kinetic energy is influenced by the function of mass and velocity. As a result of the impact, there is an energy conversion from impact energy to strain energy [14]. The amount of strain energy is obtained based on the area under the curve on the graph of the force reaction to displacement as shown in Figure 8.

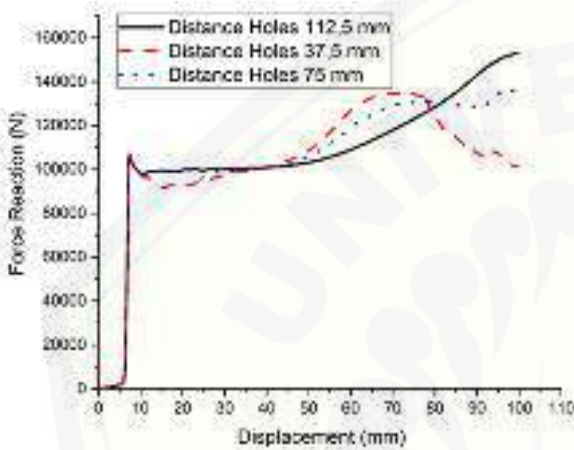


Figure 8. force reaction – displacement curves of three models crash box

The determination of energy absorption in the three models based on the area under the curve force reaction to displacement is shown in Figure 9.

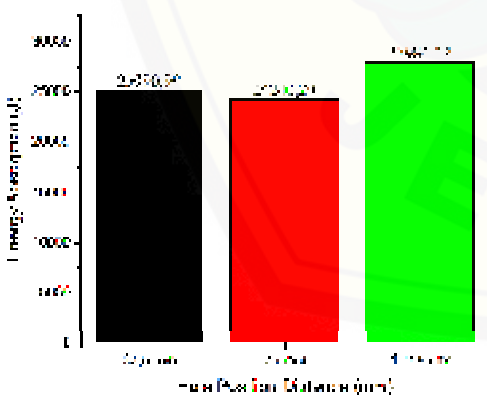


Figure 9. Energy absorption of Multi-Cell Hexagonal Crash Box

Figure 9 shows that, the highest energy absorption occurs in a crash box with a hole distance of 112.5 mm for 27984.32 J, a crash box

with a hole distance of 37.5 mm is 25090.99 J and the lowest energy absorption value is a hole distance of 75 mm of 24240.29 J. Based on the curve force reaction - displacement (Figure 8), it can be stated the initial peak load at 112.5 mm hole position distance results in a lower value connected to the first crease that occurs in the hole. The addition of holes with variations in the distance of the position of the hole is proven to affect energy absorption.

CONCLUSION

Multi-cell hexagonal crash box comparison of in the distance of laying holes under frontal loading with finite element-based software. Shows that the deformation pattern produced from the three models is the mixed-mode (axisymmetric / diamond). The highest energy absorption value at a distance of 112.5 mm was 27984.32 J. Adding holes to the crash box reduces peak load and buckling loads. The distance of laying the hole is proven to affect energy absorption, the closer to the impactor the energy absorption increases due to the first peak load occurring in the hole resulting in a lower value.

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User Acceptance of Knowledge Capture System: a Case Study in Agency for the Assessment and Application of Technology

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ABSTRACT

As one of the research institutions in Indonesia, role of knowledge management system (KMS) including its process such as knowledge capture is pivotal in Agency for the Assessment and Application of Technology (BPPT). However, earlier observation showed that participation of users in KMS was low. This study aims to identify factors that influence users to use knowledge capture system in BPPT and give recommendation to its top management about the findings. To achieve this goal, the research question in this study is what are the factors that influence intention of use of knowledge capture system. The hypothesis in this study is built using the technology acceptance model as its base. This study collected data using survey and analyzed its result using a PLS-SEM based tool that is called SmartPLS. The results of this study showed that 6 hypotheses were rejected and 6 hypotheses were accepted. Attitude toward using and perceived usefulness influences positively the intention of users to use knowledge capture system. Meanwhile, attitude toward using is influenced positively by perceived usefulness and perceived ease of use, and both factors are influenced positively by information quality and service quality consecutively. This result showed different accepted hypotheses compared to similar acceptance model. Finally, this study summarized some recommendations based on the accepted hypotheses.

Keywords: knowledge capture; user acceptance; technology acceptance model.

INTRODUCTION

Knowledge is important asset and has strategic position in any organization. Furthermore, it can give them a competitive advantage, so it is given that knowledge need to be managed. One of the impacts that is resulted by implementing effective knowledge management (KM) is the improvement of quality of products or services that are produced by its organization [1]. Knowledge capture is one of the early process in KM cycle including process to capture tacit knowledge and explicit knowledge.

In some organizations, this part of cycle is not well maintained. It resulted in some problems such as loss of knowledge, stagnant innovation and product development [2][3].

Agency for the Assessment and Application of Technology (BPPT) is one of governing body that has purpose of knowledge acquisition. Its main duty is to study and apply technology through innovation and technological services that will raise industrial competitiveness. Through presidential mandate, BPPT also has obligation to implement Knowledge Management System (KMS) in all government agencies related to the use of public services through internet. To enable KM in

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BPPT, one of department in BPPT developed KMS in 2016. There are four sub systems in the implemented KMS which are community of practice (COP), expert system database, digital library and open journal system.

Unfortunately, after three years of KMS live implementation, an assessment about the use of KMS, especially related to knowledge capture process, showed that the participation of users of BPPT was not high. This is contrary to the expectations of the BPPT top management's. KMS should become a legacy to any technologist either in BPPT or Indonesia. There was a gap between top management expectations and its reality. Finally, this gap indicated that there were some factors that influence BPPT users to reluctantly accept the use of KMS in BPPT.

This study aims to (a) identify factors that influence users to use the knowledge capture in BPPT's KMS, and (b) to give recommendations to BPPT's top management about its result study. To achieve this goal, the following research questions (RQ) have been raised:

RQ: What are the factors that influence intention of use of KM Capture System?

To answer this question, a systematic study about user acceptance must be done. This study consisted four sections which are introduction, material and method, result and discussion, and conclusion.

MATERIALS AND METHODS

1. Knowledge Capture System

KMS in BPPT has a purpose to manage any knowledge residing in BPPT. This system includes some KM tools that support KM processes such as KM capture, KM discovery, KM sharing, and KM application. In specific, KM capture process has two sub processes which are internalization and externalization.

2. Technology Acceptance Model (TAM)

TAM is made by Davis in 1986. This model can be used to identify factors that affect any technology acceptance. It can also describe end-user behavior and user populations based on its result. TAM has two variables that are considered as factors that influence user's intention to use technology that are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Both variables give influence on variable of Attitude Toward Using (A) [4]. PU

and A will influence a variable of Behavioral Intention to Use (BI) which is influence variable of Actual System of Use [4].

3. Related Works

Case studies in different domains used various acceptance models such as DeLone McLean, TAM, PIIT (Personal Innovativeness in Information Technology), and TTF (Task Technology Fit), each study used the acceptance model according to their needs. Some studies adjusted by combining several models such as [5][6]. Others adjusted known models by adding or reducing some variables [6][7]. Those studies have similarities of problem which is getting to know the important factors that affect user acceptance of any information system. Each case proposed a hypothesis how each variable affects other variables and it may lead to different results for each case study. Based on literature study, TAM is one of the most used models in KMS acceptance [8][9][6]. TAM has three versions and each version offers more variables that support the internal factor that influence user's intention of use. Some additional variables from other case studies can be relevant to this study such as PCIL (Personal Characteristics and Information Literacy) [7] or Information Quality [8]. Several indicators can be relevant to this study such us service quality, information quality, and system quality [10].

4. Theoretical Framework

Summarized from theories and related works, this study proposed Knowledge Capture Acceptance Model that will be used and tested to users in BPPT. The model is adapted from TAM and its external variables are adjusted to the needs in BPPT condition. The model can be shown in Figure. 1.

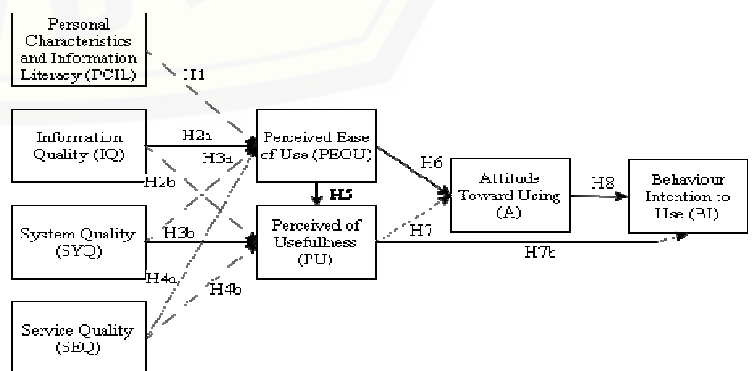


Figure 1. Theoretical Framework / Proposed Model

5. Methodology

There are eight stages used in this study, which is preliminary data collection, research question and objective, literature review, build instrument, selecting sample, data collection, data analysis and conclusion. Activities carried out in the first four stages have been carried out and explained in the previous section, the activities carried out are identification of the root problem and identification the research question and literature review.

5.1 Build Instrument

This study used survey to collect the data. In this step, questions were designed for each indicator of all variables in the model. Questionnaire used 5-point Likert scale[11]. The instrument was tested using validity and reliability test and the purpose was to make sure the content was consistent.

5.2 Selecting Sample and Data Collection

Random sampling was used to represent population. Sample used in this study were researcher in BPPT. Based on [12], this study should have at least 40 samples because it used 4 dependent variables. For data collection purpose this study used questionnaire as an instrument. Questionnaire was planned to be distributed to BPPT users who were in PUSPIPTEK Serpong and Thamrin. There were 300 targeted respondents but in the span of two weeks only 51 respondents answered the questionnaire.

5.3 Data Analysis

This study used Partial Least Structural Equation Modeling (PLS-SEM) as quantitative analysis technique. It was used considering PLS-SEM is suitable for developing new theory and only require small number of samples [13][14]. SmartPLS Version 3.0 was used to analyze collected data.

RESULTS AND DISCUSSION

The first step in data analysis was constructing the model using SmartPLS. Model was built based on theoretical framework.

1. Measurement Model Evaluation (Outer Model)

Measurement model evaluation (*outer model*) was needed before theoretical

framework, that had relational and causal model, can be evaluated [13]. It was performed to test validity and reliability of instrument. Validity test was needed to make sure that each indicator could represent latent variable used in the model [15]. Reliability test was needed to measure consistency of respondent in answering questionnaire (related to each indicator) [13].

1.1 Convergent Validity Test

This test was performed to measure if each indicator had positive correlation with other indicators with the same variable [13]. Two criteria need to be met to pass this test: value of Standardized Loading Factor (λ) / outer loading need to be higher than 0.7 and Average Variance Extracted (AVE) need to be higher than 0.5 [13][16]. Table 1. showed the result of the first convergent validity test. From the first test, there were two indicators that did not meet the threshold which were A3 and B15. [16] suggested to remove any indicator that does not meet threshold. Second validity was performed after both unqualified indicators had been removed. It is showed that both variables and indicators had fulfilled the convergent validity criteria. Both Outer Loading and AVE scores were also improved significantly.

Table 1. Convergent Validity Test Result

Variable	Indicator	Outer Loading				AVE
		Initial	Final	Initial	Final	
A1	A11	0.857	0.897	0.728	0.760	0.524
A2	A21	0.868	0.897	0.728	0.760	0.524
A3	A31	0.524	0.728	0.728	0.760	0.524
B1	B11	0.897	0.897	0.760	0.760	0.524
B2	B21	0.897	0.897	0.760	0.760	0.524
B3	B31	0.897	0.897	0.760	0.760	0.524
B4	B41	0.897	0.897	0.760	0.760	0.524
B5	B51	0.897	0.897	0.760	0.760	0.524
B6	B61	0.897	0.897	0.760	0.760	0.524
B7	B71	0.897	0.897	0.760	0.760	0.524
B8	B81	0.897	0.897	0.760	0.760	0.524
B9	B91	0.897	0.897	0.760	0.760	0.524
B10	B101	0.897	0.897	0.760	0.760	0.524
B11	B111	0.897	0.897	0.760	0.760	0.524
B12	B121	0.897	0.897	0.760	0.760	0.524
B13	B131	0.897	0.897	0.760	0.760	0.524
B14	B141	0.897	0.897	0.760	0.760	0.524
B15	B151	0.524	0.728	0.728	0.760	0.524
B16	B161	0.897	0.897	0.760	0.760	0.524
B17	B171	0.897	0.897	0.760	0.760	0.524
B18	B181	0.897	0.897	0.760	0.760	0.524
B19	B191	0.897	0.897	0.760	0.760	0.524
B20	B201	0.897	0.897	0.760	0.760	0.524

1.2 Discriminant Validity Test

This test was performed to make sure the constructed model was unique (compared to another construct) [16]. It measures cross loading scores which describe relation between variable and indicator. Criteria of this test is that cross loading score need to be higher than other indicator scores to prove the discriminant validity of the variable [13]. The result showed that all indicators scores of each variable had higher scores than the others. It meant that discriminant validity test was successful.

1.3 Reliability Test

This test was performed to make sure the consistency of instrument to measure a concept.

Two criteria need to be satisfied to pass this test. Cronbach's alpha and composite reliability need to be higher than 0.7 [13]. **Error! Reference source not found.** showed the result of the test and it was shown that each variable passed both thresholds.

Table 2. Reliability Test Result

Variable	Cronbach's Alpha	Composite Reliability	Variable	Cronbach's Alpha	Composite Reliability
A	0.81	0.827	PEOU	0.78	0.776
BI	0.78	0.785	PU	0.77	0.776
IQ	0.75	0.757	SYQ	0.74	0.745
SEQ	0.74	0.743	PCIL	0.73	0.734

2. Structural Model Evaluation (Inner Model)

Structural model evaluation (*inner model*) was performed to measure relation between variable in the model by analyzing R-square, path coefficient, and t-statistic [16].

2.1 R-Square (R²) Test

This test was performed to measure correlation between exogenous variable and endogenous variable [16]. If R² score of a variable is higher than 0.75, then it is categorized as strong variable. R² score of 0.5-0.75 is categorized as intermediate variable. Lastly, R² score below 0.5 is categorized as weak [16]. the result of this test **Error! Reference source not found.** showed that variable of A was considered strong with the score of 0.808. It meant that there was 19.9% other factor that influence A outside theoretical framework in this study. BI, PEOU and PU were considered intermediate variable with score of 0.708, 0.643, and 0.611 consecutively.

2.2 Path Coefficient Test

This test was performed to measure the significance of relation between variables. The criteria of this test are path coefficient score (need to be higher than 0.1), P-value (need to be less than 0.05), and t-statistic score (need to be higher than 1.645 because it has a significance value of 5%) [16]. Table 3. showed the result of the test. Table 3 shows which variables are significant or not significant.

Table 3. Hypotheses Test Result

Hypothesis	Path Coefficient	T-Statistic	Significance	Accepted/Rejected
H1	0.123	1.234	0.221	Rejected
H2a	0.391	3.912	0.000	Accepted
H2b	0.273	2.734	0.008	Accepted
H3	0.283	2.834	0.005	Accepted
H4a	0.286	2.864	0.005	Accepted
H4b	0.127	1.274	0.201	Rejected
H5	0.104	1.043	0.298	Rejected
H6	0.406	4.064	0.000	Accepted
H7a	0.341	3.412	0.001	Accepted
H7b	0.267	2.674	0.010	Accepted
H8	0.283	2.834	0.005	Accepted

3. Evaluation Summary

Evaluation of hypotheses of study could be concluded from Table 3. For each hypothesis that resulted as significant could be considered as accepted. Otherwise, it could be considered as rejected. The acceptable hypotheses were H2b, H4a, H6, H7a, H7b and H8. The rejected hypotheses were H1, H2a, H3a, H3b, H4b and H5. Figure 2. showed the evaluation of theoretical framework based on the accepted (solid line) and rejected (dash line) hypotheses.

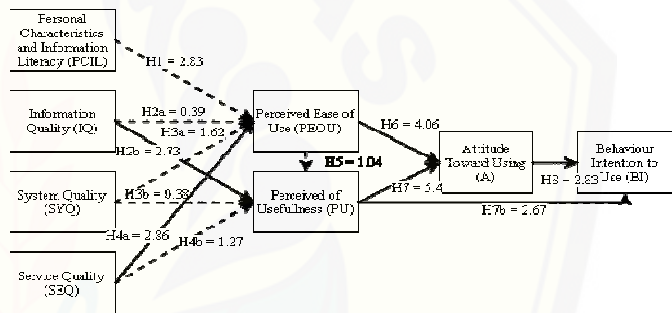


Figure 2. Theoretical Framework / Proposed Model

Based on the evaluation of 4 dependent variables (PEOU, PU, A, and BI), those variables related to 4 accepted hypotheses and 1 rejected hypothesis. The test showed that **H6, H7a, H7b, and H8** were accepted. This result was aligned with the result of studies on [4][5] and general theory of Technology Accepted Model. The difference was **H5** in this study was rejected unlike the result of those studies. This finding can be interpreted as perceived ease of use is not significantly influence perceived of usefulness in BPPT environment. It implies that majority BPPT user does not necessarily believe that ease of use of knowledge management system can improve their working performance.

Meanwhile in independent variables, there were only 2 of 7 hypotheses on 4 independent variables (PCIL, IQ, SYQ, and SEQ) that were accepted (H2b and H4a).

H2b & H4a is accepted it showed that IQ has positive influence PU & SEQ has positive

influence on PEOU and it is aligned with the result of [10]. It is indicated that by having better quality information and service quality on knowledge management system, BPPT user will feel having more benefit and ease of use to support their work performance.

H1, H2a, H3a, H3b and H4b is rejected, It is not aligned with the result of [7][10]. This study analyzed that this phenomenon can happen because most of BPPT users already have personal experience in using information system. Because of that, it does not reflect perceived ease of use of knowledge management system. Furthermore this study analyzed that BPPT users does not consider having better quality information in KMS result in having less effort to use KMS. It can be inferred because BPPT is an organization based on R&D (Research and Development) so that quality information will reflect on the usefulness of KMS in BPPT user's perception rather than the easiness of KMS. Moreover research performance in BPPT is based on the resulted product. Because of that, this study analyzed that it does not matter how the quality system of KMS if it is easy to use and can contribute to their work performance. Although service quality reflects the easiness of KMS, it does not influence perceived usefulness of the system. BPPT users only rely information quality to consider whether the KMS is useful.

CONCLUSION

Theoretical framework designed in this study used TAM (Technology Accepted Model) with addition of some external variables which were system quality, service quality, information quality, and personal characteristic & information literature. These external variables based on previous works influence either perceived usefulness or perceived ease of use in the model.

This study showed that attitude toward using (A) and perceived usefulness (PU) influence the intention of users (BI) to use KM capture system. Meanwhile, attitude toward using (A) is influenced by perceived usefulness (PU) and perceived ease of use (PEOU), and both factors are influenced by information quality (IQ) and service quality (SEQ) consecutively.

There were several different results with previous works. This study showed that perceived usefulness (PU) is not influenced by

system quality (SYQ) and service quality (SEQ). In the other hand, perceived ease of use (PEOU) is not influenced by information quality (IQ), personal characteristic & information literature (PCIL), and system quality (SYQ). Lastly, perceived usefulness (PU) is not influenced by perceived ease of use (PEOU).

1. Recommendation

Based on the result, this study concluded a recommendation to top management of BPPT as practical contribution of this study to the organization. Both perceived usefulness and perceived ease of use influence behavior intention of use of KMS. To shape the perceived usefulness of the KMS, organization can focus on improving the information and content quality in KMS. This recommendation is expected to have an impact on the internalization process. better quality information will increase the intention to use of knowledge seekers who want to acquire knowledge.

To shape the perceived ease of use of the KMS, organization can maintain or increase service quality level given to BPPT users. This recommendation is expected to have an impact on the process of internalization and externalization as well as knowledge sharing process. better service quality will increase the intention to use of knowledge seekers and knowledge owners.

ACKNOWLEDGEMENT

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Prediction Preventative Measures for Coronary Heart Patients Using K-Nearest Neighbor Algorithm

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ABSTRACT

According to data from the World Health Organization (WHO), heart disease is the number 1 cause of death in the world, which causes 17.9 million deaths each year. In Indonesia, heart disease also tends to increase as a cause of death; in 2008, a cardiovascular disease caused around 17.3 million deaths. Cardiovascular disease is a disease caused by impaired heart and blood vessel function. There are many types of cardiovascular disease, but the most common and most well-known are coronary heart disease and stroke. This disease occurs when blood flow to the heart muscle stops or becomes blocked, resulting in severe damage to the heart. This study was conducted to determine medical procedures suitable for cardiac patients based on age, sex, and diagnosis. This study uses the K-Nearest Neighbor (K-NN) algorithm, using a dataset from the heart catheterization unit of RSUP DR. M. Djamil Padang, West Sumatra. This study used 875 heart disease patient data in 2014. Based on the dataset, there are 10 types of preventative measures for cardiac patients, and the data are categorical, need to be preprocessed with the K-NN algorithm to get the best results, the research results obtained an accuracy value of 69%. Featuring the K-KN algorithm can be used to determine the type of preventative measures for coronary heart patients.

Keywords: Cause of death, heart disease; cardiovascular disease; K-Nearest Neighbor (K-NN); categorical data.

INTRODUCTION

Cardiovascular diseases (CDVs) are the number 1 cause of death in the world [1], an estimated 17.9 million people died due to CVDs in 2016 [2], [3], according to the Center for Data and Information of the Ministry of Health of the Republic of Indonesia in 2013, the number of sufferers of heart disease was around 2,650,340 people [4]. There are many types of cardiovascular disease, but the most common and most well-known are coronary heart disease and stroke. This disease occurs when blood flow to the heart muscle stops or becomes blocked, resulting in severe damage to the heart.

Heart disease risk factors consist of that cannot be modified, i.e. family historical, Age, sex, obesities and can be changed, i.e. Hyper tense, Diabetes mellitus, Dyslipidemia, Lack of physical activity, unhealthy diet and stress.

Based on the data, there are ten preventive measures given to patients with heart disease based on the diagnosis, and there are 27 types of diagnoses, the data also consists of male patients and female patients. Patients are aged from 16 years to 92 years, with the most distribution between 40 years to 80 years.

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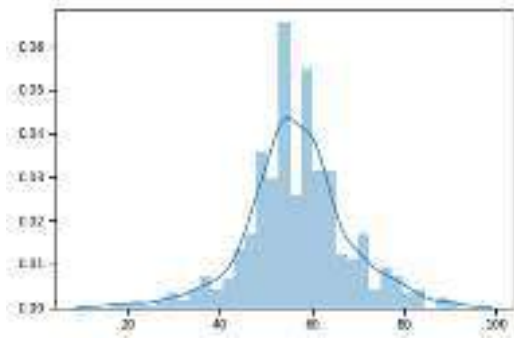


Figure 1. Patients Age Distribution

Gender is also a factor in heart disease, based on data, and male patients suffer more heart disease. Figure 2 shows the comparison between male patients and female patients, and the number 1 female patients represent male patients are represented by the number 0.

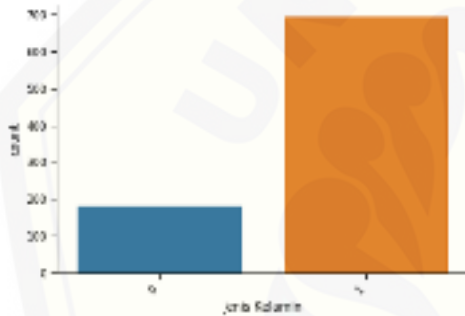


Figure 2. Gender of Patients

Several studies make age a factor in heart disease [5], to determine someone suffering from heart disease, age in several groups. For the young group, the inclusion criteria were healthy (not showing risk factors for CVD) <30 years. For healthy older adult groups, individuals must be healthy and over 60 years old [6].

To predict some algorithm is needed, like previous research some algorithm has done. Machine learning or data mining is useful for a diverse set of problems. One of the applications of this technique is in predicting a dependent variable from the values of independent variables. IoT device also used like utilizing IoT wearable medical device for heart disease prediction [7]. To predict some algorithm is needed, like previous research, some algorithm has done. Machine-learning techniques can be useful for overcoming to predict risk at an early stage. Some of the techniques used for such prediction problems are the Support Vector Machines (SVM), Neural Networks, Decision

Trees, Regression and Naïve Bayes classifiers [8].

Machine learning to predict one-year cardiovascular events in patients with severe dilated cardiomyopathy. The results indicated that Machine Learning (ML) using naive Bayes classifier was well-suited for risk prediction in patients with severe Dilated cardiomyopathy (DCM) confirmed by 10-fold cross-validation (AUC, 0.887 [95% confidence interval, 0.813–0.961]) [9].

In addition to machine learning, deep learning has revolutionized computer vision and is now seeing applications in cardiovascular imaging[10], Random Forest Algorithm, machine learning can be used to better identify patients at risk for death or congestive heart failure (CHF) rehospitalization after the percutaneous coronary intervention[11].

K Nearest Neighbors (KNN) classification is one of the top-10 data mining algorithms[8][12]. Generally, the KNN algorithm first finds k nearest neighbors of a query in training dataset and then predicts the question with the dominant class in the k nearest neighbors[13][14]. Figure 1 illustrates the limitations of k NN algorithm with a fixed k value.

Equation of Euclidean Distance to find distance of k [15]

$$d_i = \sqrt{\sum_{i=1}^p (x_{2i} - x_{1i})^2} \tag{1}$$

Where:

x_1 = data sample

x_2 = data train

i = data variable

d = distance

p = data dimensions

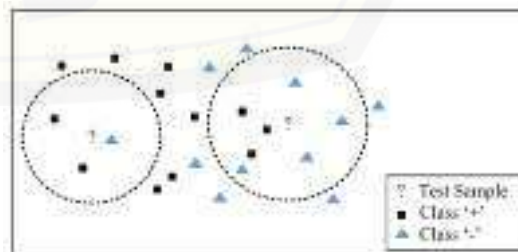


Figure 3. Training examples for k NN classification [13]

In contrast to other studies, the prediction made whether someone has heart disease or not — the purpose of this study, how to predict the right treatment in heart patients using existing features.

MATERIALS AND METHODS

1. The Dataset

The dataset from the heart catheterization unit of RSUP DR. M. Djamil Padang, West Sumatera. This study used 875 heart disease patient data in 2014. Based on the dataset, there are 10 types of preventative measures for cardiac patients, there are 27 types of diagnoses, and the data are categorical type need to be preprocessed. This study uses several features such as age, address, sex, insurance and diagnoses and Treatment as Target.

Table 1. Research Feature and Target

Age	Address	Sex	Insurance	Diagnoses	Treatment
75	Sijunjung	0	PBI/111	Total AV Block	TPM
71	Padang	0	PBI/111	Total AV Block	PPM
75	Agam	0	Umum	Total AV Block	PPM
38	Padang	1	Umum	Stemi Anterior	PPCI
53	Padang	1	NPB/1	Stemi Anterior	Angiografi + PTCA

2. The Methods

The data used in this study by recording from the patient's treatment log recorded into the form of a google sheet, the input data was carried out by an expert. The next step the data is stored in the form of a CSV file, pre-processing data is needed like to handle typo. The data also consists of categorical data which must be converted into numerical data to processed in the KNN algorithm. After the preprocessing data did, then it enters training and testing data, the data collected into 80% training data and 20% testing data. Determination of the value of k several times so that the accuracy with the best value obtained. The Figure 4 show the research method in this study.



Figure 4. Research Method

RESULTS AND DISCUSSION

Of all the features, several features are given high accuracy values, such as an address, address describing the situation of the patient's residence, whether, in urban, rural, temperature and altitude, these factors can be a factor in many areas of people with heart disease.

This type of insurance is also included as a factor to predict because it will show from the economical category of patients who may be the cause of heart disease so that specific preventive measures given for heart disease patients.

CONCLUSION

The study shows that the treatment of cardiovascular diseases could be predicted using K-Nearest Neighbour Classifier with 69% accuracy using k values of 19. However, the f1-score of every treatment varied, with the highest score of 0.80 and the lowest is 0, this could be handled by adding more data to balance the treatment class and try another algorithm for future works.

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Organizational Culture Analysis for Knowledge Management: A Case Study on Ministry of Trade of the Republic of Indonesia

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ABSTRACT

Knowledge has become an important asset that government organization such Ministry of Trade (MoT) should manage in order to achieve organization's goal and objectives. Organizational culture is a deciding factor that will have an impact on how a knowledge management will be implemented. This study intends to analyze organization culture in MoT before implementing knowledge management system. Quinn and Cameron (2006) proposed an instrument to examine organization culture called Organization Culture Assessment Instrument (OCAI) with a framework called Competing Value Framework (CVF). This framework consists of 4 different culture types with different characteristics i.e. clan, adhocracy, market and hierarchy. Based on the result, we found that the dominant culture type in MoT is hierarchy culture and preferred culture is clan culture. In order to support Knowledge Management that fits the organization culture and increase successful implementation, we proposed changes to be performed by MoT based on 3 aspects of People, Process and Technology that includes improvement of leadership involvement as mentor, promote knowledge sharing and discovery through interaction among employees and prepare technology architecture that supports sharing information, collaborative teamwork and cooperative decision making within the organization.

Keywords: Knowledge Management; Organizational Culture; OCAI; CVF.

INTRODUCTION

Government Organization are depending more on improvement of efficiency by using resources effectively, implement automation and eliminate redundant in administrative processes to meet government's goals. One of the main challenge faced by government is to meet demand and react to citizen's demand and high expectations. This forces government to prepare a strategy that not only will improve effectiveness and efficiency but also increase citizen satisfaction to government services.

An effective solution is utilizing knowledge [1]. Knowledge is a critical factor affecting an organization's ability to achieve its goals. Therefore knowledge must be recognized as a valuable resource and organizations need to develop a mechanism so that the collective intelligence and skills of employees can be make use of in order to produce a valuable organizational knowledge base [2]. Having knowledge created and transferred in an organization has become a critical factor to achieve organization's goal and to meet demand and expectations. More efforts are done by organizations lately to transfer and share

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knowledge, particularly tacit knowledge, across the organization [3]. How to create, share and make use of these knowledge in an organization is defined by Knowledge Management (KM). KM also supports how to organize and make knowledge available wherever and whenever needed. KM not only emphasizes on knowledge in forms of process, procedures, best practices and lesson learned in an organization, but also there is an important source of knowledge in form of tacit knowledge in the mind of organization's experts [4]

As part of KM Infrastructure organization culture plays an important role as an enabler of knowledge management within the organization. It reflects rules and beliefs that guides member of the organization behavior [4]. Organization's values could have an impact to members' intention not only in facilitate sharing knowledge but also affecting negatively as in hierarchical structure for example. Whereas organization with more open and support guidance will promote constructive knowledge behavior between members in the organization.

Ministry of Trade (MoT) as one of central government institution has critical task and function in directing the formulation of policies related to the development of trade in Indonesia. The domain of MoT including foreign trade, national trade, trade negotiation, trade policy research, export development, trade order and consumer protection. In a previous study [5], KM Readiness was evaluated in one business unit in MoT. This study found out that the overall KM Readiness level in MoT is "ready but needs improvement" with a significant gap in organization structure and culture aspects.

Because organization culture is part of KM foundations that have significant impact as KM Infrastructure [4], and in order to have a complete view of the organization culture, this study intend to find out the current dominant and expected in organizational culture in MoT using OCAI survey instrument. The subject of the survey will be representative from each echelon unit in MoT. The organizational culture that will be evaluated is based on the concept of Competing Value Framework (CVF) by Cameron and Quinn (2006) that divides organizational culture into 4 different types i.e. hierarchy, market, clan and adhocracy. The result of the study will describe the current dominant culture in the organization and a preferred culture

how the organization in the future will be. Based on the result, this study will suggest how MoT should be perform changes at certain areas in order to fit organizational culture with KM implementation in the future.

Current literature regarding the work subject should be examined and the differences of the said work from the past, similar works should be presented clearly in the introduction section.

MATERIALS AND METHODS

All materials and methods that have been used in the work must be stated clearly and subtitles should be used when necessary.

1. Organizational Culture

The Organization Culture is important to motivate interactions between individuals and to support the knowledge flow [6]. Knowledge management process depends on several critical factors, and among the factors which is culture of the organization [7]. Based on previous studies, it is implied that cultural values has an influence in knowledge sharing behaviors and qualities of interaction among people. Culture also influences how people communicate and share knowledge and thus can have impact how an organization approaches KM. An emerging perspective based on organizational conceptual development is to find out the relationship how organizational culture type have impacts to an organizational effectiveness [8].

2. Competing Values Framework

The Competing Values Framework (CVF) is one of the most influential and used models on Organizational Culture research due to its reliability and [6]. CVF aims to diagnose and trigger the changes in the Organizational Culture changes while they organizations grow and experience external environment pressure [6]. Four dominant culture types generated from the CVF model: clan, adhocracy, market, and hierarchy.

Clan culture focuses on human relations, team work, collaboration, participation. Trust and support is one of the values promoted. Organization gives more opportunity in employees involvement and open communication [8].

Adhocracy culture focuses on external relations with flexible organization structure. Adaptability, innovation, growth, creativity, entrepreneurship and agility are values that are promoted. This culture believes that one of the fundamental aspect that employee should be able to take risks and become creative [8].

Market culture focuses to the customer, increase productivity and competitiveness. Another value promoted is the focus to achieve result by defining clear goals and giving rewards will drive employees to aggressively perform so that they will meet stakeholders expectations or increase profit [8].

Hierarchy culture focuses on internal relations supported by a rigid organization structure driven by a defined control mechanism such as procedures. This culture promotes stability, controlled process, measurement, predictability in regards of achieving high efficiency. Employees role are well defined so that they can meet their expectations. Other important values including formalization, precise communication, consistent routines [8].

Based on the identification of the four CVF cultural types, Cameron and Quinn developed and validated the Organizational Culture Assessment Instrument (OCAI). This instrument uses a questionnaire to verify and establish Organization Culture profile in the organization. By using OCAI it is possible to identify the current organizational profile, as well as the preferred or desired one.

Gray and Densten [9] proposed a theoretical model that integrates the CVF and the SECI model. According to Gray and Densten [9], the integration offers an opportunity to explain and acknowledge the impact of OC on the organizational knowledge treatment process. The authors conclude that:

- a) Organizations of clan culture are likely to focus on socialization;
- b) Organizations of adhocracy culture are likely to focus on externalization;
- c) Organizations of market culture are likely to focus on combination; and,
- d) Organizations of hierarchy culture are likely to focus on internalization.



Figure 1. Competing Values Framework

3. Knowledge Management

Knowledge management has been a critical factor for organizations that wants to increase productivity and effectiveness [10]. Knowledge management goal is on the acquisition of new knowledge, on how to manage existing knowledge in ways so that people are able to use it in the future, on how storing and spreading them, and providing applicable strategies for new contexts [5]. According to Nonaka and Takeuchi, knowledge may be classified in two types: tacit and explicit [5]. The tacit knowledge is subjective and based on human experience, perception and individual values. Explicit knowledge is considered objective and transmittable by formal and systematic languages. The dynamic interaction between tacit and explicit knowledge leads to summarized knowledge conversion model known as SECI (Socialization, Externalization, Combination and Internalization). The SECI model focus on creating, exploring and maintaining knowledge [10]: a) *Socialization* is the experience of sharing process, in which a person's tacit knowledge is spread to another by observation, cooperation or behavior imitation; b) *Externalization* transforms tacit knowledge into explicit knowledge and it is important on creation processes, because ideas and concepts are formulated; c) *Combination* generates new explicit knowledge by combining different explicit knowledge; d) *Internalization* is the process that converts explicit knowledge into tacit knowledge, also known as the individual learning process.

Knowledge management was one of the applications that could be used to manage the existing knowledge within the company. Knowledge management had become one of the main agenda in an organization because it was considered as a competitive strategy, which might provide some benefits for the company [11]. Knowledge management could provide important benefits to the company including the increasing distribution of knowledge which may resulting in adding value to the product and increasing companies' profit, increased job satisfaction for employees and also increasing the effectiveness and efficiency of the process [11]. Successful implementation of knowledge management was unable to stop from the role of human resources that existed within the organization itself. Knowledge management started from the knowledge owned by individual (personal knowledge) within organizations which would be transferred to other individuals in an organization. The successful application of knowledge was demonstrated by employees who were not only showing knowledge but also their curiosity and willingness to make new innovation.

4. Methodology

An electronic questionnaire with the research instrument was designed using Google Forms and sent to employees in Ministry of Trade. The questionnaire is based of the Organizational Culture Assessment Instrument (OCAI) examining 6 dimensions of culture i.e. dominant characteristics, organizational leadership, management of employees, organization glue, and strategic emphases. Each question consists of a statement that represent a culture type. The respondents were asked a question to give their assessment of how each of the statements represent the current culture and then also asked another question whether they expect the statement to represent MoT in the future. The instrument used a 5-point Likert scale to measure responses, with 5 being "strongly agree" and 1 being "strongly disagree".

The OCAI questionnaire was distributed to 221 staff of MoT from all managerial levels. There were 40 valid questionnaire results that are processed were questionnaires that were complete and clearly filled out in accordance to the instructions. Based on the managerial levels there were respondent are 2 from Echelon III

position, 4 from Echelon IV position and 34 from Staff level. Based on the units that responded there were 25 responses from Secretariat General, 1 from Inspectorate General, 1 from Directorate General of Foreign Trade, 3 from Directorate General of National Trade, 2 from Directorate General of Foreign Diplomacy, 2 from Directorate General of Export Development, 3 from Directorate General of Trade Order and Consumer Protection, 1 from Trade Policy and Development Agency, and 1 from Commodity Trade Supervising Agency. Results from the questionnaire are calculated based on the choice the respondent have chosen and are grouped based on the organizational culture types. First step is to compute an average score based on the responses for each dimensions that represent the current culture type. The highest score would represent the dominant culture in the dimension. This steps is also repeated for the expectation questions to find out which culture types is expected by respondents. The average scores from each dimensions are combined to determine which organizational culture type is currently perceived as dominant culture and which culture type is preferred in MoT. This result will be mapped into OCAI Diagram to visualize the current situation and preferred situation based on the respondent scores result. A more realistic model was calculated by subtracting the competing (opposite) typologies perceived and preferred scores (Δ) from each other [12] and mapped to OCAI diagram.

RESULTS AND DISCUSSION

1. OCAI Survey Result

As shown in Table 2, result for perceived culture assessment shows that the hierarchy culture scored highest value in 3 dimensions, market culture in 2 dimension, clan and adhocracy each in 1 dimensions. The overall score, shows that the perceived culture in MoT is leaning towards hierarchy culture. The hierarchy culture is characterized by predictability and internal focus. Emphasis is centered on information management, documentation, stability, routines, centralization, continuity, and control. Members in hierarchy culture are bonded together through internal controls that maintain regulations, policies and procedures [9].

Table 2. Result of OCAI Measurement

Dimension of Culture	Perceived				Preferred			
	Clan	Hierarchy	Market	Adhocracy	Clan	Hierarchy	Market	Adhocracy
Organizational Leadership	3.0	2.5	2.0	2.0	3.0	2.5	2.0	2.0
Information Exchange	3.0	2.5	2.0	2.0	3.0	2.5	2.0	2.0
Structure	3.0	2.5	2.0	2.0	3.0	2.5	2.0	2.0
Human Relations	3.0	2.5	2.0	2.0	3.0	2.5	2.0	2.0
Technology Use	3.0	2.5	2.0	2.0	3.0	2.5	2.0	2.0
Organizational Commitment	3.0	2.5	2.0	2.0	3.0	2.5	2.0	2.0

The result for preferred culture shows that clan culture scored highest in all dimensions except organizational leadership dimension. This concludes that the clan culture are the preferred organizational culture type in MoT. Clan culture is characterized human relations perspective with emphasis in information sharing and participative decision making. Members are bonded together by developing a sense of affiliation and belonging [9].

With the difference of perceived and preferred culture it may be become obstacle to knowledge management implementation. Hierarchy culture that focus on structured and formalized workplace is very different to clan culture that focus on human relations and collaboration. The effect of organizational culture that is not align with organizational strategy may affect and reduce efficiency and productivity in the organization [13]. Based on Organizational Knowledge Management Model by Densten, clan culture has similarity with socialization based on SECI Model where both acknowledge that informal interaction between individual to create tacit knowledge that enable a shared experience in order to improve organizational effectiveness and knowledge creation and transfer process[9].

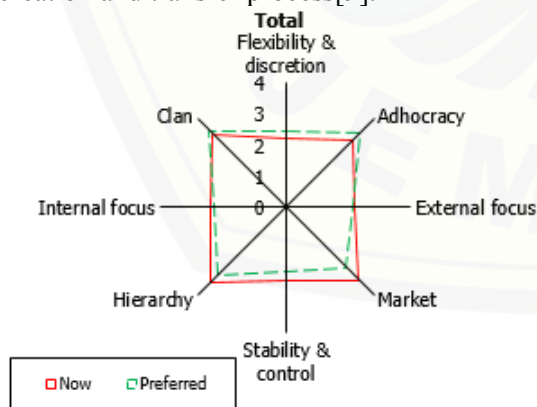


Figure 1. OCAI Diagram of MoT at CVF

Organizational change is proposed to bridge the difference of preferred culture and

existing culture based on three major components of knowledge management: People, Processes, and Technology. Focus of Knowledge management is people and their culture in order to stimulate and promote sharing and knowledge; also method and processes how to locate, create, capture and share knowledge and using technology to store and provide accessibility to knowledge allow people to work together anytime and anywhere [14]. Leadership (leading organization, leading people and leading self) is very important to the successful knowledge management and become bridge to culture change [13]. With clan culture the role of leadership behavior to develop a sense of affiliation, trust, and belongingness is very important in order to facilitate information sharing and raise awareness of benefits of KM. The implication is that organization need to make recommendation, i.e. leadership training, ensure top-management commitment to change, develop and nurture communities of practice.

Knowledge management process have a significant impact on organization's performance [15]. To bridge existing culture to preferred clan culture the organization need to adopt knowledge management process that focuses in knowledge discovery and knowledge sharing. Organization need to facilitate collaborations between employees that will enhance the knowledge sharing and utilization in order to increase skill and knowledge of employees.

Technology of knowledge management system (KMS) can make new opportunities and innovation [16]. With clan culture in mind the organization KMS can be starting point for collaboration and knowledge exchange among employees, where participants can share information and knowledge. In addition before adopting KMS technology, organization need to build architecture and infrastructure for knowledge management resources that can support KMS and will be used and maintained in the long run.

CONCLUSION

Organization Culture is part of infrastructure in Knowledge Management. It is important to implement Knowledge management system that is aligned with organization's culture in order to have successful implementation.

Based on analysis using OCAI, currently the culture in MoT according to employee is hierarchy culture and the preferred culture to be implemented in the future is clan culture. Because there is a very different approach in implementing Knowledge Management in a clan culture and hierarchy culture, MoT needs to make some changes especially in organization leadership that enables participative decision making, processes to support knowledge management activities (discovering and sharing knowledge) and tools to perform effective collaboration between members of organization.

There are a number of limitations to this study, and because of this there is room for future studies. Since samples were collected from Indonesian organization, the finding may not be generalizable. Future studies could be done in other region and other type of organization. Several organizational factors were not considered in this study, which may have impacted the research model. Future studies should consider more factor and different factor for showcase other angles to the result. Finally, this study focuses in knowledge management using organizational culture assessment. Follow-up studies could measure about knowledge readiness using organizational culture as core model.

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Pattern Recognition Of Mathematical Symbols Using Backpropagation Networks

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ABSTRACT

Artificial neural networks are artificial intelligence systems that are similar to biological neural networks. Artificial neural networks are widely applied for pattern recognition and forecasting in an event. Pattern recognition is the process of identifying patterns based on their characteristics in order to be able to classify patterns. The application of artificial neural networks regarding pattern recognition mostly uses the backpropagation algorithm. Research that discusses pattern recognition has been carried out by several researchers. However, there are still some data that can be used as further research data. Therefore, this paper uses data in the form of images of mathematical symbols for this study. This data is processed using feature extraction that is intensity of character and mark direction to get the characteristics data from the images taken. The characteristics data used as input to the backpropagation algorithm then performs the training and testing process. Based on the test results, it is known that the backpropagation algorithm can recognize mathematical symbols with the highest accuracy level is 83.9% with the parameters used are 5 neurons in the input layer with 5 neurons containing the value of characteristic data from the feature extraction process, 5 hidden layers with each hidden layer containing 50 neurons, the number of neurons in the output layer is 23 neurons because the number of mathematical symbols used is 23 symbols, and the activation function used is binary sigmoid.

Keywords: backpropagation; mathematics symbols; intensity of character; mark direction.

INTRODUCTION

Computers consist of hardware and software designed to emulate human intelligence, one of which is pattern recognition. Pattern recognition is the process of identifying patterns based on their characteristics. Pattern recognition aims to classify patterns. Pattern recognition is the application of artificial neural networks. Artificial neural network algorithm used for pattern recognition one of which is the backpropagation algorithm [1][4][9]. Much data has been used in previous researchs regarding pattern recognition such as numeric data, alphabets, and mathematical operators [1][4][7].

Based on these statements, this research conducted pattern recognition using mathematical symbol data.

The backpropagation algorithm has 3 phases. The first phase is the forward phase, calculating the input from the input layer to the output layer. The second phase is the backward phase, this phase calculates the change in weight. The third phase is the modification of weights, this phase modifies the weights by adding old weights with changes in weights [9].

Pattern recognition using the backpropagation algorithm has been done in previous research, one of which is the recognition of Japanese Hiragana letters [4]. This research uses the feature extraction, that is intensity of character and mark direction.

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Intensity of character is characterization of data which is done by counting the number of pixels that are black. Mark direction is the characterization of the data which is done by counting the number of black pixels that are neighboring 4 directions, that is horizontal, vertical, diagonal left, and right [11]. The use of these two feature extractions requires that the images used must be converted into binary images. Binary image is one image processing that has two values, value 0 for black and 1 for white [2][5][6][8][10]. This research resulted in high accuracy with 86.63%. Based on the statement above, the researcher is interested in using these two feature extractions in this research.

MATERIALS AND METHODS

This research uses data of mathematical symbols obtained from the Kaggle site [3]. The mathematical symbols used are 23 symbols, data for training backpropagation algorithm each symbol there are 100 data and data for testing each symbol there are 20 data. The steps taken in this research are explained as follows.

1. Data Collection

First, take a picture of a mathematical symbol. The picture taken is in the format ".jpg". Image of mathematical symbols possessed measuring 45×45 pixels. The picture was taken three times, that is, the picture taken for training data, testing, and testing single data.

2. Feature Extraction Intensity of Character and Mark Direction

After taking pictures, convert the image into binary images. Images of mathematical symbols are already in the form of grayscale so that only converting grayscale pixels in the image into binary images with below 128 tends to be black while above 128 tends to be white [8]. After that, perform feature extraction to get image feature data. Characteristic data consists of 5 features, that is feature 1 for the intensity of character results, feature 2 for the results of the horizontal direction mark direction, feature 3 for the vertical direction, feature 4 for the left diagonal direction, and feature 5 for the right diagonal direction.

3. Program of Backpropagation Algorithm

The characteristic data that has been obtained is saved into matlab with the format ".mat". After that, feature data is used as input to the backpropagation algorithm. Then build a network architecture with 5000 epochs and learning rate is 0.5. The target is determined in the form of a vector measuring 23×1 because the number of symbols used is 23. The activation function used is the binary sigmoid function. The number of hidden layers and neurons of each hidden layer used in this research varies. This network architecture development is carried out for the training and testing process. The following table is for division of symbol classes and targets.

RESULTS AND DISCUSSION

This research uses 23 mathematical symbol data. Training data amounted to 2300 data with the details of each symbol there are 100 data. Test data there are 460 data with the details of one symbol there are 20 data.

This research conducted 8 experiments with the number of hidden layers and the number of neurons per hidden layer variation. Targets, number of epochs, activation functions, and learning rates have been determined in the material and method sections. Following the division of classes along with the target symbols in Table 1.

the form of a file which will be used as input to the backpropagation algorithm.

3. Program of Backpropagation Algorithm

This section discusses the results of running a backpropagation algorithm program based on the network architecture created. This research conducted 8 experiments. This experiment consisted of 2 types namely testing using the training method *trainidx* and *traincg*. The highest accuracy results in this research occurred in experiments using the *traincg* by using 5 hidden layers and 50 hidden neurons for each hidden layer. The accuracy produced in this experiment was 83.9%. The highest accuracy results in experiments using the *trainidx* were 41.52%. The following results are the accuracy of all the experiments that have been displayed in Table 3.

Table 3. Result of The Accuracy All Experiment

Experiment	Amount of Hidden Layer	Amount of Neuron in Each Layer	Training Method	Accuracy
1	2	20	Backprop	20.68%
2	1	50	Backprop	24.37%
3	5	50	Trainidx	41.52%
4	2	20	Traincg	61.99%
5	1	50	Traincg	74.37%
6	5	50	Trainidx	79.8%
7	2	50	Traincg	83.9%

CONCLUSION

Based on the description of the results and discussion above, that the feature extraction that intensity of character and mark direction work nicely so that the backpropagation algorithm can recognize mathematical symbols well. The highest accuracy is 83.9%. The network architecture used is 5 hidden layers, 50 neurons in each hidden layer, and the training method is *traincg*.

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Comparison of Classification Methods for Handling Data Imbalanced in Dataset of Public Complaints SMS based Using the SMOTE Approach

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ABSTRACT

Public complaints using short message service (SMS) is one of the media used by the public in delivering suggestions, criticisms, and complaints about the government to improve the quality of public services. However, the SMS must be classified before being forwarded to the relevant agencies according to their authority so that it can be followed up. This research will classify the SMS content of public complaints into the appropriate agencies. Nevertheless, data imbalance is one of the problems that often founded in the classification, where the amount of data is small and the classifications is many, which is called multi-class. To handling this problem, this research try to find methods including preprocessing by using case folding, tokenizing, and stopword removal, feature extraction by varying the n-grams, oversampling by using SMOTE, and classification using SVM, Naive Bayes, and KNN. Testing is done using 60% training data and 40% testing data. The results showed that the best accuracy is obtained at 73.13% and the best precision is obtained at 73,67% when the unigram feature extraction combined with the SVM classification method. In addition, by combining SMOTE techniques and Naive Bayes methods for data imbalance conditions, the accuracy increases to 77.61% and the precision increases to 83,66%. Thus, the application of the SMOTE technique with the Naive Bayes method can handle data imbalances and has better accuracy and precision in the classification of SMS content of public complaints compared to the SVM and KNN methods.

Keywords: Short Message Service, Classification, Data Imbalance, SMOTE.

INTRODUCTION

Public complaints using short message service (SMS) is one of the media used by the public in delivering suggestions, criticisms, and complaints about the government to improve the quality of public services. However, the SMS must be classified before being forwarded to the relevant agencies according to their authority so that it can be followed up.

Text mining can be used to classify short message texts based on agency authority. The purpose of text mining is to extract useful information from a collection of documents for a particular purpose[1]. One part of the text mining is text classification. Many researchers who have

done research on text classification, such as user emotion classification[2], tax complaint classification [3], news classification [4], and sentiment analysis [5].

There are several methods of text classification in text mining This research will compare Support Vector Machine (SVM), k-nearest neighbor (k-NN) and Multinomial Naive Bayes to classify the SMS content of public complaints into the appropriate agencies. SVM was originally designed for binary classification but can also be used in multi-class classifications [6]. SVM method aims to find the best hyperplane that separates two classes. K-NN method looks for the value of the k training data which is the closest distance to the new data whose label is unknown. The Naive Bayes method is a simple probabilistic based prediction technique based on the application of the Bayes theorem with a strong assumption of

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independence from each condition or event.

In previous studies, SVM achieves 93% accuracy to help classify Indonesian news articles [4]. K-NN method and the TF-IG-CHI feature extraction method gave an accuracy of 83.75% in the classification of public complaints via Twitter [7]. The Naïve Bayes method and the TF-IDF method were used in classifying the LaporGub SMS community complaint, giving an accuracy of 87.7% [8].

Nevertheless, data imbalance is one of the problems that often founded in the classification, where the amount of data is small and the classifications is many, which is called multi-class. There are nine classes that will be used for classification in this study, that are *Badan Penanggulangan Bencana Daerah*, *Dinas Kependudukan dan Catatan Sipil*, *Dinas Kesehatan*, *Dinas Lingkungan Hidup dan Persampahan*, *Dinas Pekerjaan Umum dan Penataan Ruang*, *Dinas Pendidikan*, *Dinas Perhubungan*, *Dinas Perumahan Rakyat dan Kawasan Permukiman*, and *Satuan Polisi Pamong Praja*.

SMOTE oversampling method is able to overcome the problem of imbalanced data better and has good accuracy when combined with the SVM method in handling multi-class classification [9].

METHOD

This section discusses the methodology used to compare the results of the classification of short text message of public complaints using several classification methods, feature extraction variations and SMOTE oversampling techniques. The steps of our study are in accordance with the flow chart shown in Figure 1.

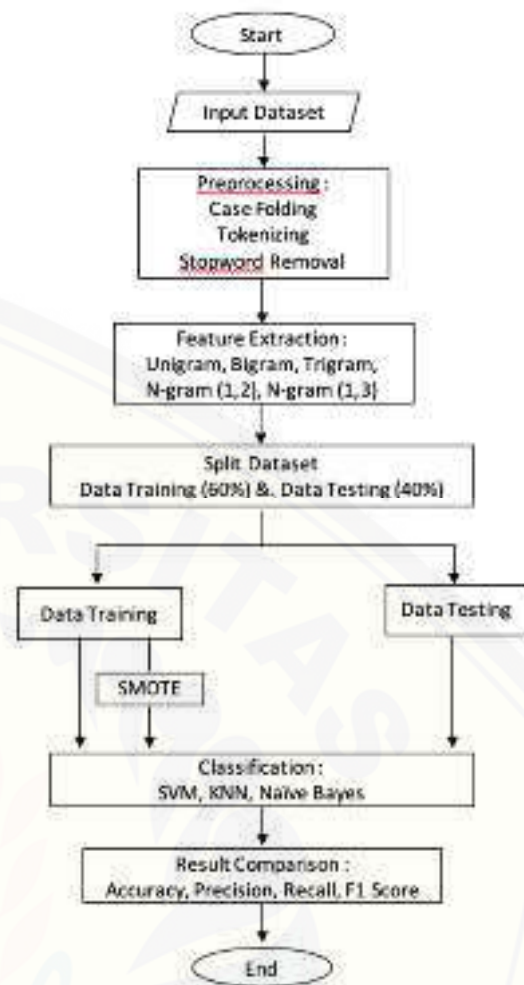


Figure 1. Flowchart of research.

1. Dataset

The dataset used in this study is 166 short text messages of public complaints that have been labeled with the appropriate agencies. The distribution of datasets can be seen in Table 1.

Table 1. Distribution of Dataset

Agencies	Count
<i>Badan Penanggulangan Bencana Daerah</i>	23
<i>Dinas Kependudukan dan Catatan Sipil</i>	34
<i>Dinas Kesehatan</i>	12
<i>Dinas Lingkungan Hidup dan Persampahan</i>	17
<i>Dinas Pekerjaan Umum dan Penataan Ruang</i>	32
<i>Dinas Pendidikan</i>	8
<i>Dinas Perhubungan</i>	21

<i>Dinas Perumahan Rakyat dan Kawasan Permukiman</i>	8
<i>Satuan Polisi Pamong Praja</i>	11

2. Preprocessing

Preprocessing functions to change text data that is not structured or arbitrary, into structured data. Preprocessing in this study includes Case Folding, Tokenizing and Stopword Removal. Case Folding is the process of forming standard letters in the SMS text into lowercase letters. Tokenizing is the process of cutting an SMS text document into several parts, called tokens. Tokenizing also works to get rid of certain characters that are considered as punctuation. Stopword removal is a process of removing common words that usually appear often and are considered not to contribute too much to the contents of the SMS text. This is done to reduce the task of the machine to process words that are not necessary.

3. Feature Extraction

After the preprocessing process, feature extraction is then done by taking a list of words from the text of the short message and then transform it to forms that can be used by classifiers [10]. The feature extraction method used in this study is TF-IDF. TF-IDF calculates the frequency of occurrence of words in the short message text dataset. The parameter used on TF-IDF is N-gram. N-gram is a cut of n characters or words in a particular sentence. The types of n-grams used in this study are unigram, bigram, trigram, and their combination.

4. SMOTE

The next step after feature extraction is to split the dataset into training data and test data. It is found that there is a condition of data imbalance. Data imbalance is a condition where data distribution is not balanced in all classes, so that majority and minority classes are generated. Oversampling transforms data by adding data to minority classes to provide replicas of the data so that the distribution becomes more balanced. Synthetic Minority Oversampling Technique (SMOTE) is one of the most effective and best oversampling techniques for handling data imbalance conditions. The distribution training data, before SMOTE and after SMOTE is shown in Table 2.

Agencies	Before SMOTE	After SMOTE
Badan Penanggulangan Bencana Daerah	13	17
Dinas Kependudukan dan Catatan Sipil	17	17
Dinas Kesehatan	9	17
Dinas Lingkungan Hidup dan Persampahan	10	17
Dinas Pekerjaan Umum dan Penataan Ruang	16	17
Dinas Pendidikan	5	17
Dinas Perhubungan	16	17
Dinas Perumahan Rakyat dan Kawasan Permukiman	4	17
Satuan Polisi Pamong Praja	9	17

RESULTS AND DISCUSSION

The dataset is divided into two parts, with a comparison of training data of 60% and test data of 40%. The training data is used by the classification method to form a classifier model. This model is a representation of knowledge that will be used to predict classes from new data. Test data is used to measure the extent to which the classifier successfully classifies correctly. Therefore, the data in the test data should not be in the training data so that the classifier model's accuracy in classifying can be known.

1. Evaluation Metric

The accuracy, precision, recall, and F1 scores of each n-gram feature extraction combination with the classification model tested are shown in the Table 3.

Table 3. Evaluation Metric for each n-gram feature

Evaluation	SVM	KNN	Naïve Bayes
Unigram (1,1)			
Accuracy	73,13	71,64	59,70
Precision	73,67	71,65	56,97
Recall	73,13	71,64	59,70
F1 Score	70,59	69,32	52,98
Bigram (1,1)			
Accuracy	49,25	50,75	38,81
Precision	48,55	52,45	45,45
Recall	49,25	50,75	38,81
F1 Score	45,48	49,86	30,78
Trigram (1,1)			
Accuracy	32,84	16,42	25,37
Precision	56,21	62,43	6,44
Recall	32,84	16,42	25,37
F1 Score	23,81	20,16	10,27
N-gram (1,2)			
Accuracy	73,13	65,67	56,72
Precision	67,66	67,54	47,43
Recall	73,13	65,67	56,72
F1 Score	68,55	63	48,54
N-gram (1,3)			
Accuracy	73,13	67,16	52,24
Precision	65,12	69,17	44,11
Recall	73,13	67,16	52,24
F1 Score	67,85	64,76	42,76

As shown in table 3, using the SVM method, a matrix of relatively good performance in each feature is obtained. With the unigram feature (1.1) achieving the highest accuracy, precision, recall, and F1 scores of 73.13%, 73.67%, 73.13%, and 70.59%, respectively.

2. Oversampling training data using SMOTE

The application of SMOTE techniques to training data can increase the value of accuracy, precision and recall. Figure 2 shows the comparison of the accuracy, precision, recall, and F1 scores of the three classification models with a combination of unigram features and SMOTE techniques.



Figure 2. Comparison of classification models after applying the SMOTE technique with unigram feature

The combination of unigram features and the SMOTE technique, resulting in the highest Naive Bayes classification model has the highest levels of accuracy, precision, recall, and F1 scores, respectively 77.61%, 83.66%, 77.61%, and 77.32%.

The evaluation model using the SMOTE and Naïve Bayes method achieve about 71-76% for each of the metrics, shown in Figure 3.

As shown in Figure 4, all test data with class *Dinas Kependudukan dan Catatan Sipil*, can be predicted accurately in its class. The most misclassified are the data in the *Dinas Pekerjaan Umum dan Penataan Ruang* class which is predicted to be *Badan Penanggulangan Bencana Daerah* class.

It also shows that for this dataset, the use of the unigram feature provides good accuracy, precision, recall, and F1 scores for all three classification models.

Akurasi Score : 73.13 %
 Precision Score : 76.99 %
 Recall Score : 73.13 %
 F1 Score : 71.74 %
 Classification Report :

	precision	recall	f1-score	support
Badan Penanggulangan Bencana Daerah	0.73	0.80	0.76	10
Dinas Kependudukan dan Pencatatan Sipil	1.00	0.94	0.97	17
Dinas Kesehatan	0.75	1.00	0.86	3
Dinas Lingkungan Hidup dan Persampahan	0.58	1.00	0.74	7
Dinas Pekerjaan Umum dan Penataan Ruang	0.71	0.31	0.43	16
Dinas Pendidikan	1.00	0.67	0.80	3
Dinas Perhubungan	0.75	0.60	0.67	5
Dinas Perumahan Rakyat dan Kawasan Permukiman	0.50	0.75	0.60	4
Satuan Polisi Pamong Praja	0.40	1.00	0.57	2
micro avg	0.73	0.73	0.73	67
macro avg	0.71	0.79	0.71	67
weighted avg	0.77	0.73	0.72	67

Figure 3. The results of the evaluation model using the SMOTE + MNB algorithm

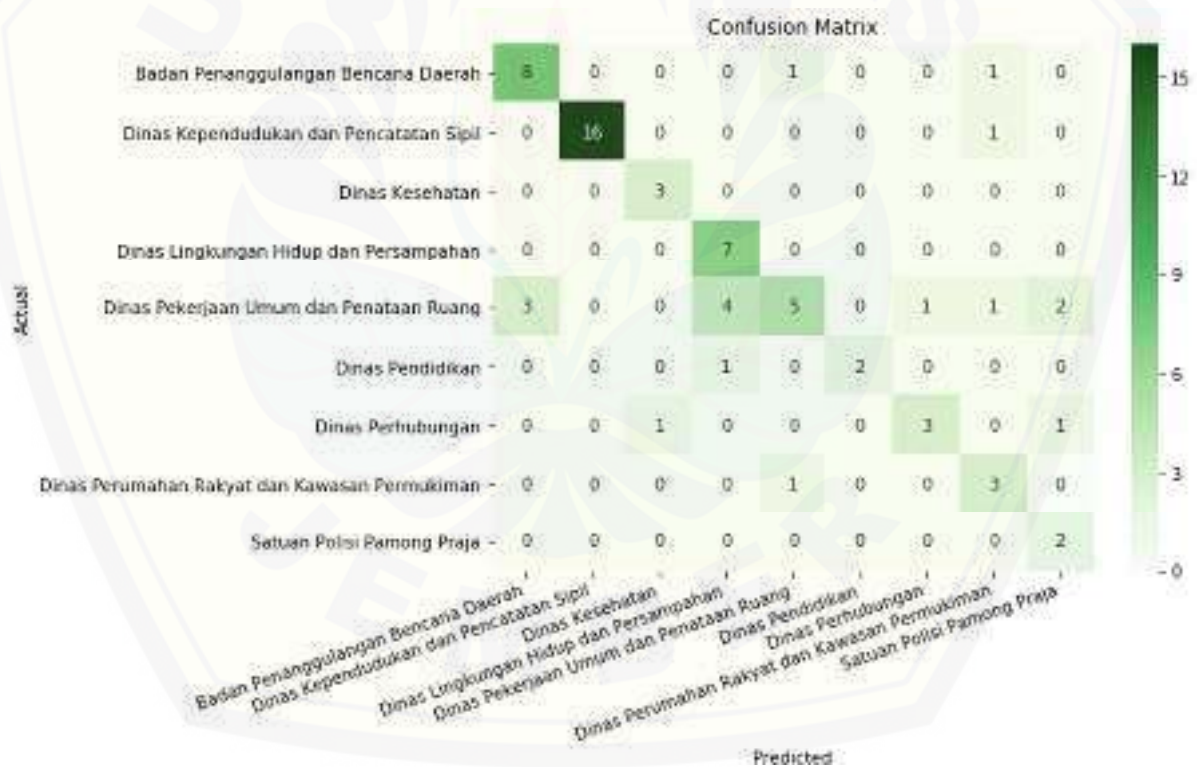


Figure 4. Confusion Matrix of the evaluation model using the SMOTE + MNB algorithm

CONCLUSION

Naïve Bayes method with the SMOTE technique obtained the best accuracy to handle the imbalance of data in the classification of SMS content of public complaints, compared to the SVM and KNN methods. N-gram values in feature extraction also affect the accuracy of the classification model. Further research should be conducted using other feature extraction methods, such as BOW, Word2Vec and GloVe.

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An Automated Scoring Tool of Originality for Torrance Test of Creative Thinking-Figural Form

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ABSTRACT

A popular creativity scoring system, Torrance Test of Creative Thinking Figural (TTCT-F), includes fluency, flexibility, originality, and elaboration scales. Such assessment scales can substantively from one assessor to another and depend on the individual analyses and knowledge of assessors. In other words, the subjectivity is potentially high. On the other hand, efficiency, consistency, and cost are precisely important factors in assessment. This work, therefore, proposes a method to allow consistent and meaningful assessment of creativity thinking, particularly for originality scale, as well as maintaining efficiency. In simple terms, originality indicates the rarity of the ideas. Scale invariant feature transform based on sparse coding (ScSIFT) is adopted to score originality scales. The proposed method is evaluated by administering 75 students to perform TTCT-F. Student's responses are processed in three stages: sparse dictionary learning, query image sparse, and image matching algorithms. The success of this proposed automated tool was revealed by a scale independently judged by humans and confirmed as a better approximation of human responses than habitually-done measures.

Keywords: Automated assessment tool; creative thinking; figural forms; originality; Torrance Test of Creative Thinking.

INTRODUCTION

Creative thinking is considered as an important skill in 21st century. With the technology becoming increasingly disruption, creativity has been recognized by many scholars and practitioners as the most important quality for success in the 21st century workplace. Although recent years have observed the impact of technology on creativity teaching strategies in classrooms, limited studies have considered the use of technology in the assessment of creativity. However, most assessments of creativity are still managed in paper and pencil tests, making it challenging for them to serve emerging purposes such as large-scale testing and faster data acquisition.

The study of divergent thinking is one of the eldest and major areas in the study of creativity [1]. According to the psychometric study of creativity, divergent thinking is the most suggesting basis for creative thinking. Therefore, the Torrance Tests of Creative Thinking (TTCT) is widely employed as divergent thinking tests [2]. On the beginning, this test was ideal, easy to administer, and quick to score. Guilford devised a number of tasks to assess divergent thinking through TTCT. These measurement tools consist of tasks with verbal and figural based items. In verbal-based items, both the stimuli and the responses are verbal. In figural-based items, stimuli are figural, but the response could be figural or verbal. For example, on some TTCT items, the respondent is expected to complete

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drawings (figural–figural), and to interpret lines or figures (figural–verbal). Several scales has proposed to evaluate TTCT items, such as fluency, flexibility and originality. Fluency indicates to the ability to produce numerous ideas for a specified problem, and it is evaluated by the number of meaningful and appropriate responses. Flexibility is defined as the skill to perceive a problem from different methods, and it is gained by the number of different categories inferred by the responses. Originality refers to the ability to produce unique, infrequent ideas, and it is frequently measured by the statistical infrequency of the responses in a specified sample. Nevertheless, up-to-date researches on creativity reflect complexity about the usefulness of divergent thinking tasks. The more respondents involved, the more times required [3].

Technology-based assessment is one of the most rapidly developing research areas in educational field. The increasing interest can be explained by the advantages of technology-based assessment, such as online test administration, automated scoring, precision feedback, objectivity, reliability and the possibility of immediate feedback [4]. The existing assessment tools are challenging, if not impossible, to apply in the educational field, either because they are too complex or hard to score. Furthermore, creativity test such as TTCT requires a trained person to assess the responses, but this preference is not always applied. Such assessment is slow, expensive, and subjective. Creativity scoring can vary significantly from one reviewer to another, and depend on the individual interpretations and knowledge of reviewers. This results are in a highly inconsistent assessment. Therefore this work propose a novel method to utilize technology for developing automated assessment tool of creativity thinking partially in scoring originality scale for TTCT Figural (TTCT-F). The originality scale of creative thinking skill is identical with matching several images and calculate the similarity. The less similarity score, the greater originality score. The similarity algorithm in this work adopts Scale invariant feature transform based on sparse coding (ScSIFT) [5].

MATERIALS AND METHODS

1. Creative Thinking Test

The creative thinking test in this work is adopted from Figural Form of The Torrance Tests of Creative Thinking (TTCT-F). The responses on the TTCT-F responses are drawn. 75 students are conducted to complete a figure (Fig. 1) to make pictures out of them. Student's responses are then evaluated to determine their originality score of creative thinking. The evaluation consists of two methods which are utilizing proposed automated assessment tool and employing an expert of creative thinking assessment. These two methods are then compared using student t-test to determine the significant difference of the score.

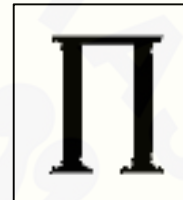


Figure 1. Figural form of TTCT

2. Scale Invariant Feature Transform Based on Sparse Coding (ScSIFT) Formulation

The Scale Invariant Feature Transform based on Sparse Coding (ScSIFT) [5] is an improvement algorithm of the sparse SIFT feature vectors [6]. An extraction of the SIFT feature is initially conducted before sparse coding on the 128-dimension SIFT vector and therefore the coding index are exploited to limit the matching time consumption. The qualities of the sparse representation have confidence on the selection and design of the whole dictionary. In addition, the errors generated by the partial eigenvectors are less than the errors produced by the default fixed dictionaries. However, when sparsity represents the rest of the eigenvectors and different dictionary learning algorithm to learn the error between the dictionaries is largely identical.

The main idea of the ScSIFT algorithm is exploring the SIFT feature from the key frame extraction as a training dataset to train the over-complete dictionary to accumulate a collection of over-complete sources. The SIFT vector of the query image is sparsely encoded with the over-complete dictionary. The sparse vector is then

indexed. Moreover, the SIFT feature of the key-image is matched with the query image feature index by exploiting the over-complete dictionary to obtain a set of comparable candidate sets, match the key-image sparse coefficient and therefore the query image sparse coefficient and catch similar image detection results. SIFT feature sparse coding of the sparse coefficient vector is further defined as the image ScSIFT features.

Let's assumed A as $128 \times n$ SIFT feature matrix, A_m^k is a $128 \times n$ matrix with the mean of the columns of eigenvector A , and $|A'|_j^k$ is a $128 \times n$ matrix with the mod of the columns of eigenvector A' . The training dataset is standardized by normalization process, A_s , as formally defined in Eq. (1).

$$\begin{aligned} A' &= A - A_m^k \\ A_s &= \frac{A'}{|A'|_j^k} \end{aligned} \quad (1)$$

The distance between the SIFT feature points which are symbolized as A and B utilizes Euclidian Distance, L_2 , and is formulated in Eq. (2).

$$\begin{aligned} L_2(A, B) &= \|A - B\|_2 = \\ \sqrt{(A - B)(A - B)^T} &= \sqrt{\sum_{i=1}^{128} (x_i - y_i)^2} \end{aligned} \quad (2)$$

The overcomplete dictionary which is assumed as D is the sparse representation of the eigenvector estimated in Eq. (3).

$$A = D \cdot \alpha \quad (3)$$

Let us define $\|A - B\|_2$ is the Euclidian distance of feature A and B while $\|\alpha_A - \alpha_B\|_2$ is the Euclidian distance of sparse α_A and α_B . The sparse feature is then formally written in Eq. (4).

$$\begin{aligned} \|A - B\|_2^2 &= (A - B)(A - B)^T \\ &= [D(\alpha_A - \alpha_B)][D(\alpha_A - \\ &\quad \alpha_B)]^T \\ &= D(\alpha_A - \alpha_B)(\alpha_A - \\ &\quad \alpha_B)^T D^T \\ &= D \|\alpha_A - \alpha_B\|_2 D^T \end{aligned} \quad (4)$$

Eq. (4) reveals that the square of the distance of the sparse feature can be expressed by Eq. (5).

$$\|\alpha_A - \alpha_B\|_2 = \sqrt{\sum_i (\alpha_{Ar} - \alpha_{Bs})^2} \quad (5)$$

While the vast majority of sparse = 0, the ScSIFT feature distance is formulate in Eq. (6) where r is the element identity for nonzero values in vector α_A and zero value in vector α_B . Similarly, s is the element identity for zero values in vector α_A and nonzero value in vector α_B . Furthermore, q is the element identity for nonzero values in both vectors α_A and α_B .

$$\|\alpha_A - \alpha_B\|_2 = \sqrt{\sum_r \alpha_{Ar}^2 + \sum_s \alpha_{Bs}^2 + \sum_q (\alpha_{Aq} - \alpha_{Bq})^2} \quad (6)$$

Finally, The ScSIFT feature is transformed into a binary vector as in Eq. (7).

$$\alpha_l = I(\alpha) \quad (7)$$

subject to:

$$I(\alpha) = \begin{cases} 1, & x \neq 0, \\ 0, & x = 0. \end{cases} \quad (8)$$

The image similarity process to determine original score of creative thinking comprises three stages: sparse dictionary learning, query image sparse, and image matching algorithms. The pseudocode of each algorithm is listed in Fig. 2-4.

Algorithm 1 Sparse Dictionary Learning

```

1: n ← number of images from query
   library
2: for (k = 1; k ≤ n; k++)
3:   Training_Fk ← extract SIFT features
   of image I_k
4: endfor
5: normalize F_k according to Eq. (1)
6: train the overcomplete dictionary D
   using Training_Fk
7: output dictionary D
    
```

Figure 2. Sparse Dictionary Learning

Algorithm 2 Query Image Sparse

```

1: s = 1
2: while I is uncoded image in the query
   library
3: do
4:   read image I_s of query library
5:   image_Feature_Fs ← extract SIFT
   features of image I_s
6:   normalize F_s according to Eq. (1)
7:   ScSIFT ← preserve the sparse
   coefficient α
8:   s++
9: endwhile
10: create index
11: save ScSIFT in the query library
    
```

Figure 3. Query Image Sparse


```

Algorithm 3 Image matching
1: while column  $\neq$  maximum
2:   do
3:     Read the image  $I$ 
4:      $F_s \leftarrow$  extract its SIFT feature
5:     Normalize  $F_s$ 
6:     ScSIFT feature  $\beta \leftarrow$  Get the sparse representation of the normalized feature set  $F_s$  by the sparse algorithm
7:      $\sigma \leftarrow$  ScSIFT feature similarity distance threshold
8:      $\theta \leftarrow$  image similarity threshold
9:     read the first column of ScSIFT feature  $x = \beta 0$ .
10:    Search for the nearest  $k$  column coefficients of the ScSIFT feature  $x$ 
11:    Calculate the distance  $dk$  of  $\alpha$  according to Eq. (6)
12:  endwhile
13:  calculate the total number of sparse feature points
14:  calculate the similarity degree
15:  if similarity degree  $\neq$  0
16:    Originality score = 0
17:  endif
    
```

Figure 4. Image matching

RESULTS AND DISCUSSION

1. Creative Thinking Assessment Score

Students are first requested to complete The Torrance Tests of Creative Thinking – Figural (TTCT-F). The test consists of one item as depicted in Fig. 1. The maximum responses are limited to five. The originality score is 0 if student’s item response is similar to other students and 1 if it is unique and different from others’ responses. Thus, the maximum score of each student is 5. The scoring methods are comprised two: utilizes automated assessment tool of TTCT-F (Auto TTCT-F) and manually scoring by an expert of creative thinking. The results of both Auto TTCT-F and Manual TTCT-F are shown in Fig. 5. It depicts that the maximum obtained score is 4 according to both Auto TTCT-F and Manual TTCT-F. Neither Auto TTCT-F nor Manual TTCT-F results 5 score. According to Auto TTCT-F, three students acquire score 0, 14 students gain score 1, 15 students get score 2, 32 students acquire score 3, and 11 students gain score 4. Auto TTCT-F results is slightly different with Manual TTCT-F. In Manual TTCT-F, three students acquire score 0, 15 students gain score 1, 18 students get score 2, 29 students acquire score 3, and 10 students

gain score 4. Simply, the results of Auto TTCT-F and Manual TTCT-F are shown in Fig.5-Fig. 6.

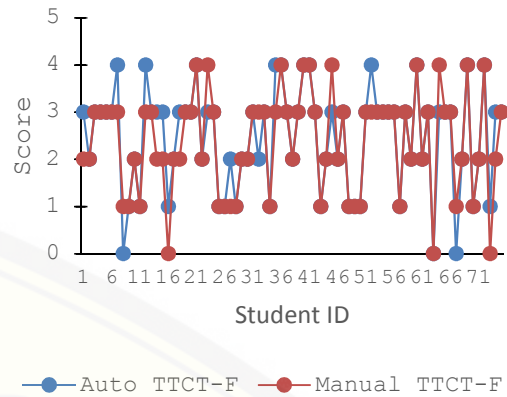


Figure 5. TTCT-F Score

Table 1. Number of students for each score

Score	Number of students	
	Auto TTCT-F	Manual TTCT-F
0	3	3
1	14	15
2	15	18
3	32	29
4	11	10

2. Comparison of Auto TTCT-F and Manual TTCT-F

Unpaired student t-test is exploited to determine the significance difference results of Auto TTCT-F and Manual TTCT-F. The results of unpaired t-test is listed in Table 2. The two-tailed P value equals 0.6260. By conventional criteria, this difference is considered to be not statistically significant. In other words, there is no difference in scoring TTCT-F using either Auto TTCT-F or Manual TTCT-F.

Table 2. Statistical analysis results

	Auto TTCT-F	Manual TTCT-F
Mean	2.45	2.41
Standard deviation	1.08	1.08
Standard error of the mean	0.12	0.12
N	75	75
P value	0.6503	
The mean of Auto TTCT-F minus Manual TTCT-F	0.08	

95% confidence interval of this difference	from -0.27 to 0.43
t	0.4543
df	148
standard error of difference	0.176

In addition, the expert who assessed the TTCT-F complained that it is wasting time to manually assess 75 students' responses. The expert consumed 22 hours to assess 75 students' responses of TTCT-F since he has to compare a student's response to others'. Total students' responses are 364, this is to say, each student responses an average of 5 answers. Moreover, the expert requires about 17.5 minutes to assess a student responses or 3.5 minutes for a response. Contrarily, Auto TTCT-F requires 2.85 minutes to assess 75 students' responses of TTCT-F or approximately 0.5 seconds for a response.

CONCLUSION

Measuring student's creative thinking skill such as originality may be simple to quantify, but they can sacrifice time. This work proposes automated assessment tool for The Torrance Tests of Creative Thinking – Figural. The evaluation reveals the proposed method outperforms manual assessment. T-test results confirms that the difference is not statistically significant. Additionally, the proposed method save more times than manual method. For further work, other scales of creative thinking including fluency, flexibility, and elaboration are suggested to explore in automated assessment tool.

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Parameter Estimation and Hypothesis Testing of Path Quadratic Using Ordinary Least Square (OLS)

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ABSTRACT

Path analysis is the development of correlation and regression analysis, known as a causal model. Path analysis used to see the pattern of causal relationships in a model and interprets the pattern to endogenous and exogenous variables. Path analysis has the disadvantage of unreciprocal and inflexible model because only the linear relationships can be accommodated. The complex problems is nonlinear data forced using linear analysis then the interpretation will be a spurious. One of the simple nonlinear form is quadratic and currently the development of path quadratic is limited. The purpose of this study is to estimate the parameters of path quadratic and test the hypothesis in each of relationship variable. The method of estimating parameters used in this study is Ordinary Least Square by minimizing the number of residuals. Modeling will be completed by a simulation data to adjust the data as the criteria of quadratic. The simulation study is determining X , β and generating errors, so Y will be obtained according to the calculation results. In addition, this study was also conducted to test the hypothesis of path quadratic analysis relationship by considering the direct and indirect effects between variables indicated by the path coefficient. The result of this study is it possible to build a path model with a quadratic relationship between variable and the hypothesis testing show a significant results for a direct but not significant on indirect effect of path quadratic.

Keywords: path quadratic, OLS, data simulation..

INTRODUCTION

The more complex problem of determining functional relationships between variables requires a comprehensive methods. Regression analysis is one of statistics methods to examine two or more variables, but it accomadate limited realationship. Path analysis is the development of the concept of correlation and regression analysis, known as the causal model. In path analysis there is two variables, one called exogenous variable as a cause and endogenous variable as an effect. Simple path model must consist of at least one exogenous variable (X), one endogenous intervening variable (Y), and one pure endogenous variable (Z) [1].

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The form of relationships in path analysis is direct and indirect effect of exogenous variables on endogenous variables that formulated by researchers on the basis of theoretical considerations. Some studies on path analysis include: [2] studying path analysis to make a path diagram in complex relationship of neural communication disorders, as well as explaining the benefits of using path analysis, one of it is distinguishing between true and spurious or false correlations; [3] developed a path analysis in natural selection process (plant growth as seen from 5 treatments, namely seed size, planting time, number of leaves, height of plant and number of fruits) due to a causal relationship in the process that cannot be analyzed using multiple regression analysis.

One important assumption of path analysis is linearity. This linearity assumption can be tested using Ramsey's RESET test. This test is

used to determine whether an exogenous variable said to have a linear or nonlinear relationship with an endogenous variable. If the linearity assumption is not fulfilled, it may be no effect, or there is an nonlinear effect, for example quadratic, cubic, polynomial, logarithmic, exponential, etc [4]. Past studies of nonlinear path analysis include: [5] developing a nonlinear path analysis process based on asymptotic regression, [6] applying robust nonlinear path analysis and [7] also assessing the benefits of using nonlinear path analysis.

One of things that underlying the development of nonlinear path analysis is based on nonlinear data and forced using linear analysis then the model interpretation can be spurious or false. On the other hand many studies analyze nonlinear data with simple linear analysis. The simplest known form of nonlinearity in path analysis is quadratic. The development of nonlinear path analysis is currently limited and hasn't yet reached the quadratic nonlinear model.

MATERIALS AND METHODS

Basically, path analysis is the development of regression analysis that involving more than one function. Path analysis was developed by Sewall Wright in 1918, 1921, 1934, and 1960 as a study to learn the direct and indirect effects of several variables which had a causal relationship. Path diagram is used to describe the causality relationship between variables [8]. Simplest quadratic path model is described in Figure 1:

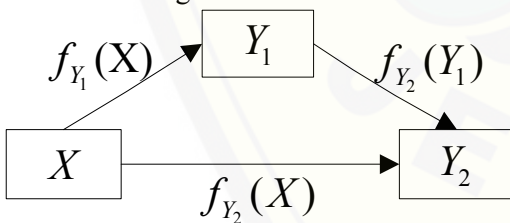


Figure 1. Simple nonlinear path diagram

Based on Figure 1, the nonlinear path equation approached by quadratic function and has been standardize is as follows:

$$\begin{aligned}
 Z_{Y_{1i}} &= \beta_{11}Z_{X_i} + \beta_{21}Z_{X_i^2} + \varepsilon_{Y_{1i}} \\
 Z_{Y_{2i}} &= \beta_{12}Z_{X_i} + \beta_{22}Z_{X_i^2} + \beta_{13}Z_{Y_{1i}} + \beta_{23}Z_{Y_{1i}^2} + \varepsilon_{Y_{2i}} \quad (1)
 \end{aligned}$$

Linearity testing in path quadratic analysis uses ramsey's RESET test statistics. This test

was introduced by Ramsey in 1969, start with an idea if there is an existence of nonlinearity then the various nonlinear transformations of $f(t) = (\widehat{X}_t^T \hat{\theta})$ not giving a benefit of expressing $Y(t)$. The RESET approach using Ordinary Least Square (OLS) to minimize the number of squared errors from each observation [9]. However to find out the form of relationship between exogenous and endogenous variables in path quadratic will be use a modified ramsey RESET test. The advantage of using the modified ramsey RESET test is to find out the form of relationship between exogenous and endogenous variables, i.e. quadratic, cubic, quartic, or polynomials with k degree.

The next process is estimating the path quadratic parameters using OLS method by minimizing the number of residuals. OLS method is used if the model is linear in parameters by minimizing the square error $(\varepsilon^T \varepsilon)$. Equation to estimating parameters using OLS is as follows:

$$\hat{\beta} = (X^T X)^{-1} X^T \bar{y} \quad (2)$$

Solving problem of path quadratic model is by comparing the path coefficient of resulting model. Hypothesis testing used to determine the significance of the formed path analysis model [10]. The general linear hypothesis will used to complete the hypothesis testing of path quadratic analysis. The parameter function hypothesis according to [11]:

$$H : k' \beta = m \quad (3)$$

β is a parameter estimator of path quadratic, with constraints $k' \beta - m = 0$, k orthogonal to each other. The hypothesis based on equation (1) is:

$$\begin{aligned}
 H_{0_1} : \beta_{11} = \beta_{21} = 0 & \quad \text{vs} \quad H_{1_1} : \beta_{11} = \beta_{21} \neq 0 \\
 H_{0_2} : \beta_{12} = \beta_{22} = 0 & \quad \text{vs} \quad H_{1_2} : \beta_{12} = \beta_{22} \neq 0 \\
 H_{0_3} : \beta_{13} = \beta_{23} = 0 & \quad \text{vs} \quad H_{1_3} : \beta_{13} = \beta_{23} \neq 0
 \end{aligned}$$

The test criterion if the value of $F_{hitung} \geq F_{tabel}$ then H_0 is declined. It means that the path coefficient gives a significant effect between the exogenous variables and the endogenous variables.

This study using simulation study to create quadratic data easily and has an effect one another. The simulation based on determining X, β and generating errors, so Y will be obtained according to the calculation. Simulation data is

designed to be able to meet the condition of the relationship between exogenous and endogenous variables which are quadratic, with criteria not meeting the linearity assumption, nonheteroskedasticity and normality assumptions. The number of sample size used in simulation data is $n = 1000$. The auxiliary program used in this study is R. The generated data will be applied to a path diagram in figure 1, that has an exogenous variable, an endogenous intervening variable and a pure endogenous variable with the relation of the variable X to Y_1 quadratic open up and the relationship Y_1 to Y_2 quadratic open down, and the relationship of variable X to Y_2 will be predict later. The following are the steps of the research carried out: (1) Assigning data for exogenous and endogenous variables for the path diagram model, (2) Checking the linearity assumption of path analysis using Ramsey's RESET test and modified ramsey RESET test (3) Estimating the value of the path coefficient from the generated data using the OLS method, (4) Conducting hypothesis testing for the formed model.

RESULTS AND DISCUSSION

1. Estimation Parameter

In path quadratic, the first thing to do before estimating parameters is testing the linearity assumption using the ramsey RESET test to examine nonlinearity and the modified ramsey RESET test to examine the relationship between variables. The results of testing with the rasmey RESET test are as follows:

Table 1. Test Results with Ramsey RESET Test

Variable	p-value	Results
$X \rightarrow Y_1$	0,000	Nonlinier
$Y_1 \rightarrow Y_2$	0,000	Nonlinier
$X \rightarrow Y_2$	0,036	Nonlinier

In table 1 it is known that the $p\text{-value} < \alpha(0,05)$ so it means the relationship between exogenous and endogenous variables is nonlinear. The next test that needs to be done is using modified ramsey RESET test to determine the form of the relationship between exogenous variables and endogenous variables. The test results are as follows:

Table 2. Test Results with Modified Ramsey RESET Test

Variable	p-value	Results
$X \rightarrow Y_1$	0,795	Kuadratik
$Y_1 \rightarrow Y_2$	0,410	Kuadratik
$X \rightarrow Y_2$	0,000	Kuartik

Table 2 shows the form of relationship between exogenous variables (X) with endogenous intervening variables (Y_1) having quadratic relationship forms, endogenous intervening variables (Y_1) and pure endogenous variables (Y_2) have quadratic relationships, while from those relationship before it shows that the relationship between exogenous variable relations (X) and endogenous variables pure (Y_2) has a quartic relationship. The results in table 2 equals to the curves that have been obtained from the simulation data. The relationship curve between variables can be seen in the following figure:

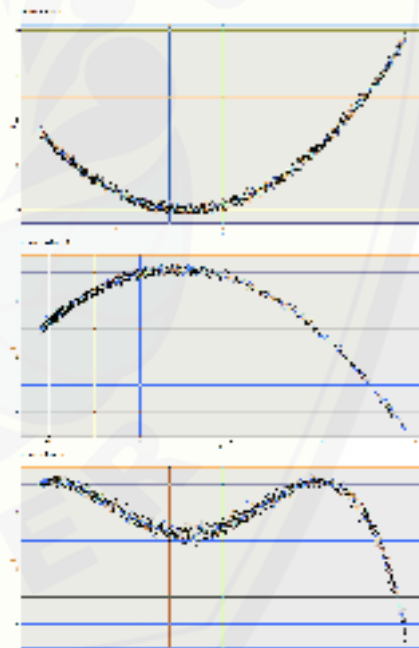


Figure 1. Curve between exogenous and endogenous variables (a) variable X with Y_1 (b) variable Y_1 with Y_2

(c) variable X with Y_2

Based on Figure 1, it can be seen that the shape of the relationship curve between exogenous variables (X) and endogenous variables (Y_1) (Y_2) equals with the modified ramsey RESET test results. Based on table 2 and

figure 1, the equation for the path quadratic in equation (1) changes as follows:

$$Z_{Y_1} = \beta_{11}Z_{X_1} + \beta_{21}Z_{X_1^2} + \varepsilon_{Y_1}$$

$$Z_{Y_2} = \beta_{12}Z_{X_1} + \beta_{22}Z_{X_1^2} + \beta_{32}Z_{X_1^3} + \beta_{42}Z_{X_1^4} + \beta_{52}Z_{Y_1} + \beta_{62}Z_{Y_1^2} + \varepsilon_{Y_2} \quad (4)$$

Parameter estimation in equation (4) using OLS method is as follows:

$$Z_{Y_1} = 0,601Z_{X_1} + 0,797Z_{X_1^2}$$

$$Z_{Y_2} = 0,767Z_{X_1} - 1,401Z_{X_1^2} + 0,005Z_{X_1^3} + 0,006Z_{X_1^4} + 0,002Z_{Y_1} - 0,005Z_{Y_1^2} \quad (5)$$

Based on equation (5), we have obtain the path coefficient of path quadratic in path diagram as follows:

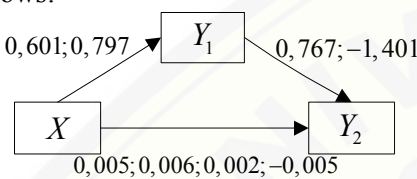


Figure 3. Path diagram with path coefficient n path quadratic

2. Hypothesis Testing

In quadratic path analysis also needed a hypothesis test to determine the significance of the variables in the model formed. This hypothesis using general linear hypothesis

Table 3. Test Results with the General Linear Hypothesis

Variable	p-value	Results
$X \rightarrow Y_1$	0,020	Significant
$Y_1 \rightarrow Y_2$	0,241	Not Significant
$X \rightarrow Y_2$	0,242	Not Significant

Based on Table 3, it can be seen that the relationship of variable exogenous X with variable endogenous Y1 has a p-value < alpha(0,05), it means H0 is declined so there is an effect on path quadratic between. them. However, the endogenous variables Y1 with Y2 and exogenous variable X with endogenous variable Y2 has a p-value > alpha(0,05) so that there is an acceptance of H0 so that there is no effect or indirect effect on the quadratic and quartic path.

CONCLUSION

Although the assumption underlying the path analysis is the linearity assumption but it is still possible to carry out path analysis

approached by quadratic function. If the relationship between exogenous and endogenous variables is quadratic, then the indirect effect that occurs on exogenous and endogenous variables is quartic. Estimating parameters obtained is only significant in the relationship between variables X dan Y1 and the rest is not significant.

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Conceptual Model for Gamification of Sustainable Academic Administration Service System

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ABSTRACT

A service system requires the commitment of its users because the system will be used every day in carrying out basic tasks serving customers. A service system with a gamification model can provide motivation and a sense of engagement to its users. However, some research shows that the longer the application of gamification is used, the boredom will occur, and the less the effect on its users so that the sustainability of the application is questioned. Based on these problems, this study tries to propose the conceptualization of an academic, administrative service system model with the gamification method. This model tried combining 2 (two) gamification frameworks, that is Marczewski's Simple Gamification Framework and Sustainability of Gamification Impact Framework (SGI). Marczewski's was chosen because it provides clear technical guidance for designers in designing and developing a gamification system, whereas SGI can be used as a guide in evaluating the sustainability of systems that have been released. Game elements in Marczewski's user types players like points, badges, and leaderboards can support gamification system users in achieving their goals of increasing user motivation and engagement, as well as increasing academic, administrative service satisfaction, whereas user type Achiever such as challenges, learning, and levels/progression can improve the player knowledge and ability. SGI framework can be used as evaluation material that can improve the sustainability of the gamification system. The concept of this model is expected to increase motivation and engagement of users while at the same time maintaining the sustainability of gamified the educational administration service system.

Keywords: Gamification; Marczewski's Simple Gamification Framework; Sustainability of Gamification Impact Framework (SGI)

INTRODUCTION

A state university must always maintain a reputation for being a superior university. Reputation can be achieved through the achievement and satisfaction of services to customers. At the college, the Academic Administration section is directly related to customers, that is students. Problems around academic, administrative services include not-optimal services.

Monotonous daily routine activities can lead to boredom and reduce employee morale in academic administration so that it impacts on the quality of services provided to customers. The optimization of administrative services can be helped with an online-based information system. However, a new problem arises, namely the lack of motivation and involvement of users to continue to use the system with pleasure.

Gamification is a method that can be applied to make an activity more exciting, challenging, can motivate and bind users to continue using it. Gamification is the application of gaming elements into activities that are not normally associated with the game. Gamification method is often used to motivate employees to carry out

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work activities more comfortably and there is engagement in these activities. Engagement is a willingness to participate as an act of mental construction which includes the involvement of the offender, emotions and cognitive employees at work. For this reason, the academic administration of a college requires a new web-based administrative service system with a gamification method to motivate and create user engagement with the system.

Research conducted by Sari [1] created a gamification model for learning web-based systems using Marczewski's gamification framework by designing game rules and gameplay. Using Blackbox testing, this research yields the conclusion that Marczewski's framework can be applied to design a learning website. Another research conducted by Sitaresmi [2] is to design e-learning in 3-dimensional animation using the concept of gamification. Analysis of the scope of the discussion uses the MDA framework. The results of this research are the feasibility of developing an overall mobile commerce application architecture for micro-enterprise.

GAMIFICATION

In gamification, the designer adds elements and replaces the game in a non-game environment. Gamification is used to redesign a work process with games for pleasant experiences that are expected to turn routine activities into more enjoyable ones. Gamification combines various components that drive a series of desirable mechanisms for developing dynamic behavioral interactions to support key business processes [3]. Gamification has the main concept to shape user motivation [4].

There are 2 (two) kinds of motivation, intrinsic motivation and extrinsic motivation. Intrinsic motivation is related to impulses within, for example, desires or interests, while extrinsic motivation is related to self effort in getting certain results. With gamification, participation in a game is considered as a combination of human nature itself with design and entertainment where a game system promises prizes to its players. [3]. However, involvement has a strong relationship with actions related to time and conditions that are sustainable, so this requires a solution to overcome this problem by creating a good gamification system

development concept model, because some of the main problems faced by gamification applications are long-term relationships with users [5]. In this study, there are 5 reasons why to use gamification in the academic administration service system :

1. Feedback: gamification is the best way for employees to receive responsive feedback from customers and employers.
2. Motivation: gamification can increase employee motivation.
3. Training: in gamification, there are game mechanisms such as quizzes and simulations so learning is more exciting and enjoyable.
4. Recognition: gamification is a great way to see who is performing well. For employees, status at work is as important as financial rewards. Feel important that users have done an excellent job and are recognized by the manager.
5. Employee Engagement/involvement: gamification can encourage employee involvement. By applying gamified techniques to training, employees gain more significant commitment to the organization and a sense of belonging to the team can be increased.

FRAMEWORK

The gamification framework can be divided into 2 (two), namely general and specific frameworks [6]. General Framework designed to apply to a variety of frameworks and business environments. Many frameworks can be used to develop gamification systems, such as the Six Steps for Gamification and catalysis: Complete Gamification Framework (Chou). While a specific framework is designed to be applied for specific business needs, for example, the gamification framework in the development of e-banking software, in the field of marketing business, and for the management process company change.

This research uses Marczewski because it has defined the types of user and game mechanics that each designer can choose in determining the objectives of the gamification system that will be created. While the SGI framework was chosen because it contains essential elements to achieve the objectives of a gamification system that was created, which is often overlooked by designers with other

frameworks. SGI expected to be able to help designers improve the ability to propose a sustainable gamified system.

1. Marczewski's Framework

In Marczewski's framework, intrinsic motivation becomes a significant factor in designing a gamification system to get user engagement. Intrinsic motivation is an impulse that comes from within. According to Marczewski's, four main motivational drivers can be used as a basis for all good gamification systems, namely Relatedness, Autonomy, Mastery, Purpose (RAMP) [7]. Every good gamified system will have one or more intrinsic motivators of any kind. Intrinsic Motivation RAMP produces a framework called Marczewski's Simple Gamification Framework as shown in figure 1. The first part is a series of 8 (eight) questions to ask every time to create a gamification system design. The first 4 (four) questions as a basis in the design of gamification.

At the planning stage, it is done by determining the boundaries of the framework to be designed and determining the objectives for making the gamification system. Then the design phase is done by determining the motivation, feedback and game mechanics, the user's journey or storyline, and determining the user engagement. To answer the WHO question or who is the user of the gamification system, Marczewski distinguishes it into several types of users called Marczewski's User Type Hexad or 6 (six) user groups which can be seen in figure 1.



Figure 1. Marczewski's Simple Gamification Framework and User Type Hexad[7]

2. Sustainability of Gamification Impact (SGI) Framework

One of the problems often faced by gamification systems is about sustainability. Designers may ignore elements that enhance sustainability because of the lack of a standard framework that contains essential components to achieve that goal. SGI proposes a framework aimed at increasing the sustainability of the desired impacts of gamification applications. Similar to Marczewski's Intrinsic Motivation RAMP, SGI has components such as Flow, Linkage, Purpose, Autonomy, and Mastery in the design of gamification applications [8]. SGI can be used to help guide potential work in the fields of gaming and gamification. The SGI framework is shown in figure 2.

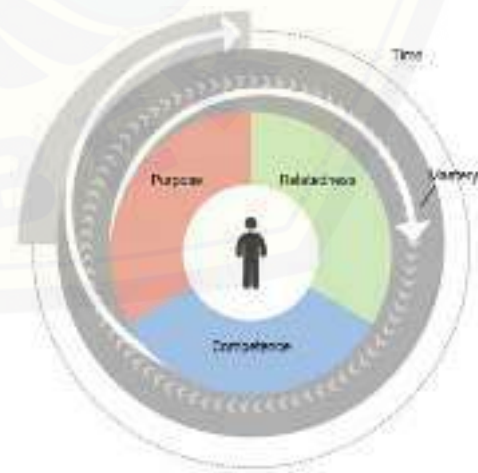
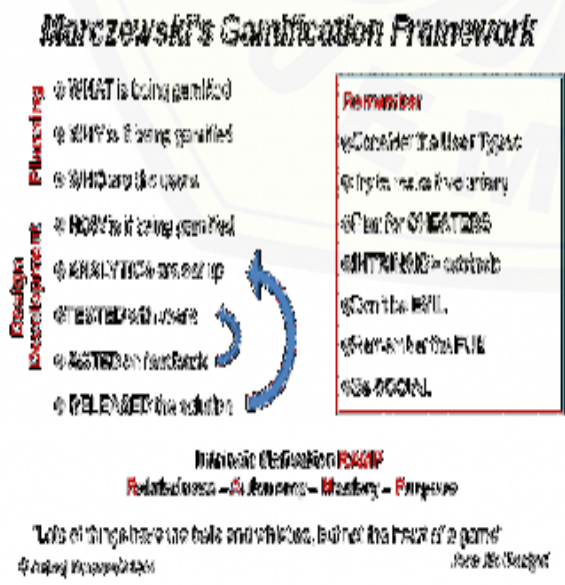


Figure 2. Sustainability of Gamification Impact Framework [8]

The SGI framework considers three backgrounds that refer to the dimensions of Flow [9], the Pink element to encourage motivation [10], and Self Determination Theory (SDT) [11]. A gamification application often, in the long run, feels the benefits and pleasures tend to fade and decrease. This relationship can be linked to three important concepts: motivation, flow and involvement. For example, for the goal element by including the user's motivation, while for the mastery element by considering the user's goal. All elements must be balanced and be able to encourage users to be better and maintain interest for a certain amount of time, giving players something that allows them to master and become better at each level.

CONCEPTUAL MODEL OF SUSTAINABLE IMPACT GAMIFICATION

This model tried combining 2 (two) gamification frameworks namely Marczewski's Simple Gamification Framework and Sustainability of Gamification Impact Framework (SGI) as shown in figure 3. This conceptual model is preceded by defining a game of thinking, namely Augmentation - Iterative, which has the intention that play activities will be repeated, using gamification as a substitute for traditional methods with added enhancements. The model is divided into two stages, namely the development stage and the evaluation stage. The Marczewski Framework is used in the development, while the evaluation phase uses SGI. The main concept of Marczewski's gamification design is intrinsic motivation RAMP which consists of Relatedness, Autonomy, Mastery, and Purpose. Marczewski's clearly defines the steps of planning and designing a gamification system [7].

In this study, at the planning stage, the academic administration service system will be gamified. The reasons for choosing a gamification model are to make work activities more fun (motivational), employees more involved and for self-development. Users of this gamification system are Academic Administration employees and students. At the design stage, this gamification model will only use two elements from 4 of Marczewski's design elements, namely the Motivation element used to determine the User / Player Type and the

Feedback and Game Mechanics element used to determine the game mechanics and their components. User types used are Player and Achiever. Player types tend to like feedback, get recognition or status from other users and desire to gain knowledge to develop themselves. While the Achiever type like challenges and will try to overcome these challenges to improve abilities.

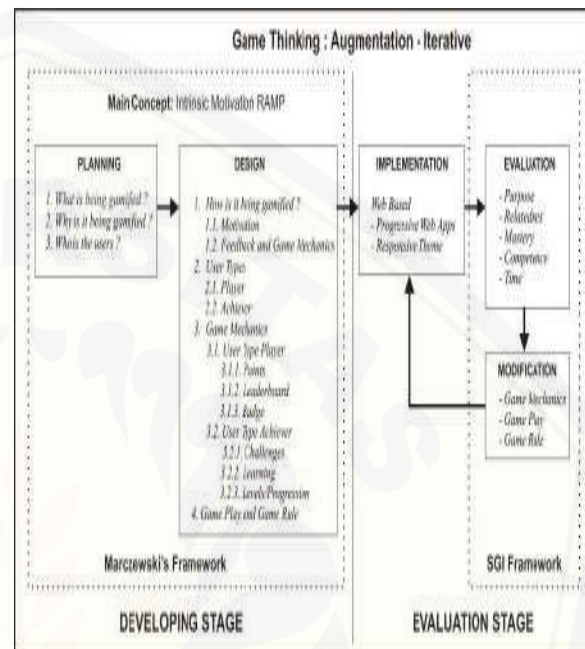


Figure 3. Conceptual Model for Gamification of Sustainable Academic Administration Service System

This gamification of the academic administration service system will involve three game mechanics out of six-game mechanics in the Player type namely Points, Leader Board, and Badges. As well as three-game mechanics from 6 game mechanics on the Achiever player types is namely Challenges, Learning, and Levels/Progression. Points are given that every employee completes service with good feedback. The leaderboard is used to display the rank of the player with the highest points value. Badges are given to players who have earned several points that meet the criteria for the value of the badge. Challenges are made to improve the ability of players and will get points after completing challenges. Learning is used to provide tutorials containing SOPs and knowledge that support the player's self-development, which will get 10 points for completing an assignment at the end of learning. The PLayer type user level is leveled

based on the number of Badges, while the Achiever type is based on Learning. Gameplay and game rules are made as storylines or scenarios of the gamification academic administration service system.

The next stage is implementation; the concept of this model chooses a web based with Progressive Web Apps (PWA) technology because PWA is a mobile site with a responsive layout that has notification features like mobile Apps. PWA is halfway between native and hybrid so that the conditions will be more stable but still up to date according to the actual conditions of hybrid. In the Evaluation stage, SGI can help the designer to evaluate and add to the modified application. SGI is used to analyze the application elements being worked on and identify the parts that need to be added or modified. Furthermore, the analysis results from the evaluation and modification are applied again to have a continuous gamification effect.

CONCLUSION

The academic administration system, which is developed web-based with the gamification model, is expected to be able to handle academic administration service transactions become more enjoyable ones. Game elements in Marczewski's user type Players such as points, badges, and leaderboards can support gamification system users in achieving their goals of increasing user motivation and engagement, as well as increasing academic, administrative service satisfaction, whereas user type Achiever such as challenges, learning, and levels/progression can improve the player knowledge and ability.

Elements in the SGI framework can be used as evaluation material that can improve the sustainability of the gamification system. The concept of this model is expected to increase motivation and engagement of users while at the sametime maintaining the sustainability of the educational administration service system gamification. Universities can use this concept model in order to build an administrative system with a sustainable gamification model. For further research, it can be developed with other userstypewith their different game mechanical.

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Managing High Availability of Strategic IT Service Case Study: BPS-Statistics Indonesia

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ABSTRACT

BPS-Statistics Indonesia delivers an IT Service called BPS Official Website. This website was built to be the single online access to statistical data from BPS. This website should maintain to be always available or have a high availability level of 99.999%. The current SLA of BPS official websites is associated with other IT services based on the web application, server, and database hosting by 97%. The best recommendations are needed to improve the availability of website services in terms of infrastructure, service management, and applications. The research aims to find out the recommendations that can be taken from the service management side. This study uses a gap analysis method between the current condition of the HA operation of the BPS Official Website with the ISO 20000:2011 standard. Determination of the gap between current HA operation condition and ISO 20000:2011 obtained by assessing the assessment worksheet that was built by mapping the HA operation (Terry Critchley) to ISO 20000:2011 processes. The results of this study are recommendations for BPS that can be considered to be taken based on gap analysis results and literature study to manage high availability on BPS Official Website.

Keywords: High Availability, HA, Strategic IT Service, BPS-statistics.

INTRODUCTION

BPS-Statistics Indonesia (BPS) is a National Statistical Office that has the main task to provide trusted statistical data in Indonesia. To do this task BPS provides an Information Technology (IT) service called BPS Official Website. This website was built to be the single online access to statistical data from BPS. Because this website is single online access to statistical data, it became the forefront of BPS service to stakeholders. BPS should maintain this website to be always available or have a high availability level.

The IT infrastructure that supports this website was managed by Data Communication Network Sub Directorate of Statistics Information System Directorate (BPS IT Division). IT infrastructure service of the web application that the IT Division provides to Subject Matter (SM) has a Service Level Agreement (SLA). This SLA is not only for BPS Official website but also for all web applications hosted in BPS Data Center. In BPS, IT Division Infrastructure Service for web applications divided into 3 (three) services, those are Web Hosting Service, Server Hosting Service, and Database Hosting Service. According to the SLA defined, the service availability targets for these services are 97% for Web Hosting Service, 95% for Server Hosting Service, and 95% for Database Hosting Service. According to the IT helpdesk system database collected from January 1st, 2019 until September 30th, 2019, there is 0 overdue ticket over 46 tickets, as shown in Table I below.

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Table 1. IT Service Ticket Overdue (IT Helpdesk Database)

No.	Service Name	Ticket	Overdue
1.	Web Hosting Service	37	0
2.	Server Hosting Service	9	0
3.	Database Hosting	0	0

(Source: BPS IT helpdesk database system, January to September 2019)

SLA of official website was defined with other IT services based on web, server and database hosting. So, there is a problem to make sure the official website service was highly available. If availability measurement based on three IT infrastructure services that support official website service, there are 46 reported problems occurred from January to September 2019 but there is no overdue problem. According to overdue measurement, the official website service was ready to become a high availability service. The problem is how BPS manages this HA to reduce the reported problem to zero. Until now BPS has never assessed the existing HA operations, as a result, BPS does not know what operation to manage HA on BPS official website service.

According to the problem, this study proposed to assess HA operations in managing critical website service. The result of this study is to find a gap in existing HA operation, target operation, and also builds recommendations to fill the gap based on literature studied.

MATERIALS AND METHODS

1. High Availability

ISO 2382:2015 document states that availability is the ability of a device to be in a ready-made condition according to the desired function at a certain time or at any time in a certain time interval and its external source must be available [4]. Koopmann [1] states that high availability is the design of a system protocol and the implementation of a guarantee of certainty of operational continuity within a specified period. Another opinion on high availability refers to the ability of service being functional and accessible with a probability of 99.999% for a given time interval [2]. The percentage illustrates that errors may be caused to be less than 1 second within 24 hours or no more than 1 minute in a period of 1

month. This incident makes the system requires a high level of redundancy and the operational management level is more complicated [3].

2. ISO 20000:2011

ISO / IEC 20000:2011 is a standard of the service management system (SMS). This standard provides specifications regarding group management processes and requirements. The implementation of a coordinated IT Service Management (ITSM) process is the main prerequisite in this standard [5].

ISO 20000-1:2011 is organized into 9 main clauses, clause 1 to 3 only as a basic concept while clause 4 to 9 is as follows:

1. Clause 4: Service management system general requirements, provide a management system, including policies and a framework to enable the effective management and implementation of all IT services.
2. Clause 5: Design and transition of new or changed services, the methodology is known as "Plan-Do-Check-Act" (PDCA) can be applied to all processes.
3. Clause 6: Service delivery processes, ensures that the service being delivered to the clients are of the best quality. It is a set of six processes with the overall responsibility of managing the services delivered by the company. The processes being covered are:
 - Service level management – It manages a definition, an agreement with a customer and monitors the service of levels being delivered to the customers.
 - Service reporting – Its business creates service reports.
 - Service continuity and availability management – It guarantees that service is operable and available at all circumstances to the customers.
 - Budgeting and accounting for IT

services –It plans and monitors the cost spent on the resource used for the service provision.

- Capacity management – It guarantees enough resources are available for service provider and there is no shortage of resources at any time.
 - Information security management – It manages the security of IT services; it also covers the resolution of security incidents.
4. Clause 7: Relationship processes, it is a set of two processes; it manages the relationship between the service providers and the customers.
 5. Clause 8: Resolution processes, it covers two processes for solving defects or dealing with any technical errors or any type of shortcomings while providing services to the customers.
 6. Clause 9: Control processes, it consists of two processes, which work as an
 7. integrated approach for the service

provider’s asset management.

3. High Availability Operations on ISO 20000:2011

The mapping of the HA Operations carried out by Terry Chritley [6] to the processes in ISO 20000:2011 standard. The results of the mapping are shown in Table 2 below.

Table 2. HA Operations to ISO 20000:2011 Mapping

HA Operations ^a	ISO 20000:2011 ^b
Change Management	Change Management
Performance management	Capacity Management
Security management	Information Security Management
Problem determination	Incident Management
Event management	Service Request Management
Fault Management	Incident Management
Problem management	Problem management
Helpdesk architecture and its implementation	Incident and service request management
Resource management	Capacity Management
Service monitor	Capacity Management and availability management
Availability measurement	Availability Management
Disaster recovery (manager DR, assessing type disaster, performing impact analysis)	Service continuity management and availability management
Availability monitor	Availability Management
System resource monitor	Capacity management
Documentation	Service reporting

^{a)} HA Operations [6], ^{b)} ISO 20000:2011 [5]

METHODOLOGY

The methodology used in this study is qualitative. Some of the steps conducted in this research were data collection and data analysis. In general, the process of the stages can be seen from Figure 2 below.

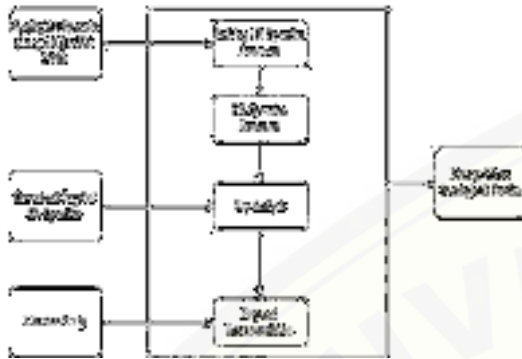


Figure 2. Theoretical Framework

1. Data collection

This study used primary and secondary data. Primary data were obtained by interviews with the person in charge (PIC) of the system and the PIC of infrastructure related to the conditions of the BPS official website, while the secondary data was taken from the literature review about standards used in support of the HA operation. The discussion items are arranged according to the standard guidelines found in ISO 20000:2011. The expected conditions and the HA operating assessment worksheet obtained by mapping the High Availability IT Services Operation by Terry Critchley [8] to the ISO 20000:2011 processes.

Interviews were conducted in October 2019 to 3 (three) of the interviewees as the subject matter (SM). The first SM is a BPS employee who has been working for 19 years since December 2000, as the Head of the Section of Network Services Data Communication Sub Directorate of Data Communication Network. The second SM is employees of BPS who has been working for five (5) years since October 2014, and the third SM is employees of BPS who has worked for 10 years since December 2009 as the staff of the Development Section Data Communication Network Sub Directorate of Data Communication Network.

2. Data analysis

After the interview stage, a gap analysis was conducted to determine the gap between the current conditions with the expected conditions. The results of the analysis phase will be integrated with an existing literature review to obtain appropriate recommendations in accordance with the management of HA operation at BPS Strategic IT Services.

RESULT

1. Current Condition

The current service management condition obtained by the results of interviews with SM1, SM2, and SM3, then mapped to the standard ISO 20000:2011 by the 6 (six) processes as follows:

a. Change management

The results of the assessment found that the change management operations in the management of IT services especially the official website have been carried out. From the interviews with SM1 and SM2, service changes were made based on requests from service managers, when the change requested have a major impact, then a formal or informal meeting needs to be held between the infrastructure team and the service management team. All requests for service changes were made through Halosis application put together the form that had to be filled. The request will be reviewed by the infrastructure team whether it is necessary or not. Meanwhile, the evaluation is only done by a technical team that handles changes in demand. Until now, such changes in demand like this is not documented in the change request document.

b. Service continuity and availability management

BPS official website SLA has not been determined specifically, at this time it referred to SLA for web hosting and cloud hosting which is only 97%. The analysis of Business Impact Analysis (BIA) has been conducted and discussed by the technical team, but not yet documented. Service monitoring reports are performed on each service. Trials and simulations of service continuity such as DRC testing have been done but have not been documented and conducted periodically.

c. Capacity management

The resource capacity provided by the BPS technical team to the customer has been documented, and website-related capacity monitoring is also done using monitoring tools in the data center workspace. However, the results of the monitoring are not documented so that the capacity addition plan never did periodically.

d. Information security management

Based on information obtained by interviews with SM3, no information security policy document existed, the current condition is still a non-formal agreement between the technical team only. In addition, activities such as physical security and its components have also been done but not yet documented, so there is no risk management that makes SLA difficult to define.

e. Incident and service request management

The results of the assessment on the aspects of Incident and service request management found that the incident management process has been carried out by one-stop media called the Halosis application, but there is no classification related to incidents both major or minor, and SOPs for handling it.

f. Problem Management

The results of the assessment have been found that there is no clear policy related to problem management. The policy in question is the identification of problems, recording problems, allocating priority problem solving, classification of problems, updating the recording of problems, escalation of problems, resolution of problems, to close the problem.

2. Recommendations

After gathering the current conditions from the previous stage, a gap analysis was performed, and then formulate some appropriate recommendations obtained from the literature review conducted. The recommendations given are as follows:

1) Change Management

Recommendations were formulated in the form of a standard change management

procedure that must be used by all IT personnel as well as documentation of change management activities, from receiving requests for changes (RFC) to solving the problem of changing official website services. This study also conducted a literature study to obtain additional recommendations related to HA Operation to increase availability. Additional recommendations include [12]:

- a. Making documentation especially for key information from the change management process. The key information is a description of the change, impact analysis, change the classification, risk analysis, and action plan. This documentation is very important to improve and maintain the availability of BPS official web sites.
- b. After the documentation has been done then the person must carry out the process of fulfilling the change request in accordance with the action plan. Therefore, it is also necessary to monitor the change process. From this monitoring, the management can evaluate and ensure the change process is carried out smoothly and smoothly with a minimum impact so that the Official Website Availability is well maintained.

2) Service Continuity and Availability Management

Recommendations can be formulated by BPS to manage the sustainability and availability of services, the recommendations are:

- a. Building a risk assessment of the BPS website by identifying the impact it has on the business and the likelihood of it happening.
- b. Defining SLAs related to the BPS website through 3 stages (Discover Provider, Define SLA and Establish SLA) [11].
- c. All components of the IT infrastructure can be tracked, monitored, including various system metrics, applications, and services [11].
- d. Building a Business Continuity Plan based on ISO 22301 covering the impact on the business, the strategy of activities, roles and responsibilities, as well as periodic BCP review [13].
- e. Performing testing, training and increasing awareness of the Disaster Recovery Plan in stages.

3) Capacity Management

A number of recommendations can be formulated by BPS in managing service capacity. The recommendations are [15]:

- a. Creating SOP documents on service capacity management.
- b. Monitor all resources that support the sustainability of BPS website services and regularly reported.
- c. Analyzing the use of BPS website capacity.
- d. Periodically produce a capacity plan document that includes information on current capacity and predictions of the capacity needed in the future and their impacts.

4) Information Security Management

Some recommendations were formulated including:

- a. Make risk management guidelines, including risk identification guidelines and risk assessment.
- b. Make a risk register contains information of all risk assets (hardware, software, information, human resources, third party agreements, and supporting facilities).
- c. Make an SOP document related to the implementation of background checks.
- d. Make a Non-disclosure Agreement for third parties.
- e. Conduct a security test (Penetration tests) on the BPS website regularly.

5) Incident and Service Request Management

From these gaps a number of recommendations were formulated as follows:

- a. Establish a service catalog document that includes a service description, service SLA, service exclusions, and service person in charge.
- b. Make SOPs related to service requests which include service descriptions, service SLAs, service exclusions, and service providers.
- c. Make an SOP for incident management which includes the process, the person in charge, and the time needed to resolve the incident.

6) Problem Management

A number of recommendations can be formulated by BPS by implement policies regarding problem management because it is one of the important aspects in terms of service provision [7]. The policy can also help the organization in diagnosing the root cause of an incident so that can be proactive in eliminating and managing problems [8]. Several additional recommendations were formulated as follow:

- a. Create SOP document related to the problem of management that is based on the standard ISO 20000:2011 and required to be implemented by the entire IT personnel from the process of problem identification, record-keeping problems, allocation of priority issues, classification issues, renewing registration of issue, problem escalation, resolution problems, until the closure of the problem [15].
- b. Building a Known Error Database to help organizations speed up problem-solving.
- c. Conduct an evaluation of the problems that occur in a certain period to analyze the trend of problems that occurs [15].

CONCLUSION

This study aims to establish the basis for BPS in managing critical services such as websites. The gap analysis above allows BPS to determine where their IT services operate in the ISO 20000:2011 domain, and how their current operations management compares with the best practices of each domain added with other references.

The study result shows that BPS has conducted some best practices in the ISO 20000:2011 domains, but lack in documentation activity. Some recommendations are proposed related to standard operating procedures, report documentation, and policy-related services.

The lessons learned in this study conclude several recommendations for BPS that can be considered to be taken to manage HA critical service on BPS Official Website based on gap analysis results, as follows:

1. Perform a risk assessment,
2. Make an SLA for BPS official website services,
3. Create the BCP documents,

4. Gradually perform the testing, training to all staff of related divisions, and awareness-raising related to the Disaster Recovery Plan.

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Role of Youth in Disaster Risk Reduction in Sinabung Eruption Areas

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ABSTRACT

Since 2010, Mount Sinabung area has become a disaster-prone area, even the Eruption that occurred at Mount Sinabung has been occurring continuously to this day. For this reason, youth participation and role in disaster risk reduction of the Mount Sinabung Eruption are urgently needed. The purpose of this study is to analyze the Effectiveness of Youth's Role in disaster risk reduction of Mount Sinabung Eruption in Tiganderket District, Karo Regency, North Sumatra. This study uses qualitative method with descriptive data exposure. Data collection in this research uses observation, in-depth interviews, documentation studies, and literature studies. The results of this study indicate that the Effectiveness of Youth's Role in disaster risk reduction of Mount Sinabung Eruption in Tiganderket District have not been effective as demonstrated by the level of youth involvement to play a role in disaster management. Youth in Tiganderket Subdistrict was only involved in the phase when the disaster happened. While in the other two phases, namely pre-disaster and post-disaster, the role of youth involvement has not been effective, so that the achievement of disaster management goals is very low. Youth in Tiganderket District (Perbaji, Mardinding and Sukatendel Village) have less involvement in pre and post disaster phase but have quite a lot of involvement when a disaster occurs. After disaster occurs, the youth tend to lack involvement because they choose to work in the field or migrate outside the village to earn money.

Keywords: Youth's Role; Mount Sinabung Eruption; Disaster Risk Reduction.

INTRODUCTION

Mount Sinabung had never erupted since 1600, but was suddenly active again by erupting in 2010 [1]. The last eruption of this mountain has been occurring since June 9, 2019 and lasts until now. In 2013, Indonesian National Disaster Management Agency estimates the impact of losses due to Sinabung eruption to reach more than 1.49 Trillion Rupiah, the amount of losses continues to escalate considering the Mount Sinabung Eruption has been continuing until 2019. There is no clear information when will Sinabung eruption end, making 12 thousand refugees live in uncertainty, in addition to suboptimal relocation by the government. Most of the refugees who worked as farmers lost their

livelihoods due to volcanic materials which covered their agricultural land.

Sinabung Eruption disaster has disrupted the socio-economic life system of the local community. For this reason, the participation of various parties is needed, including the local youth. Youth participation and role in disaster management are needed, especially in the distribution of disaster risk reduction measures. Disaster capacity building activities for youth are equally important in order to create a commitment and accuracy of activities and targets to realize youth preparedness in facing disasters.

Mount Sinabung is located in the highlands of Karo Regency, precisely in Simpang Empat and Tiganderket Sub-districts. Being in the southwestern part of Mt. Sinabung,

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Tiganderket District retains high level of disaster risk. Besides being affected by the distribution of volcanic ash, some villages in Tiganderket are also threatened by cold lava flows that originates from Mt. Sinabung. The position of the Subdistrict with 17 villages directly intersects with the rivers of cold lava. Tiganderket Sub District has an area of 86.76 km and some of its territory is included in the Mount Sinabung red zone [2].

Disaster is a joint affair especially the government as the institution in charge for the implementation of disaster management in accordance with Act Number 24 of 2007 concerning Disaster Management [3]. Youth have a strategic role and function in accelerating development, including in the process of national and state life. Youth play a part in development, including disaster management efforts to maintain regional resilience. Act Number 24 of 2007 concerning Disaster Management, article 33 emphatically regulates the existence of 3 (three) stages in disaster management, namely the pre-disaster stage; which consists of disaster risk reduction activities and disaster preparedness, the stage when the emergency response is a rapid response to help and reduce the suffering of victims during a disaster, and the post-disaster stage, which consists of rehabilitation and reconstruction after a disaster. In fact, the involvement of youth in efforts to eradicate the Mount Sinabung eruption is urgently needed. In Act Number 40 of 2009 article 16 also contains the role of youth in national development [4]. Based on the aforementioned description, researchers are interested in investigating how the Effectiveness of Youth's Role in Perbaji Village, Suka Tendel Village, Mardinding Village which are located in Kec. Tiganderket Karo Regency, North Sumatra.

MATERIALS AND METHODS

This study employs qualitative procedure in which the theory does not function as the concepts being tested, but rather as a means of sharpening data analysis [5]. Judging from the data presentation technique, qualitative research uses descriptive patterns. Descriptive pattern as mentioned by Best is a research method that tries to describe and interpret objects according to what they are. Therefore, in conducting this research the writers use descriptive qualitative

study, because it will obtain the fundamental picture of the development of mind, ideology, and social structure values.

There are three data collecting methods in this study, namely observation, interviews, and documentation. Location of the study takes place in three villages affected by the eruption of Mount Sinabung, namely Perbaji Village, Suka Tendel Village, Mardinding Village located in Tiganderket Subdistrict, Karo Regency, North Sumatra. These three villages were chosen because although they are classified as the Sinabung red zone, the majority of residents in these three villages refused to be relocated. They only fled when evacuated and returned home when things deemed safe.

The informants in this study consisted of key informants and supporting informants. Key informants were chosen intentionally and determined based on criteria that the informant knew with certainty the problem which becomes the focus of this study. Because this research is related to the role of youth in the countermeasure of the Mount Sinabung eruption disaster, the key informant in this study is the informant from the Karo District Regional Disaster Management Agency (BPBD), namely Sarjana Ginting as the Secretary of Karo Regency BPBD, Hasan Tarigan as the Pemaji Village Youth Figure, Jefri Singarimbun as the Mardinding Village Youth Figure, Agustinus Surbakti as the Suka Tendel Village Youth Figure and three people who inhabit the study site.

Through the concept of effectiveness, the role of youth in Act No. 40 of 2009, and Act No.24 of 2007 concerning disaster management, researchers compile a research framework as a basic framework for researchers in conducting research to understand how the Effectiveness of Youth's Role in Mount Sinabung disaster alleviation, researchers pour it in the following picture frame of mind:

Table 1. Effectiveness in alleviating the eruption of Mount Sinabung, Tidanderket Subdistrict, Karo Regency, North Sumatra

Effectiveness	Fulfillment of Objectives	Integration	Adaptation
(1)	(2)	(3)	(4)
The role of youth	Implement efforts of disaster alleviation	Implement counselling process	Adjust to the situation
Disaster alleviation	Pre-disaster, during disaster, post-disaster	Pre-disaster, during disaster, post-disaster	Pre-disaster, during disaster, post-disaster

Table 2. The roles of youth in disaster alleviation

Phase	The roles of youth in disaster alleviation
Pre-disaster	-Prevention -Mitigation -Alertness
During disaster	-Early warning -Emergency response -Emergency aid
Post-disaster	-Rehabilitation -Reconstruction

RESULTS AND DISCUSSION

Disaster Management is a series of comprehensive efforts covering pre-disaster, during disaster and post-disaster. The purpose of disaster management is an effort to reduce the adverse effects of the threat of disaster, the activities undertaken are disaster prevention, emergency response and rehabilitation.

1. Perbaji Village

Perbaji Village is a village that has a high level of disaster vulnerability but has not been successfully relocated by the government, so the rehabilitation effort undertaken by village youth is by helping the community to repair the roofs

of residents' houses that were destroyed by volcanic ash of Mount Sinabung. Usually, the role of village youth is limited to helping prepare Jambur (temporary gathering site), helping to water roofs of houses affected by volcanic ash. The role of youth was also witnessed at the time of the disaster, by helping to make early warning, emergency response and emergency assistance efforts. Pemaji Village Youth made efforts to rescue residents to the capital of the Regency and coordinated for the construction of emergency posts and assisted in the process of emergency assistance by preparing logistical needs while the community lived in the evacuation posts.

After the disaster, many Perbaji village youths began leaving their villages. They went out to look for work because in the village there was no more work they could do. Land had been destroyed as a result of the eruption of Mount Sinabung and they had no more capital to replant their damaged land.

2. Mardinding Village

The pre-disaster phase consists of prevention, disaster mitigation and preparedness in order to minimize the impact of disasters in the form of casualties and property losses. Pre-disaster efforts were not carried out in Mardinding Village because the entirety of Mount Sinabung had not experienced an eruption for more than 600 years and there were no significant signs before the eruption occurred. Mardinding village had a very high level of disaster vulnerability because at one time lava flows and various materials originating from Sinabung could quickly hit. Mardinding Village Youth participated in helping when the Sinabung disaster occurred by coordinating securing the village community to a safer area, assisting the management of posts at the Terung Peren command post and helping to clean the houses of the residents together. Mardinding villagers have evacuated to the Terung Peren post for 4 years.

The post-disaster phase is the recovery period that is carried out after the disaster occurs. During this phase emergency relief, rehabilitation and reconstruction efforts are usually carried out. In this phase the youth of Mardinding Village were less actively involved in groups but were active in the recovery of their respective families by starting to make a living by moving to a safer place whereas the recovery

of livelihood through planting salak pondoh was quite successful in Mardinding Village.

3. Sukatendel Village

Disaster management is not only reactive, which is done after a disaster has occurred; but disaster management can also be anticipatory, namely with carrying out assessments and preventive measures to minimize the possibility of disasters. In Sukatendel Village, there are around 27 houses that are vulnerable to cold lava disaster. In the aftermath of the disaster, village youth participated in the process of cleaning up people’s settlements which were affected by cold lava. The village youth cooperatively participated in an effort to clean up the material carried from Mount Sinabung such as rocks and mud that hit residents' homes. In the phase when the disaster took place, the youth of Suka Tendel Village carried out mutual cooperation that aided the disaster relief efforts.

Suka Tendel Village Youth were only involved shortly after the disaster occurred and were less involved in the recovery period of disaster management. Village Youth prefer to migrate and look for work outside the village, only a small proportion of village youth decide to stay and settle in the village. Ignorance in the process in disaster management is also a strong factor why many young people are not involved when post-disaster management takes place.

Although the level of vulnerability of the region is not too high, it is very necessary to have a thorough understanding of disaster management efforts in the watershed. However, there has not been a serious outreach effort related to this.

Table 3. Effectiveness of the role of youth in alleviating Mount Sinabung eruption, Tidanderket Subdistrict, Karo Regency, North Sumatra

No	Village	Effectiveness of Youth								
		Pre-disaster			During			Post-disaster		
		Active	Passive	Not	Active	Passive	Not	Active	Passive	Not
1	Perbaji	✓			✓			✓		
2	Mardinding	✓			✓			✓		
3	Sukatendel	✓			✓			✓		

Table 4. The Role of Youth in Disaster Alleviation

Phase	The Role of Youth in Disaster Alleviation	On Site Condition
Pre-disaster	-Prevention -Mitigation -Alertness	-Not done -Not done -Not done
During disaster	-Early warning -Emergency response -Emergency aid	-Done -Done -Done
Post-disaster	-Rehabilitation -Reconstruction	-Not done -Not done

CONCLUSION

1. Village youth only have a role to play during a disaster. Therefore, the achievement level of disaster management goals is very low because there are two phases with very minimal results. The integration process in the disaster alleviation of Mount Sinabung eruption efforts is still deficient, this can be seen through their low role in the phases of disaster management. In addition, adaptation efforts are still lacking, characterized by low levels of youth knowledge and not being able to adapt to the current disaster environment.
2. Village youth in Perbaji Village, Mardinding Village and Sukatendel Village have less direct involvement in the pre-disaster phase and have quite a lot of involvement when disaster occurs and after a disaster occurs village youth tend to lack involvement because they choose to work or migrate out of the village.

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Disaster Nursing Competencies in Disaster Management

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ABSTRACT

Background Almost every country is faced with the condition of the lack of the role of nurses in response to disaster management. Therefore, a nurse's competency is needed to compensate for the complexity of the disaster and the impact that may be greater in the future. The global nature of a disaster allows nurses to be prepared with the same competence so that nurses are able to work together in meeting the health needs of the affected population. **Objective:** to explore research on disaster nursing competencies based on the International Council Nurse (ICN) competency framework that has implications for disaster management, both before, during and after a disaster. **Method:** a systematic review using several literature databases on disaster nursing competencies in the past 10 years. The keywords are nurse competence, disaster, disaster nursing, disaster management. These keywords are sometimes used in combination to identify relevant literature. **Results:** the number of available studies increased with increasing disasters. Articles commonly found using the search category "nurse competence and nursing disaster." A total of 15 articles from a total of 205 identified are considered relevant. Themes gained (1) Disaster Nursing Competency Domain; (2) Disaster Nursing in the Curriculum. **Conclusion:** ICN disaster competence is recommended to be developed by each country according to its characteristics. Nurses must be prepared with knowledge, skills and professional attitudes in nursing care to populations affected or at risk of disaster, so disaster education is a priority in the nursing curriculum.

Keywords: competency, nursing, disaster

INTRODUCTION

Republic of Indonesia Law No. 24 of 2007 concerning Disaster Management means disaster is an event or a series of events that threaten and disrupt people's lives and livelihoods caused by both natural and/ or non-natural and human factors, resulting in human casualties, environmental damage, property loss objects, and psychological impacts. Both natural and man-made disasters have a significant effect on the health and physical, emotional and psychological state of community members. To control the possible negative impacts of a disaster, a disaster management strategy must be implemented.

The four main stages in providing appropriate disaster management are mitigation, preparedness, response and recovery. Normally, mitigation and preparedness are carried out before a disaster occurs; the response phase starts during a disaster; and the recovery phase is carried out after the disaster. Nurses play an important role in all phases of disaster management. In order for nurses to respond competently, they must be equipped with skills to provide comprehensive and holistic care to affected populations or those at risk of disaster [1].

Nurses as a health team have a very big role to reduce the risk of disaster. So far, not only in Indonesia but in other countries are also faced with conditions that lack the role of nurses in

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response to disaster management. Therefore, we need a competency from a nurse to compensate for the complexity of the disaster and the impact that may be greater in the future. The global nature of a disaster allows nurses to be prepared with the same competence so that nurses are able to work together in meeting the health needs of the affected population. All nurses are expected to be able to demonstrate this competency.

The purpose of this literature review is to explore research on disaster nursing competencies based on the International Council Nurse (ICN) competency framework that has implications for disaster management, both before, during and after a disaster. The competencies referred to cover 4 areas, namely: prevention / mitigation competencies; preparedness competencies; handling competence; and rehabilitation / recovery competence [2].

METHOD

A systematic review using several literature databases on disaster nursing competencies in the last 10 years from 2008 to 2018 was conducted for this study. The keywords are nurse competence, disaster, disaster nursing, disaster management. These keywords are sometimes used in combination to identify relevant literature.

RESULTS AND DISCUSSION

A total of 205 articles have been reviewed. The amount of research available has gradually increased from 2010 to 2018 along with the increasing number of natural disasters. The most commonly used article was found using the search category "nurse competence and disaster nursing." A total of 15 articles from a total of 205 identified are considered relevant. There are two themes obtained and described as follows:

1. Disaster Nursing Competency Domain

A study conducted by ICN and WHO in 2009 differed from previous studies in several respects. The study reviewed two documents created by Stanley and Yamamoto to develop core competencies in disaster nursing. ICN helps explain the importance of disaster management for nurses and identifies the knowledge, skills

and abilities that nurses must have in each phase of disaster, namely mitigation, preparedness, response, and recovery. Around 130 core competencies were identified from 10 domains. As such, this research helps develop core competencies in disaster nursing and tests the level of competence of nurses. This is understood to be the only framework that has been developed to determine the core competencies of disaster nursing. However, the focus of this study is on general nurses. There has been a gradual development in the core competencies of health service providers, especially nurses. Researchers have developed many core competencies based on specific objectives. For example Walsh outlines the core competencies of having 11 domains, along with 37 sub-competencies. Although much progress has been made in their research, concerns regarding core competencies in triage, transportation and psychological issues remain unexplored. However, a solution was proposed by Schultz, who identified 19 core competencies and more than 90 goals [1]. Using a different methodology, when emergency nurses in Brazil were interviewed about the domain of core disaster management competencies; as a result, five domains were identified with a total of 17 competencies focused primarily on emergency preparedness and response.

2. Disaster Nursing in the Curriculum

The findings of research conducted in Korea provide useful information indicating the need for regular disaster-related education and training programs for emergency nurses so that they can deal effectively with disaster situations and carry out their roles with confidence [3]. Disaster preparedness is an important component of education for health professionals. Students must be adequately educated to successfully carry out their role in disaster as a professional requirement. Higher education institutions are able to make a major contribution to all phases of disaster management. First, these institutions can instill a culture of disaster preparedness and mitigation by developing training curricula, promoting educational opportunities and raising awareness of institutional disaster management plans. Second, academic institutions can conduct relevant research and develop capacity building programs for health care workers and those

involved in humanitarian work [4,5].

Almost all nurses (97%) consider themselves unprepared for disaster [6]. Since ICN launched the Disaster Nursing Competency Framework in 2009, nurses' competencies in this field have been highlighted about disaster preparedness. For example, other research [7] on preparedness and perceived competence in managing disasters consisting of 620 nurses in Texas found that most nurses were not confident in their ability to respond to disasters. According to Al Khalaileh [8], Jordanian nurses consider themselves weak to prepare for disasters and think that additional training will be beneficial. The same problem is felt by Hong Kong nurses and the existence of a lack of understanding of their preparedness needs in connection with disasters [9].

Previous studies showed that nurses believed they were poorly prepared and did not have the training needed to respond to disasters with confidence due to lack of knowledge or skills. Some background data on existing emergency preparedness and disaster training competencies in the allied health curriculum and identifying possible gaps in the existing health curriculum, and exploring the current perceptions of tertiary educators to apply the core competencies of emergency preparedness to their competencies in the curriculum, if not already entered [10].

The findings of this study indicate that disaster education programs using case-based small group learning methods and based on ICN disaster nursing competencies are effective for increasing disaster nursing competencies among nursing students. Therefore, this program can be used as a basis for developing a curriculum for disaster nursing in the future, thereby contributing to the formation and expansion of the role of nurses by increasing their disaster nursing capacity [11]. It must be acknowledged that all nurses, regardless of being educated and trained or not, can be called upon during a disaster and therefore, all nurses must have the minimum knowledge and skills for the appropriateness of their responses [12, 13]. A more serious implication is that involvement in future disaster response can contribute to high levels of stress reactions and mental health problems for emergency nurses. Previous studies have reported that nurses who were previously involved in disaster response had superior experience and knowledge, which resulted in reduced feelings of inadequacy and fear. With a

background of minimal involvement in disaster response, regular disaster exercises will give nurses knowledge of what is expected, realistic expectations and the feeling that they are ready to handle similar situations in the future [14].

Nurses continue their role in providing care and support to those who need physical and mental health. Injured or sick victims or those with chronic illnesses, mental health disorders and disabilities should be monitored to reduce the risk of complications. Referral must be made in accordance with the health service provider, government or aid agency for housing, food, medication, health equipment, specialist services, mental health service needs or long-term, financial assistance to meet the costs of care. The nurse also follows up the survivors to ensure all needs are met [15, 16].

CONCLUSION

A review of this literature reveals that ICN disaster nursing competencies are recommended to be developed by their respective countries according to their characteristics. Nurses play an important role in all phases of disaster management. In order for nurses to respond competently, they must be prepared with knowledge, skills and professional attitudes to provide comprehensive and holistic nursing care to affected populations or those at risk of disaster, so that disaster education is recommended as a priority in the nursing curriculum.

ACKNOWLEDGMENTS

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Land Surface Temperature (LST) for detecting lava flow in Gunung Anak Krakatau, Study Case Eruption in 2018

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ABSTRACT

Gunung Anak Krakatau, located in Sunda Strait categorized in A-type volcano that having eruption in 2018. The character of the eruption is a magmatic eruption in strombolian, deadly and beautiful at once and also having effusive eruption when lava comes out from the summit of the crater. Lava flow activity can be seen from the Pasauran volcano monitoring post, which means that rely on visual monitoring. In this research we try to analyzed remote sensing data obtained from Landsat 8, which is equipped with the thermal infrared band makes it possible to detect changes in surface temperature locally as well as globally. Band 4,5 was used in order to perform NDVI data, then used for calculating the emissivity of the land area. Whereas metadata from band 10 was used to calculate at sensor brightness temperature. Combine the value from that calculation, LST was provided to give the maximum temperature in Gunung Anak Krakatau complex area. The highest temperature from LST has come from the main island, Anak Krakatau Island where the active crater is located. In 2018, GAK starting its eruptive activity in June and the biggest eruption on 23 December 2018 after the tsunami. In September 2018, The highest temperature distribution, 70°C, can be seen from the LST image extending from the crater area to the Southeast. Visual monitoring shows lava is heading towards the sea in that month.

Keywords: Gunung Anak Krakatau; temperature; Landsat 8; remote sensing.

INTRODUCTION

Gunung Anak Krakatau (GAK) or briefly called Gunung Krakatau is one of the active volcanoes in Indonesia, located in the Sunda Strait between Sumatra and Java Island. Its notable name came from a volcanogenic tsunami occurs in 1883 classified as one of the big volcanic hazards. Based on the historical eruption from the Center for Volcanology and Geological Disaster Mitigation the last eruption in 2018 to date occurred on June 25-26, July 16, August 3, August 17, August 23, October 3 and 6, and November 16 and 26. The eruption on July 23, 2018, and September 23, in addition to removing volcanic ash, produced incandescent lava melt, down the slope, leads South and South East to reach the sea (<http://www.vsi.esdm.go.id/index.php/gunungap>

[i/aktivitas-gunungapi](http://www.vsi.esdm.go.id/index.php/gunungap)). With a large number of eruptions per year plus a long history, monitoring of GAK activities is very important. This monitoring is mainly based on the seismic method by deploying a seismometer in volcanic edifice around the crater. Damage to equipment due to high activity is a weakness of the seismic method besides frequent battery theft makes monitoring activities disrupted (<https://news.detik.com/berita/d-4260751/bahaya-aki-seismometer-dicuri-aktivitas-krakatau-tak-terdeteksi>).

The use of remote sensing to monitor volcanic activity has begun to be used in recent years, using data taken from space-borne sensors, such as complexity deformation, distribution of gas and dust emissions, lava flows and changes in heat emissions [1]. The information on surface temperature in the volcano also can be derived to monitor lava flow and lava flow deposits [2].

Landsat 8, which was launched in 2013, brought two imaging sensors, OLI (Operational Land Imager) and TIRS (Thermal Infrared

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Sensor). The OLI sensor consists of 9 bands, including visible, infrared, and infrared shortwave bands with a spatial resolution of 30 meters, while the TIRS has 2 thermal bands not disclosed by OLI with a spatial resolution of 100 meters [3]. By utilizing TIRS that installed on Landsat 8, it is possible to calculate the temperature distribution on the surface, both locally and regionally.

METHOD

ST retrieval from space-borne sensors was determined by the value of surface emissivity and the effect of the atmosphere. Both of them can significantly affect the measurement. [4] later revised in [5] was build a single-channel algorithm that is used to retrieve LST data by calculating radiance value, correcting for atmospheric effect and emissivity value.

The determination of LST is done by utilizing Band 4 which is the Red band (0.64-0.67 μm), Band 5 which is Infrared band (0.85-0.88 μm) in OLI Sensor and Band 10 which is thermal infrared (10.6-11.19 μm) in TIRS sensor. In this study, band 10 is used to estimate brightness temperature, while bands 4 and 5 are used to calculate NDVI.

1. Atmospheric Correction (TOA)

The Landsat-8 OLI were converted to Top of Atmosphere (TOA) spectral radiance, then converted into TOA reflectance. The equation was used to convert DN values to TOA reflectance for OLI data taking into account the angle of elevation the sun using following equation [6] :

$$\rho_{\lambda} = \frac{M_{\rho} * Q_{cal} + A_{\rho}}{\sin(\theta_{SE})} \quad (1)$$

In which ρ_{λ} is TOA planetary reflectance (after correction for solar angle), M_{ρ} is Band-specific multiplicative rescaling factor, A_{ρ} is band-specific additive rescaling factor, and Q_{cal} is quantized and calibrated standard product pixel values (DN).

The atmospheric correction is important related to the multiplicative effect atmosphere can have on the signal recorded by the satellite, influencing data quality. The technique was developed by [7], known as Dark Object Substraction (DOS)

2. Emmisivity Calculation

Calculation of land surface emissivity (LSE) is required to estimate LST since, LSE is a proportionality factor that scales the black body radiance (Plank's law) to measure emitted radiance and it is the ability of transmitting thermal energy across the surface into the atmosphere [8]. The algorithm used to retrieve Land Surface Emmisivity (LSE), developed by [9] known as NDVI, uses NDVI thresholds to derive LSEs from different pixel types (bare soil pixels, mixed pixels, fully vegetated pixels). The value of NDVI then can be used to calculate vegetation fraction, that is the proportion of vegetation cover.

3. Land Surface Calculation

The final step of the LST calculation uses temperature brightness obtained from Band 10 and is then combined with surface emissivity derived from the Vegetation and NDVI Fractions. The amount of LST can be calculated using:

$$T_s = \frac{T_{sensor}}{1 + (\lambda \times \frac{T_{sensor}}{\rho}) \ln(\epsilon)} \quad (2)$$

In which T_s is LST in celcius, T_{sensor} is brightness temperature at sensor, λ is the average wavelength of band 10, ϵ is emissivity. Calculation of ρ using equation 3 below.

$$\rho = \frac{hc}{j} \quad (3)$$

In which h is Plank's constant (6.626×10^{-34} Js), c is the velocity of light (3×10^8 m/s), and j is Boltzman's contant (1.38×10^{-23} J/K).

RESULTS AND DISCUSSION

The Krakatau complex consists of four islands which are Sertung, Panjang, Rakata, and Anak Krakatau. Sertung, Panjang, and Rakata Island are the remnants of the caldera collapse due to the 1883 Krakatau

eruption. Since its emergence in 1929 until now, it has erupted at least 80 times. In other words, the eruption of which has occurred every year in the form of explosive or effusive eruptions. The time of the volcano is between 1 - 8 years but the eruption can occur 1 - 6 times a year [10]. The center of activity is on the main island, Pulau Anak Krakatau, which is differentiated by higher surface temperature

compare with another island in the Krakatau complex area. The maximum temperature of the GAK crater in August 2018 reach 50°C and 25°C for the other island. This high temperature is related to eruption activity that occurs in 3, 17, and 23 August 2018. In September 2018, the maximum temperature increase until 70°C. This increasing temperature possibly due to the product eruption that flowing down to the southern flanks and entering the sea. The spot that indicates the high temperature in the LST map of September 2019, showing a long pattern than in the August 2019.

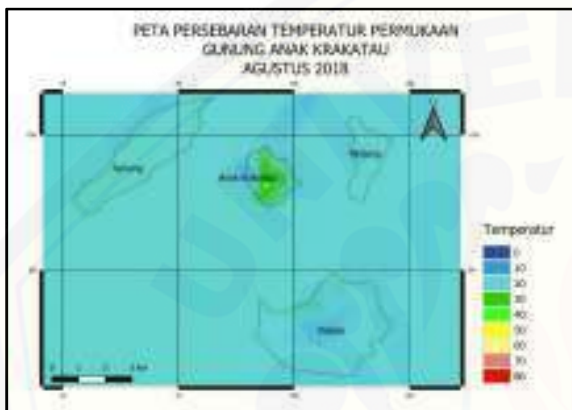


Figure 1. Retrieval LST for Krakatau Complex area, August 2018

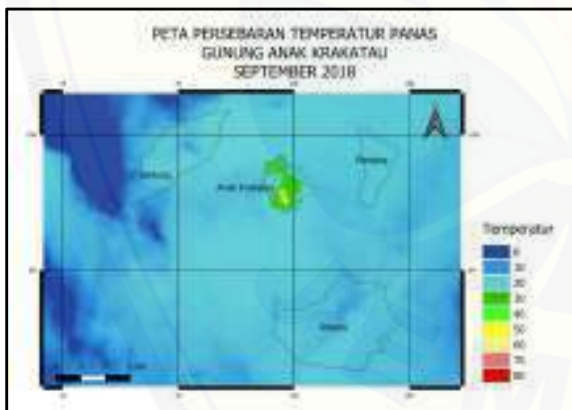


Figure 2. Retrieval LST for Krakatau Complex area, September 2018

CONCLUSION

LST retrieval from Landsat-8 OLI and TIRS sensor can be used to monitor the change of physical in the volcanic edifice especially related to the lava flow. Since the level activity of the volcano as a function of internal conditions that result in changes in surface temperature, this

method is felicitous to help a monitoring system for volcano particularly located in a remote area.

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Seismic Ray Tracing for Subsurface Structure Modelling of the Arjuno-Welirang Outflow Zone

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ABSTRACT

This paper presents results of ray tracing modeling to simulate the propagation of seismic waves on a layered medium to get a description of the structure of subsurface bedding. This model is expected to be used for the development of a continuous monitoring strategy for Arjuno Welirang seismic activity. This paper presents the results of a preliminary study of the Arjuno-Welirang subsurface structure in the outflow zone of the cangar geothermal using the seismic ray tracing method. Subsurface structure can be determined by calculating seismic wave travel time using the ray tracing method based on visualizing the curves of travel times versus the hypocenter locations distribution. According to the results and discussion, it has been obtained that travel times curves are compatible with the initial layer model. The display of travel times curves shows that there are two subsurface layers with the boundary layer at 900 m from sea level. The ray tracing algorithm is implemented by matlab programming in the two layer 2d models.

Keywords: outflow, cangar geothermal, seismic, ray tracing, hypocenter distribution, travel time, matlab.

INTRODUCTION

On 7 February 2018, after 66 years of dormancy, the Arjuno Welirang volcano showed increased activity in the presence of type-A volcanic earthquakes, which indicated that magma was moving towards the top of the channel. Visually, the appearance of a smoke eruption coming from a different side from the crater was previously seen. The occurrence of solfatara and fumarole with magmatic gas shows the existence of a geothermal system that is volcanohosted beneath the surface. The heat source and the upward flow zone are below the peak of Mt. Welirang is associated with andesite.

Na / K and Na / K / Ca geothermometers were applied to estimate the highest and lowest temperatures and were obtained in the range of 217 ° C to 305 ° C. The increased volcanic activity of Arjuno Welirang can trigger a large impact on organic rich sediments from the underground surface of Lusi's sedimentary basin. Converging geochemical data indicate that the plumbing system of the Lusi eruption site is connected at depth with the Arjuno-Welirang volcanic complex. These data support a scenario where hydrothermal fluids from the volcanic system migrated in the sedimentary basin triggering metamorphic reactions in the organic-rich sediments that ultimately resulted in a venting system at the surface. After eleven years of incessant activity this venting system remains constantly fed by the fluids from the volcanic complex and became world known as "Lusi", the

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largest ongoing clastic geysiring system on Earth Inguaggiato, S., *at. all*, 2018)..

The increased volcanic activity of Arjuno Welirang which has been recorded must still be updated to keep its relevance following the dynamics of volcanism (Goertz, *et all*, 2016). Several geophysical studies have been carried out in the Cangar geothermal area to investigate subsurface conditions, such as self-potential (SP), magnets, gravity, geoelectric, seismic, magnetotelluric, etc. Because this area is a vocano hosted geothermal, it is necessary to conduct geophysical research, especially seismic continuously, to monitor Arjuno-Welirang volcanic activity and determine whether it is related to Cangar hydrothermal activity and to mitigate volcanic hazards. Little information is available about seismic activity in this area. Most research has investigated the potential for geothermal and subsurface structures. The study of the occurrence of micro earthquakes at geothermal locations can provide insight into the rock gap system that regulates fluid migration in the geothermal field (Marynto, 2018).

This paper presents the results of a preliminary study of the Arjuno-Welirang subsurface structure in the outflow zone of the cangar goethermal using the seismic ray tracing method. This paper presents results of ray tracing modeling to simulate the propagation of seismic waves on a layered medium to get a description of the structure of subsurface bedding. This model is expected to be used for the development of a continuous monitoring strategy for Arjuno Welirang seismic activity.

MATERIALS AND METHODS

Ray tracing is needed in calculating the wave travel time from the source to the receiving station. Ray tracing is an important part of several methods or algorithms in geophysics, such as tomography and hypocenter determination. Earthquake location (hypocenter determination) in heterogeneous structures requires the accurate and fast solution of two-point ray tracing (Jean Virieux *at. all*, 1988). This paper presents ray tracing method using a shooting algorithm. This method applies Snell's law to determine the angle of incidence and transmission at each boundary layer of the seismic wave velocity, shown in the figure 1. Snell's Law of wave refraction is expressed by

equation 1 (Aki and Richards, 2002).

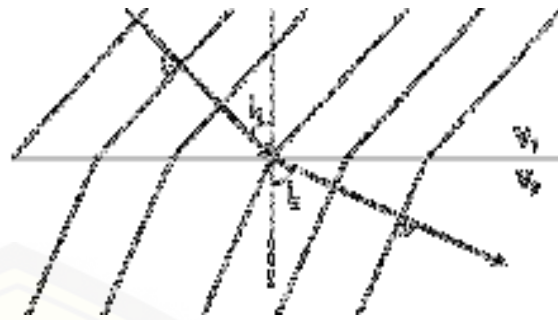


Figure 1. Snell's law of wave refraction $v_1 < v_2$ (Peter Bormann *at.all*, 2012)

$$\frac{\sin i}{v} = s \sin i = s_x = \frac{1}{v_{app}} \equiv p = \text{constant} \quad (1)$$

where i is the angle of incidence, measured between the ray and the vertical (see Figure 1), v is the velocity of wave propagation in the medium, $s = 1/v$ is called slowness, and p is the so-called ray parameter, $v/\sin i = v_{app}$ is the apparent horizontal wave propagation velocity in x -direction and $s_x = 1/v_{app}$ is the horizontal component of the slowness vector s . Note, however, that p is constant for laterally homogeneous media only.

In Figure 1 the refraction of a seismic wavefront and of a related seismic ray across the interface of two half spaces with different but constant seismic velocities v_1 and v_2 is sketched. Such an instantaneous velocity jump is called first-order discontinuity. Because the ray parameter must remain constant across the interface, the ray angle has to change, as equation 2.

$$\frac{\sin i_1}{v_1} = \frac{\sin i_2}{v_2} = s_1 \sin i_1 = s_2 \sin i_2 \quad (2)$$

The shooting method determines the ray path by treating it as an initial value problem, with a specified starting point and trial propagation direction, and then iteratively adjusting the propagation direction until the target end point is reached, as shown in figure 2 (Wenzheng Yang, 2003). The shooting method fixes one end of the ray path (source point), and takes initial incidence angle i_0 and initial azimuth j_0 , and then uses raypath equation to find the coordinates of

another end point (station).

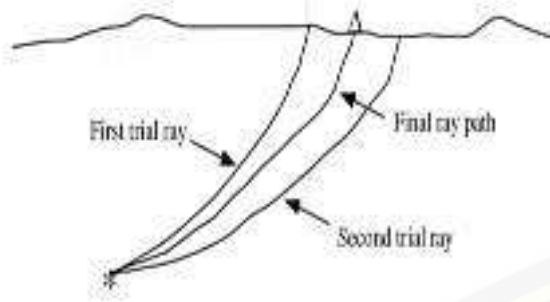


Figure 2. The ray tracing shooting algorithm determines the ray path iteratively to adjust the direction of propagation until the target endpoint is reached (Wenzheng Yang, 2003)

The ray tracing algorithm is implemented by matlab programming in the two layer 2d model. From the input position of 7 recording stations, the position of the earthquake source and the speed at each layer, the seismic wave travel time output obtained at each station. the location of the hypocenter is varied vertically and laterally, each 10 variations with respect to the position of the station. This variation is to determine the effect of layer boundaries on wave propagation time presented in the travel time graph as a function of depth. The coating model is designed based on Arjuno Welirang's geothermal conceptual model in the outflow zone of Cangar hot spring (circled in red) as shown in Figure 3.



Figure 3. Cross-sections of Arjuno-Welirang geothermal area (Tim Survey Geologi PSDG, 2010)

RESULTS AND DISCUSSION

The results of ray tracing modeling are shown in Figure 3 shows a seismic trace from the hypocenter location at -600 m depth from sea level. Ray tracing programming is implemented with matlab 7. There are 11 ray tracing displays based on 11 variations of hypocenter locations.

The eleven results of ray tracing are presented in table 1. The surface topography model is adapted to the topography of the arjuno wlirang outflow zone in the cangar hot spring area. The vertical axis represents the position of depth and the horizontal axis represents the lateral position. The seven earthquake recording stations are represented by triangle markers placed on Receiver1(3700.1650) m, Receiver2(3200.1590) m, Receiver3(2000.1600) m, Receiver4(1200.1620) m, Receiver5(500.1530) m m, Receiver6(4800,1700) m, and Receiver 7(6000,1800) m. The red line represents the seismic wave paths from the hypocenter to the surface and recorded by each station.

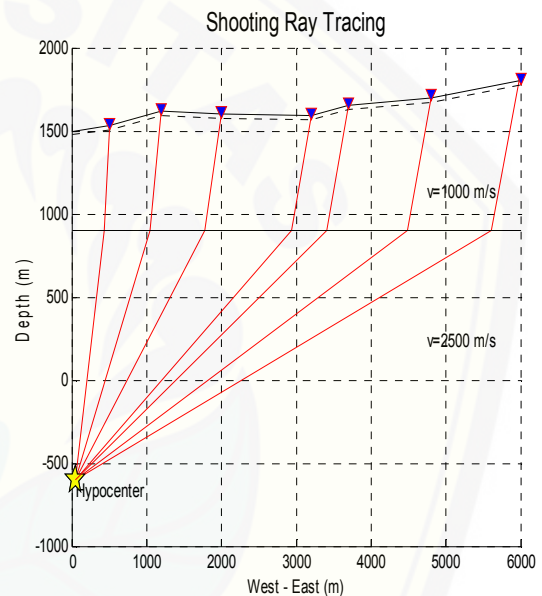


Figure 4. Ray tracing seismic waves from the hypocenter (50,-600) m to each station

Based on the propagation of these waves can be determined travel time seismic waves from the hypocenter to each station. Table 1 presents the seismic wave travel times in the two-layer subsurface model, respectively from top to bottom, having speeds of 2500 m / s and 1000 m / s. H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, and H11 express the lateral and vertical position of the hypocenter where the lateral position of all hypocenter is fixed at 50 m. Vertical position states the depth of the hypocenter below the surface expressed by the altitude position of sea level, respectively -600 m, -100 m, 400 m, 500 m, 600 m, 700 m, 800 m, 900 m, 1000 m, 1100 m, and 1200 m.

Table 1. Travel time seismic waves from the hypocenter to each station

Receiver	Travel Time (s)										
	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11
Receiver1 (3700,1650)	2.27	2.20	2.16	2.14	2.14	2.16	2.16	0.81	0.789	0.77	0.7666
Receiver2 (3200,1590)	2.04	1.96	1.91	1.90	1.90	1.89	1.89	0.75	0.725	0.71	0.6958
Receiver3 (2000,1600)	1.64	1.53	1.44	1.44	1.43	1.42	1.41	0.76	0.736	0.72	0.7076
Receiver4 (1200,1620)	1.45	1.29	1.17	1.15	1.14	1.12	1.12	0.78	0.757	0.74	0.7312
Receiver5 (500,1530)	1.25	1.06	0.88	0.84	0.81	0.78	0.76	0.68	0.661	0.64	0.6248
Receiver6 (4800,1700)	2.73	2.67	2.63	2.63	2.63	2.63	2.63	0.87	0.843	0.82	0.8195
Receiver7 (6000,1800)	3.27	3.23	3.23	3.21	3.20	3.16	3.27	0.98	0.951	0.93	0.9254

Furthermore, based on table 1 it can be plotted the travel time curve versus the depth of the hypocenter as shown in figure 4. Figure 4 shows curves consisting of travel times curves recorded by Receiver1 (3700.1650) m, Receiver2(3200.1590) m, Receiver3(2000.1600) m, Receiver4 (1200.1620) m, Receiver5 (500.1530) m, Receiver6 (4800,1700) m, and Receiver 7(6000,1800) m. At the boundary layer which is at an altitude of 900 m, there is a drastic

change in the travel time curve for all records. this shows that the calculation of travel time by ray tracing method can describe the structure of the subsurface layer by using some input data of the hypocenter location.

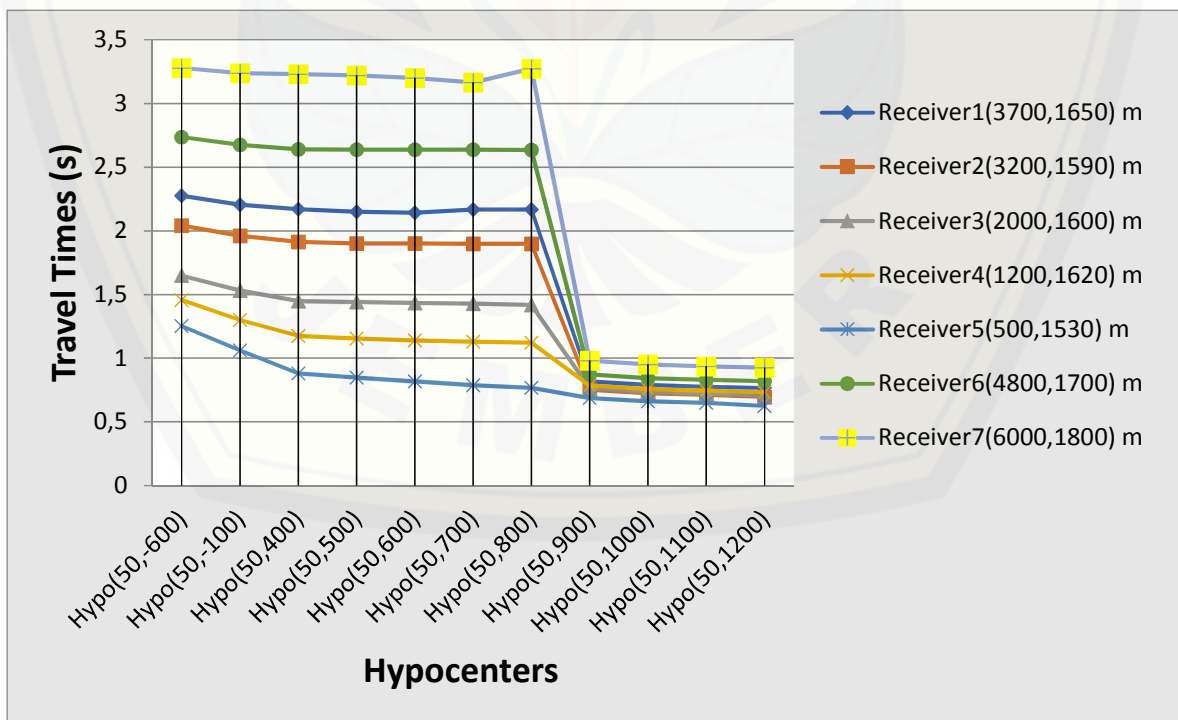


Figure 5. Travel time curve for all records

CONCLUSION

Subsurface structure can be determined by calculating seismic wave travel time using the ray tracing method. Based on the results and discussion, it has been obtained that travel times curves are compatible with the initial layer model. The display of travel times curves shows that there are two subsurface layers with the boundary layer at 900 m from sea level.

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Optimization of Solar Cell as Alternative Energy in Water Treatment Plant

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ABSTRACT

This study explains the development of biodigester reactor wastewater purification technology in water treatment using solar cells. This technology uses a 1-phase pump as an aerator input to make a microbubble from a microbubble generator. The pump used is a 1 phase pump with a 220 Volt input voltage. In this system, solar energy will be applied as an alternative energy to replace the fossil energy. The solar energy is new renewable energy (EBT) which can be used as an alternative energy power plant replacing fossil energy or supply from Perusahaan Listrik Negara (PLN). It can save the environment from pollution of fossil energy like CO_x, SO_x, NO_x and particulate matter (PM) from the fossil. By using Pulse Width Modulation (PWM) as a speed regulator reference on a coconut grated machine, optimal results are obtained in the lattice process. From the research it was found that the installed solar cell can produce an average power at 08.00 WIB is 4.86 Watt, and at 12.00 hours it gets a maximum power reaching 5 Watt. Speed regulation using Pulse Width Modulation (PWM) is obtained when the maximum current reaches 0.38 A, on a machine without a load the speed is 3724 Rpm and when loading the speed reaches 2926 Rpm.

Keywords: Solar Cell; Speed; Pump 1 fasa; Pulse Width Modulation; Power.

INTRODUCTION

Solar energy is an unlimited source of energy and will never run out of availability and this energy can also be used as an alternative energy that will be converted into electrical energy, by using solar cells. Solar Panel as an alternative source of electrical energy can be utilized by people who need electricity, but constrained by the unavailability of electrical energy from (PLN)^[1].

In wastewater treatment plants, aerobic biochemical reactors are the most important processes in the waste treatment process, where the supply of oxygen needed by microorganisms is often a problem for the process of degradation of organic matter, so the overall wastewater treatment rate becomes small. Therefore the need for oxygen supply in wastewater treatment so

that the degradation process can run well and quickly.

PWM (Pulse Width Modulation) is a way to manipulate the signal width with pulses in one period, to produce a different average voltage. PWM (Pulse Width Modulation) has a large pulse width (duty cycle), it will affect the speed of the motor rotation and if the value of the duty cycle is small, the motor will move slowly. The current entering from the inverter to the PWM (Pulse Width Modulation) also affects the motor speed as an input for the aerator.

METHOD

1. Pompa Shimizu 220 Volt

Water treatment plant is a tool used to help or facilitate human work in the case of coconut solubility. Shimizu pump image with a maximum power capacity of 200 watts with a speed of 2800 RPM is shown in Fig 1. Below:

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Specifications consist of:

1. *Type* : B-200
2. *Voltage* : 220V/50 Hz
3. *Speed* : 2800 rpm
4. *Power Input* : 200 W
- Current* : 1,1

2. Photovoltaic

Sunlight shining on the earth can be converted into electrical energy through a process called photovoltaic (PV). Photo refers to light and voltaic refers to voltage. This terminology is used to describe electronic cells that produce direct current electrical energy from solar radiant energy. Photovoltaic cells are made from semiconductor materials, especially silicon, which are coated by special additives.

If sunlight reaches the cell, electrons will be separated from the silicon atoms and flow to form electrical circuits so that electrical energy can be generated. Solar cells are always designed to convert light into electrical energy as much as possible and can be combined into series or parallel to produce the desired voltage and current [6]. Monocrystalline solar cell picture can be shown in Fig 2.



Figure 1. *Sollar Cell Monocrystall*

Specifications consist of:

1. *Module type* : SP-50-M36
(Monocrystalline)
2. *Rated max.power* : 50 W
3. *Current at Pmax (Imp)* : 2.76 A
4. *Voltage at Pmax (Vmp)* : 18,1 V
5. *Number of cells* : 36
6. *Max. System voltage* : 700 V
7. *Temperature range* : -45°C~+80°C

3. Solar Charger Controller

Solar Charge Controller is an electronic

device used to regulate the direct current that is charged to the battery and taken from the battery to the load. The solar charge controller regulates overcharging and excess voltage from the solar cell. The solar charge controller applies Pulse Width Modulation (PWM) technology to regulate the battery charging function and release the current from the battery to the load. 12 Volt solar panels generally have an output voltage of 16-21 volts [7]. Figure Charger Controller shown in Figure 2.3.



Figure 3. *Charge Controller*

Specifications consist of:

1. *Application* : Solar System Controller
2. *Rated voltage* : 12 V 24 V Auto
3. *Current* : 30 A
4. *Power* : 390 W (12 V);780 (24V)

4. Accumulator

The battery in PLTS functions to store the electric current generated by solar panels before being used to operate the load. The load can be a refrigerator lamp or electronic equipment and other equipment that requires DC electricity. Accumulator or commonly called battery/battery is one of the important components in motor vehicles. Besides functioning to drive the starter motor, the battery acts as a store of electricity and at the same time as a stabilizer of the vehicle's voltage and electric current [4]. Figure Accumulator can be shown in Fig 4.



Figure 3. Accumulator

Specifications consist of:

1. Voltage : 12 V
2. Capacity : 35 Ah

5. Inverter

Inverter is an electronic device that functions to change from a direct current (DC) voltage source to alternating current (AC) with the magnitude of the voltage and frequency can be adjusted [9]. Inverter images can be shown in Fig 5.



Figure 4. Inverter

6. PWM (Pulse Width Modulation)

Pulse width modulation (PWM) in general is a way of manipulating the signal width expressed by pulses in a period, to obtain a different average voltage. Some examples of PWM applications are data modulation for telecommunications, controlling power or voltage entering the load, voltage regulators, audio effects and amplification, as well as other applications [8]. PWM images can be shown in Fig 6.



Figure 5. PWM (Pulse Width Modulation)

Specification consist of:

1. Voltage : 220 V
2. Current : 16 A

The Solar Panel used is a Solar Panel with a capacity of 70 Wp and has a Mono-crystalline type. In the second step that needs to be done is the installation of the Solar Charger Controller. By connecting the Solar Panel on port 1 and the battery on port 2 and the load on port 3. After the first and second stages are carried out, now in the third stage is connecting the inverter on the solar charger controller port 3, due to the direct current / DC that is delivered by the Solar Panel must be changed first to alternating current / AC. After that, it is connected to PWM (Pulse Width Modulation) then to the load that has been prepared.

Before the load is turned on the Solar Panel will first charge the battery, then after the load is turned on the solar charger controller automatically divides the current coming out of the Solar Panel to the battery and the load, if there is an overload the solar charger controller will automatically use all the energy in the Solar Panel and batteries to the load. Testing is done by taking a sample of current (Ampere) and voltage (Volt) Solar Panel and PWM (Pulse Width Modulation) and take a sample of motor speed at the water treatment plant.

RESULTS AND DISCUSSION

1. Testing for Solar Cell Module

The use of solar cells is very dependent on exposure to sunlight, in this thesis uses a type of solar cell monocrystal. Measurements were made at Polytechnic State of Cilacap. The height of a place from the surface of the sea, fog (thick cloudy), air temperature/humidity, air pollution levels and the intensity of sunlight are things that

greatly affect a value of voltage and current generated by the solar cell.

In addition, the slope of the solar cell can also determine the power generated by the solar cell. The slope position of the solar cell can be adjusted manually following the movement of the direction of the sun at certain times/hours. And when around noon the sun can be captured to the maximum. At that time the accumulator/battery will be quickly filled and the water treatment plant can be used with a slow speed or with a fast speed.

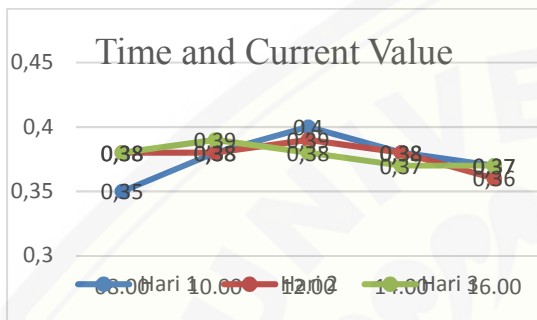


Figure 6. Graph for Comparing Time and Current Value of Solar Cell

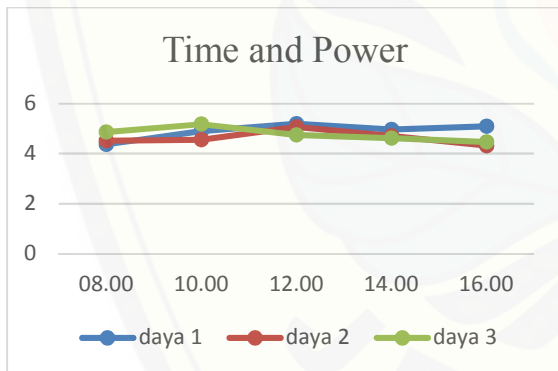


Figure 7. Graph for Comparing Time and Power Input of Solar Cell

Based on data measurements that have been made show that the nominal voltage of the solar cell fluctuates depending on the intensity of light and time. The more hot sunlight, the nominal power increases. It can be seen that the average power generated at 08.00 WIB is 4.86 Watt and at 12.00 WIB gets the most optimal output that is 5 Watt.

Solar cell test results show that with a solar

cell following the direction of the sun's movement will get greater results compared to solar cells in a horizontal position (silent), this is because the solar cell when following the direction of the sun's movement will always place the solar cell to stay facing the sun so that the solar cell will capture sunlight to the maximum.

2. Testing for Pulse Width Modulation

PWM (Pulse Width Modulation) is a way to manipulate the width of the signal with pulses in one period, to produce a different average voltage. In PWM (Pulse Width Modulation) square wave, a high frequency that has a frequency range of 50 Hz. The range of pulses in PWM is 0-255. When PWM (Pulse Width Modulation) has a large pulse width (duty cycle), it will affect the speed of the motor rotation and if the value of the duty cycle is small, the motor will move slowly.

This motor speed will affect the results of grated coconut. When a water treatment plant with a fast speed will produce nice circulation in, but when a water treatment plant with a slow speed it will not going well.

Based on the test data that has been obtained shows that the current entering from the inverter to the PWM can affect the speed of the water treatment plant that has a load or no load. This can be seen when the current entering from the inverter to the PWM of 0.15 A has a no-load water treatment plant speed of 789 Rpm, and a load of 628 Rpm, and when the current entering from the inverter to the PWM of 0.2 A has a no-load water treatment plant speed of 2677 Rpm, and weighs 1084 Rpm.

Table 2. Result of Testing Pulse Width Modulation with Load and Without Load

No	Current (mA)	Volatge (V)		Speed of Motor (RPM)	
		Without Load	With Load	Without Load	With Load
1	0,05	39	34	0	0
2	0,1	52	52	0	0
3	0,15	66	62	789	628
4	0,2	87	77	2677	1084
5	0,25	94	130	2741	2456
6	0,3	207	213	2879	2973
7	0,35	229	230	2980	3090
8	0,38	233	231	3724	2926

CONCLUSION

Based on the results of the design, manufacture, and testing of the system that has been done, the following conclusions are obtained:

1. Generated a water treatment plant design with a solar cell source. Based on the test results, the power obtained is 4.86 Watt and gets an optimal output of 5 Watt.

When the maximum current reaches 0.38 A, on a machine without a load the speed is 3724 Rpm and when it gets a load the speed reaches 2926 Rpm.

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Prototype Of Data Logger As A Wind Energy Monitoring

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ABSTRACT

The need for fossil energy is increasing every year. Not only in the sector of community needs, but there are still many power plants in Indonesia that are still dependent on non-renewable energy. Therefore, there is a need for innovation to utilize a large number of renewable energy sources. Wind energy is one of renewable energy source that considered a hope as a clean and sustainable energy. To be able to optimize the potential of wind energy, a system must be designed that is continuously able to carry out the process of monitoring wind energy data. . The use of a data logger can help provide a solution to the technological needs that are suitable to be applied in mapping energy potential. The types of sensors used in this study include anemometer and wind direction as a measure of wind energy potential, and also solar power sensors and BME280 as a measure and monitoring of solar energy potential. The sensor data stored is around 4,320 data per day presented in CSV file format. The experiment was carried out for 5 days, producing the highest average wind speed data on day 4 with a speed of around 10 m / s at 8 AM.

Keywords: Wind energy; Data logger; Energy Monitoring; Renewable energy.

INTRODUCTION

Wind is the flow of air in large numbers arising from differences in air pressure around it. The wind moves from high pressure to low pressure. Displacement of air will move and produce a certain speed. Wind movement can occur horizontally or vertically with dynamic and fluctuating speeds. Wind is a type of renewable energy source that has the potential to produce electricity. Almost every place in Indonesia has good wind potential, especially in coastal areas.

The renewable energy sources such as wind, solar, geothermal and biomass are utilized by an electrical energy producer. The wind energy has meaningful advantages with respect to other sources in terms of installation and generation costs.

A group of wind turbines in the same location is known as a wind farm and it is used to provide electricity. The wind energy is converted to electrical energy by the use of a generator. Wind turbine structure of the three-bladed turbine [1]. Wind power generation is a power plant that uses wind as a primary energy source to produce electricity. This power plant converts wind energy into electrical energy using wind turbines and generator. The electricity generation system using wind as an energy source is an alternative energy system that is very rapidly developing, considering that wind is one of the unlimited energy in nature [2].

Traditionally wind energy is not dispatched. When wind is available the turbines must work and power produced must be connected to the grid. This is the normal "modus operandi". However due to the growing of power installed in this technology, grid integration must be more controlled and motive of special careful by the system operator [3]. Another important issue is the competitiveness of wind energy with other power plants. To reach that in the near future,

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enhancements of availability, reliability and life time of the turbines will be required [4]. Good predictive maintenance strategies are needed and can't be based only on periodical or preventive maintenance actions recommended by the manufacturers. In spite of being good guidelines for the maintenance of aero generators, they do not focus on the specific characteristics of the real and local life of them [5].

In the wind turbine industry, the most conventional method for developing maintenance strategies is the maintenance plan with reliability, which is based on the preventive maintenance based on the monitoring of the performance and the related and its follow-up action. In this procedure, the results of the condition monitoring (CM) will be used to determine the optimization point between the revised maintenance strategy and the scheduled maintenance strategy. The most frequently used condition monitoring technology is [6] the vibration and sound control technology of the wind turbine and the operation and maintenance technology, [7] the blade strain gage monitoring technology.

High current charging, high cycle and no memory effect of the battery characteristics are very suitable for wind turbines unstable, discontinuous power generation characteristics. Monitor the charge-discharge current and voltage of the battery, calculate the charging efficiency, and measure the battery voltage of each unit. Make sure that the battery voltage does not exceed the minimum discharge voltage and the maximum charge voltage. And use the interface to display the current battery status is conducive to maintenance personnel to check and judge [8].

MATERIALS AND METHODS

Real-time system monitoring of wind energy conversion system conditions requires a detection system that can work continuously, process data and send data to users. Monitoring is done to know the performance of wind energy conversion system from long distance. The sensor data recorded by the data logger, and then transmitted from the location to the data user. All materials and methods that have been used in the work must be stated clearly and subtitles should be used when necessary [2].

1. Wind Energy Sensor

Anemometer construction generally has 3 propellers. The position of the blades also varies, some are horizontal and vertical types. Vertical type anemometers are the most commonly used. This is because this type can detect wind speeds coming from various directions. The output signal from the anemometer is a digital signal with logic 1 and 0. The anemometer will produce a signal impulse every one rotation period. Wind speed reading is done by calculating the duration of time or the gap between signal impulses. The faster the anemometer turns, the smaller the gap between the signal impulses on the anemometer.



Figure 1. Anemometer Sensor

Table 1. Anemometer Specification

Inspeed Vortex Anemometer	
Type	3-cup rotor
Pole	1 pole (pulse/rotation)
Diameter	160 mm
Speed range	1,34-67 m/s
Accuracy	4% at 4,47-22,35 m/s

Anemometer used in this study as shown in figure 1 is Inspeed Vortex Anemometer with a type of VAWT (Vertical Axis Wind Turbine) and 3-cup blade. So that changes in wind direction do not have a big enough effect on the reading of wind speed. This sensor is able to capture the wind that blows from any direction. Range of wind speeds that can be detected between 1.34-67m / s with an accuracy of 4% as shown in table 1.

2. Wind Direction Sensor

Wind Direction Sensor as shown in figure 2 is a tool that can determine the direction of the coming wind. Wind is a vector that has direction and magnitude. Wind direction sensor can read wind direction and find out how big is the angle of the wind.



Figure 2. Wind Direction Sensor

3. Data Logger Of Wind Energy Monitoring

Data logger is a device that functions to acquire data within a certain time period and stored in a Secure Digital Card (SD Card). This device consists of 2 modules, namely the RTC module (Real Time Clock) and the SD Card module as shown in figure 3. The RTC module is used as a timer that supports the process of monitoring and storing data continuously and in real time [9]. SD Card module devices are used as data storage media. Data loggers are widely used as research instruments that require data recording in a certain period of time for research purposes.

The data logger system is independent of the device it is connected to. This makes it capable of recording all data required without the possibility of missing any interval. It creates an organized log which allows the user to identify the time of a fault in the system by saving the appropriate data memory. A record of every single condition is produced utilizing at least a recorded copy [10].

In [11] a data acquisition system is described components such as sensing unit, signal filtering unit, computing unit and display unit are used. The data logger system acquires particular environmental and physical parameters using several different sensors, performs signal conditioning on them and computes the actual value for display purpose [12].



Figure 3. Wind Energy Data Logger

Data logger works by storing data obtained from sensors. The storage media used are SD card modules. Data will be automatically saved on the SD card within a specified time interval. The storage format used is .CSV. The data generated can be transferred to a computer / laptop for further processing using Microsoft Excel software. This is to facilitate the analysis of the data generated. Thus, reading data becomes more effective and faster.

This data logger device uses an internal power supply in the form of a lithium-ion battery. This type of battery has a large enough capacity and can be recharged. This battery recharging media utilizes electrical energy produced by solar panels. Implementation of wind energy data logger shown in figure 4.



Figure 4. Implementation Of Wind Energy Data Logger

RESULTS AND DISCUSSION

1. Wind Sensor Experimental Results

Wind speed data is taken from the recording data on SD card memory. Data sampling is done every 20 seconds. Data acquisition in one full day can reach around 4,320 data lines. This data is then processed and plotted in a graph to see the characteristics obtained.

Data in the form of wind speed are then converted to the production of hourly power (Wh) using a windmill or wind turbine (WT) as a reference for power conversion. The result of the power obtained is theoretical power by assuming using a windmill type TSD-500 cogging less generator

Wind speed data is filtered in advance to adjust the cut-in point of the wind speed and the maximum speed limit of the windmill at 12m / s. The use of furling system in this windmill causes wind speeds above 12m / s to be considered fixed at 12m / s. So, data below the cut-in speed will be considered zero while above the speed of 12m / s is considered to remain 12m / s as shown in table 2.

Table 2. Wind Speed Filtered Data

Time	Wind Speed	Wind Speed (Cut in)
0:03:00	2,17	0
0:03:20	5,03	5,03
0:03:40	3,82	3,82
0:04:00	3,73	3,73
0:04:20	3,94	3,94
0:04:40	2,56	0
18:07:00	7,35	7,35
18:07:20	10,55	10,55
18:07:40	13,66	12
18:08:00	20,33	12
18:08:20	10,64	10,64
18:08:40	15,06	12

The table above is the result of the wind speed data filtration process with the cut-in limit of the WT specification. The wind speed (cut-in) column is the wind speed data that has adjusted the cut-in specifications of the WT TSD-500. The next process is the conversion of wind speed into power (theoretical power). The process of calculating theoretical power uses the formula of

wind energy power that has been multiplied by the efficiency of the windmill.

$$P = 0,5 \cdot \rho \cdot A \cdot v^3 \cdot (\text{eff}_{\text{blade}} \cdot \text{eff}_{\text{gen}} \cdot \text{eff}_{\text{cont}}) \quad (1)$$

Where:

- P = Power (watt)
- ρ = air density (1, 2Kg/m³)
- A = extensive wind sweep
- v = wind speed
- eff_{blade} = propeller efficiency (40%)
- eff_{gen} = generator efficiency (85%)
- eff_{cont} = controller efficiency (85%)

2. Wind Sensor Experimental Results

The data shown in table 3 is data taken on the roof of the building on 15-21 December 2018. Measurements were made at an average height of around 39.25 meters above sea level (meters above sea level). The results of the theoretical power of WT (in units of watts are averaged per hour to produce Watts / hour (Wh)). The largest total power generated on the 17th amounted to 1,507,17Wh / day. While the smallest power obtained was 266.79 W / day on the 16th. The data above shows that the potential power in the utilization of wind energy in the area is still relatively small.

Table 3. Wind Power Data

Time	Wind Power WT TSD-500 (Wh)						
	15	16	17	18	19	20	21
0	0,00	0,20	1,01	0,98	0,88	0,88	0,00
1	0,00	10,71	0,00	8,02	0,00	0,00	0,00
2	0,00	0,00	0,00	10,12	0,00	0,00	0,00
3	0,00	0,00	0,00	0,40	0,00	0,00	1,42
4	0,00	0,00	0,11	0,00	1,11	1,11	0,00
5	0,00	0,00	0,00	0,00	6,34	6,34	0,00
6	28,79	2,61	0,00	2,71	2,88	5,08	20,04
7	19,72	0,00	201,81	0,00	10,19	10,19	1,00
8	11,01	17,04	000,57	11,45	0,61	6,61	12,00
9	11,81	0,00	100,00	11,00	10,00	10,00	21,00
10	17,44	12,59	13,01	10,20	20,01	17,01	20,70
11	26,02	10,72	10,00	11,11	1,00	1,00	10,00
12	11,01	10,00	00,00	11,10	00,00	00,00	00,00
13	121,80	02,14	36,00	87,81	110,10	110,10	00,00
14	101,01	11,00	11,00	10,00	00,00	00,00	11,00
15	124,00	17,72	75,04	107,38	101,74	101,74	00,00
16	200,00	1,00	0,00	100,00	10,00	10,00	10,00
17	210,27	0,00	0,78	00,67	100,45	120,40	24,40
18	10,10	0,10	0,10	10,10	00,10	00,10	10,10
19	0,74	0,20	0,35	80,14	20,21	20,21	40,20
20	0,00	0,00	14,87	0,21	45,61	45,61	114,50
21	0,10	1,00	0,10	0,10	00,10	00,10	10,10
22	6,82	0,77	4,22	0,10	0,01	0,01	127,50
23	10,01	1,00	1,00	0,10	1,00	1,00	11,00
Total	100,12	266,79	1507,17	110,75	870,45	870,45	1200,00

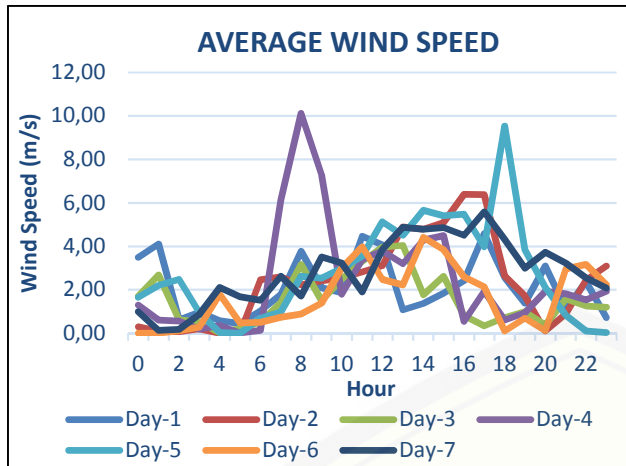


Figure 5. Implementation Of Wind Energy Data Logger

Figure 5 is the result of wind speed data processing recorded for one week from December 14, 2018 to December 20, 2018. In the resulting graph, there are significant fluctuations in wind speed data. The majority of the highest wind speeds are produced from morning to evening. The highest average wind speed reaches 10 m / s at 8 on the 4th day. However, the highest average wind speed in one day was obtained on day 7 with an intensity of 2.83 m / s.

CONCLUSION

Based on the results of the design, implementation and testing of the system that has been made, the following conclusions can be drawn: The design of this tool uses consists of several electronic modules and sensors can operate effectively. Sensor data recorded on SD Card memory per day is 4,320 data. Generating new files adjusting date and month data in CSV format that allows the data to be processed using MS Excel software. The highest average wind speed data on day 4 with an intensity of around 10m / s at 8am.

ACKNOWLEDGEMENT

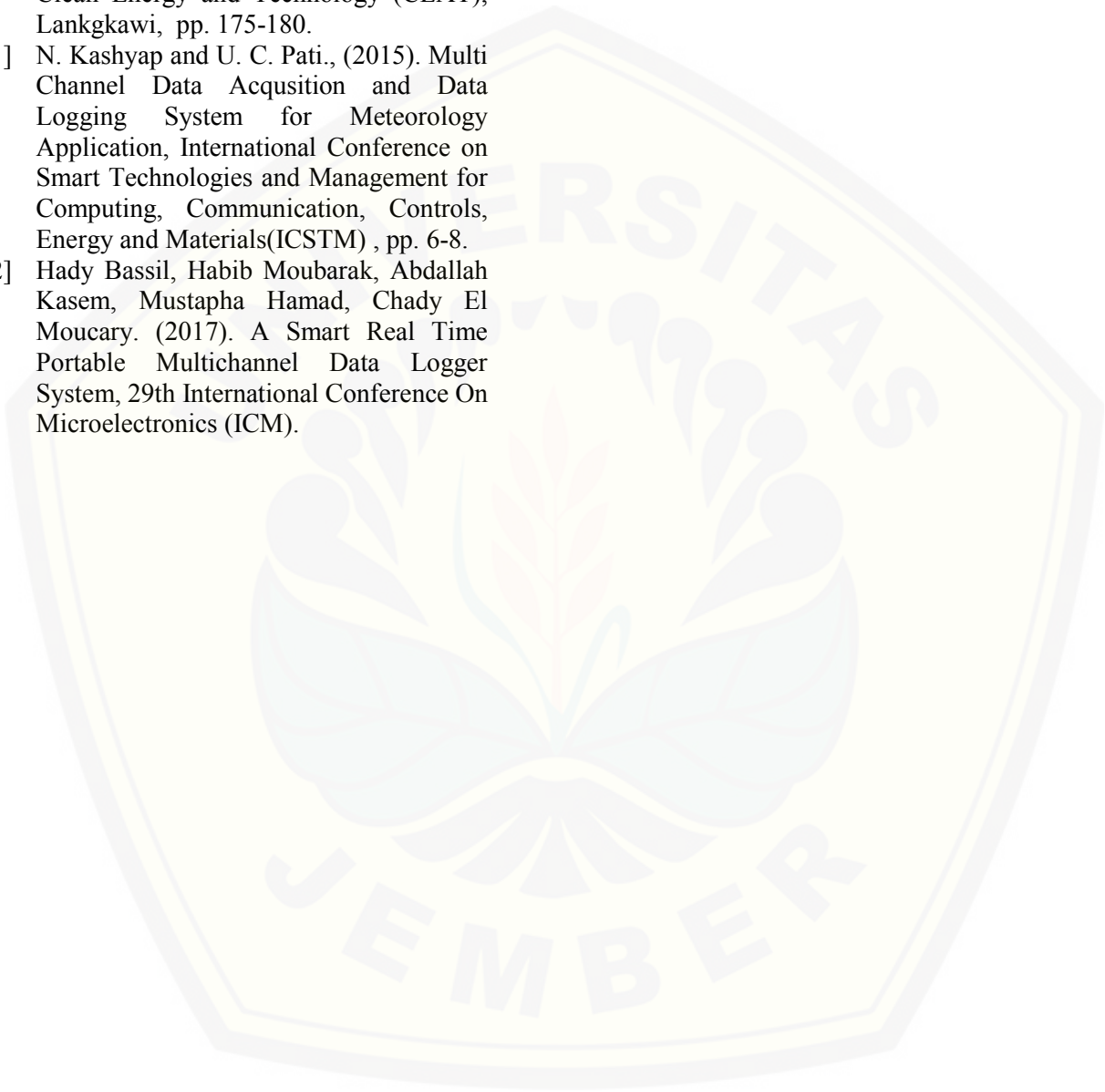
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Start Priority Determination Method of Gas Turbine in Block System of Combine Cycle Power Plant (Case Study: PT PJB Unit Pembangkitan Gresik)

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ABSTRACT

Jawa Bali System is an integrated electricity system among hundreds of power plant with millions electricity consumers around Jawa, Madura and Bali islands. In order to achieve minimum operational cost, Start/Stop scheduling and load distribution are implemented based on the economical factor of power plant. Power plant scheduling in Jawa Bali System is based on the order from the lowest production cost power plant until the highest production cost power plant. This list is called with merit order.

PT PJB Unit Pembangkitan Gresik is a part of Jawa Bali System. PT PJB Unit Pembangkitan Gresik consists of 3 Blocks of Combine Cycle Power Plant. Each Block consists of 3 units of Gas Turbine. Merit Order from PT PLN for Combine Cycle Power Plant is determined in block entity. Because in one block of Combine Cycle Power Plant consists of 3 units of Gas Turbine, therefore emerge a problem of how to determine the start priority of Gas Turbine. In general, Gas Turbine with the best operational performance have to be prioritized to start first.

PT PJB UP Gresik also has Key Performance Indicator (KPI) on the annual performance contract that is affected by the operational performance of the Gas Turbine. Two influential criteria that affect operational performance of Gas Turbine are reliability and efficiency. In daily Jawa Bali System operation that is based on merit order, there will be a chance the Gas Turbine is in operate, stop or start/stop condition. Therefore, a method that considers the unification value of reliability and efficiency is needed to determine the start priority of Gas Turbine in order to meet the demand of Jawa Bali System and to optimize the achievement of annual performance contract of PT PJB UP Gresik.

In this research, the author proposes a method to determine the start priority of Gas Turbine by phase as follows: Analytical Hierarchy Process (AHP) method to determine the comparison value of reliability and efficiency. Reliability Block Diagram (RBD) method to determine the reliability and failure probability of Gas Turbine and heat rate calculation method to determine the amount of fuel energy to produce electricity per kWh unit of Gas Turbine outcome. The priority value of reliability multiplied with failure probability are converted to the potential losses production of Gas Turbine. Meanwhile, the priority value of efficiency multiplied with heat rate value are converted to fuel cost. Start priority of Gas Turbine is determined by the unification value of potential losses and fuel cost of Gas Turbine, starting from the Gas Turbine with the lowest unification cost until the Gas Turbine with highest unification cost.

As the result of this research, start priority determination method of Gas Turbine in Block System of Combine Cycle Power Plant gives a qualitative guidance to calculate and determine which Gas Turbine that has better operational performance with efficiency and reliability as the main consideration criteria. The implementation of this method also gives better achievement of Annual Performance Contract as the target of the company.

Keywords: Gas Turbine, efficiency, heat rate, reliability, start priority, Analytical Hierarchy Process (AHP), Reliability Block Diagram (RBD).

INTRODUCTION

Jawa Bali System is an integrated electricity system among hundreds of power

plant with millions electricity consumers around Jawa, Madura and Bali islands. Jawa Bali System is controlled by PT PLN Unit Induk Pusat

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Pengatur Beban (UIP2B) form Gandul, Jakarta. Power Plants that integrated in Jawa Bali System has different value of cost production because its variety of design, capacity and fuel. In order to achieve minimum operational cost, start/stop scheduling and load distribution are implement based on the economical factor of power plant. Power plant scheduling in Jawa Bali System is based on the order from the lowest production cost power plant until the highest production cost power plant. This list is call with merit order.

PT PJB Unit Pembangkitan Gresik is a part of Jawa Bali System. PT PJB Unit Pembangkitan Gresik has 3 Blocks of Combince Cycle Power Plant. Each Block consist of 3 units of Gas Turbine. Each Gas Turbine has Nett Capacity of 100 MW. Merit Order from PT PLN for Combine Cycle Power Plant is determine in block entity. Because in one block of Combine Cycle Power Plant consist of 3 units of Gas Turbine, therefore emerge a problem of how to determine the start priority of Gas Turbine. In general, Gas Turbine with the best operational performance have to prioritise to start first.

Beside to meet the demand of Jawa Bali System, PT PJB Unit Pembangkitan Gresik also have to meet the Key Performance Indicator (KPI) on the annual performance contract that also affected by the operational performance of the Gas Turbine. The KPI are Equivalent Availability Factor (EAF), Equivalent Forced Outage Rate (EFOR), Sudden Outage Frequency (SdOF), Schedule Outage Factor (SOF) and Nett Plant Heat Rate (NPHR). The target of KPI of PT PJB Unit Pembangkitan Gresik in 2019 are shown in Table 1.

Table 1. Performance contract of PT PJB UP Gresik 2019

Factor	Unit	Weight Value	Target
Equivalent Availability Factor (EAF)	%	6	93.97
Equivalent Forced Outage Rate (EFOR)	%	6	1.20
Sudden Outage Frequency (SdOF)	Times/unit	5	1.50
Schedule Outage Factor (SOF)	%	6	3.71
Nett Plant Heat Rate (NPHR)	Kcal/kwh	6	2242

Two influential criteria that affect operational performance of Gas Turbine are reliability and efficiency. In daily Jawa Bali System operation that based on merit order, there will be a chance the Gas Turbine is in operate, stop or start/stop condition. Therefore, a method that consider the unification value of reliability and efficiency is needed to determine the start priority of Gas Turbine in order to meet the electricity demand of Jawa Bali System and to optimize the achievement of annual performance contract of PT PJB Unit Pembangkitan Gresik.

MATERIALS AND METHODS

In this research, author propose a method to determine the start priority of Gas Turbine by phase as follows : Analytical Hierarchy Process (AHP) method to determine the comparison value of reliability and efficiency. Reliability Block Diagram (RBD) method to determine the reliability and failure probability of Gas Turbine and heat rate calculation method to determine the amount of fuel energy to produce electricity per kwh unit of Gas Turbine outcome. The priority value of reliability from AHP multiply with failure probability are convert to the potential losses production of Gas Turbine. Meanwhile, the priority value of efficiency from AHP multiply with heat rate value are convert to fuel cost. Start priority of Gas Turbine is determine by the unification value of potential losses and fuel cost of Gas Turbine, start from the Gas Turbine with the lowest unification cost until the Gas Turbine with highest unification cost.

1. Analytical Hierarchy Process (AHP)

Analytical Hierarchy Process (AHP) is decision making method that was developed by Prof. Thomas L. Saaty. The step of the AHP process can be summarized as :

- a. Model the problem as a hierarchy structure contain : decision goal, criteria, sub criteria, and the alternative to reach the goal
- b. Establish priorities among the elements of the hierarchy by making a series of judgements based on pairwise comparisons of the elements.
- c. Synthesize the judgements to a set of overall priorities of the hierarchy
- d. Check the concistency of the judgements

e. Make final decision based on the results of the process.

In this research, AHP method is used to determine the priority value of reliability and efficiency.

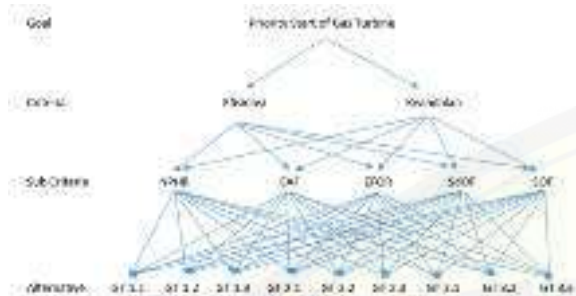


Figure 2. Hierarchy Structure of Start Priority of Gas Turbine

Figure 1 describe the hierarchy structure of start priority of Gas Turbine. The goal is to determine which Gas Turbine to prioritize first. There are two main criteria that affect the goal, efficiency and the reliability of Gas Turbine. And also there are 5 sub criteria that have to consider in this decision making problem : NPHR, EAF, EFOR, SdOF and SOF. After all the process of AHP method is conducted, we obtain that the priority value of efficiency is 0.32 and the priority value of reliability is 0.68. The results of AHP calculation is shown in Table 3.

Table 3. Priority value of efficiency and reliability

Criteria	Priority
Efficiency	0.32
Reliability	0.68

2. Reliability Block Diagram (RBD)

Reliability Block Diagram (RBD) is a diagrammatic method for showing how component reliability contributes to the succes or failure of a complex system. Gas Turbine in PT PJB Unit Pembangkitan Gresik consist of 35 components. RBD of Gas Turbine is shown in Figure 4.

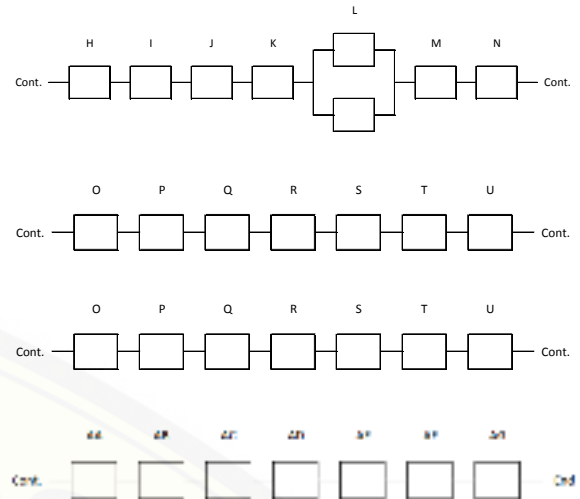
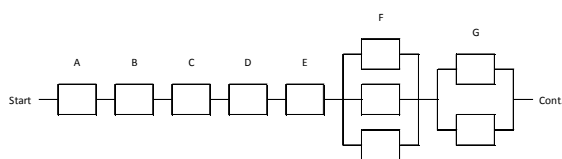


Figure 4. Reliability Block Diagram (RBD) of Gas Turbine

The step to calculate the potential losses production of Gas Turbine by RBD method are :

- Collect the failure data that affect efficiency and reliability of Gas Turbine from 1 January 2018 until 31 August 2019.
- Calculate the value of Mean Time Between Failure (MTBF) and failure rate (λ). Failure rate can be calculated by equation 1

$$\lambda = \frac{1}{MTBF} \tag{1}$$

- Calculate the reliability at component level by equation 2

$$R(t) \text{ component} = \text{Exp} [-\lambda t] \tag{2}$$

- Calculate the Reliability of Gas Turbine by equation 3

$$R(t) \text{ Gas Turbine} = R_A \times R_B \times R_C \times \dots \times R_{AG} \tag{3}$$

- Calculate the probability failure of Gas Turbine by equation 4

$$F(t) \text{ Gas Turbine} = 1 - R(t) \text{ Gas Turbine} \tag{4}$$

- Calculate the potential losses production of Gas Turbine by equation 5

$$\text{Potential losses} = \text{priority value of reliability} \times \text{probability failure} \times \text{Nett capacity of GT/hour} \tag{5}$$

3. Heat Rate Calculation Method

Heat rate calculation is use to calculate the amount of fuel energy to produce electricity per kwh unit of Gas Turbine outcome. Then, it will use to calculate fuel cost by step as follow :

- a. Calculate the heat rate value of each Gas Turbine by equation 6

$$Heat\ Rate = \frac{fuel\ flow\ x\ High\ Heating\ Value}{Gas\ Turbine\ Power\ Outcome} \quad (6)$$

- b. Calculate the energy of fuel of each Gas Turbine by equation 7

$$\Sigma Energy\ of\ fuel = Heat\ Rate\ x\ Nett\ Capacity\ of\ GT/hour \quad (7)$$

- c. Calculate the fuel cost of each Gas Turbine by equation 8

$$Fuel\ cost = priority\ value\ of\ efficiency\ x\ \Sigma Energy\ of\ fuel\ x\ price/ unit\ of\ fuel \quad (8)$$

RESULTS AND DISCUSSION

1. Propose a quantitative method to determine the start priority of Gas Turbine in Block System of Combine Cycle Power Plant

This research propose a quantitative method to determine the start priority of Gas Turbine in Block System of Combine Cycle Power Plant. Implementation of this method provide several advantages. First, it gives priority value between efficiency and reliability from AHP method. Second, from this method we can calculate total cost of each Gas Turbine, so we can make start priority list from the Gas Turbine with the lowest total cost until the highest total cost.

Table 5. Total Cost of Gas Turbine

Unit	Fuel Cost (Rp)	Potential Losses of Prod (Rp)	Total Cost (Rp)
GT 1.1	37,076,372	95,479,293	132,555,665
GT 1.2	37,322,182	94,343,697	131,665,879
GT 1.3	37,936,708	95,488,202	133,424,910
GT 2.1	37,338,258	94,340,317	131,678,575

GT 2.2	37,523,579	95,885,282	133,408,861
GT 2.3	38,428,328	94,336,304	132,764,632
GT 3.1	35,724,416	91,077,105	126,801,521
GT 3.2	36,789,593	84,298,167	121,087,760
GT 3.3	36,257,005	91,521,877	127,778,881

Table 6. Start Priority of Gas Turbine

Unit	Total Cost (Rp)	Start Priority
GT 1.1	132,555,665	GT 3.2
GT 1.2	131,665,879	GT 3.1
GT 1.3	133,424,910	GT 3.3
GT 2.1	131,678,575	GT 1.2
GT 2.2	133,408,861	GT 2.1
GT 2.3	132,764,632	GT 1.1
GT 3.1	126,801,521	GT 2.3
GT 3.2	121,087,760	GT 2.2
GT 3.3	127,778,881	GT 1.3

2. Increase the achievement of PT PJB Unit Pembangkitan Gresik Annual Performance Contract

The implementation of this method in early September 2019, give a good impact of the achievement of Annual Performance Contract of the company. Number of performance contract achievement is shown in Table 7.

Table 7. Increase of Performance contract achievement

Key Performance Indicator (KPI)	Increase of Performance Contract Achievement (%)
EAF	0.01
EFOR	17.09
SdOF	3.87
SOF	0.00
NPHR	1.00

CONCLUSION

Start priority determination method of Gas Turbine in Block System of Combine Cycle Power Plant give a qualitative guidance to calculate and determine which Gas Turbine that has better operational performance with efficiency and reliability as the main consideration criteria. The implementation of this method also give better achievement result of Annual Performance Contract as the target of the company.

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Simulation of Syngas Production through Plasma Gasification from Indonesia's Low-grade Coal as a New Energy

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ABSTRACT

The plasma gasification is a novel technology of gasification process for conversion of coal or biomass to syngas. The end use of syngas is varied from raw chemical material, fuel either gas or liquid or electricity. Updraft Fixed-bed reactor is used in this simulation with the advantages of high heat transferred and easy handling of feedstock. The majority available coal in Indonesia is low-grade coal, the conversion is considered as a New Energy. The process of syngas production by means of plasma gasification in fluidized bed reactor is modelled under thermochemical equilibrium with the Gibbs free energy approach. The aim of simulating the coal gasification with the use of various gasifying agent such as mixture of steam and air (SA) and pure steam (PS) is to give overview of the process. The effect of various gasifying agents and different type of low grade coal were studied with the focus of syngas composition, mainly on H₂ and new energy potential. It was found that the type of gasifying agent has significantly affect the energy indicators instead of type of coal, The results are: highest H₂ production in Subbituminous-PS : 46.98% and highest net-energy with Lignite-PS : 7.04*10⁻² MW.

Keywords: Plasma Gasification; Low-Grade Coal; Syngas Production; Gasifying Agent; New Energy

INTRODUCTION

Escalating demand for energy is inevitable, while easy-to-access fossil resources, thereby enlarging the race to access it, while effecting the cost and having the environmental impact. Gasification is considered as a way to ensure the energy security and minimizing the environmental impact by turning the renewable and abandon assets (waste, residual, low-grade coal) into a variety of demanding industrial chemical raw material and automotive fuels. Apart of its advantages of coal gasification, it has also several disadvantages, such as massive energy consumption, complicated purification of the syngas product and a rigorous requirement of the process equipment.

Low-grade coal is largely untapped because of high water content and low calorific value. Coal that is not exported is better used locally for electricity, upgraded to good quality coal or converted to other valuable products. Indonesian coal reserves is consisted of low-grade coal, say less than 5700 Kcal/kg and high-grade, which is greater than 5700 Kcal/kg. The percentage of low-grade coal is 88% while high-grade coal is only 12% and they're spread over South Sumatra, South Kalimantan and East Kalimantan province [1]. The government has already started a plan to create clean coal technology for upgrading quality of the low-grade coal by gasification technology since 2005 in TekMira (Mineral and Coal Research and Development Center) Bandung.

The gas produced from coal gasification depends on the type of coal and agent gasification. Coal gasification can be defined as

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the conversion of coal into gas products, especially carbon monoxide (CO) and hydrogen (H₂) either without or using reactants or gasification agents (air, oxygen, steam, CO or mixtures of various gasification agents) in reactor. CO and H₂ can be further processed into methane which is known as synthetic natural gas (SNG) [2]. The properties of coal which have an impact on energy and environmental performance often used as the basis of sale contracts, and they include calorific value, volatile matter, inherent moisture, sulfur, chlorine and ash content of coal and fuel ratio (FR) [3]. These properties are all measured at samples in the laboratory, taken during loading of the coal., understanding the coal quality is crucial for the application of the given coal [4].

This study follows the work of Sesotyo et al [5], where the modified EquiPlasmaJet used to model the plasma gasification reactor. Customized model was implemented to address the feedstock changed from Municipal Solid Waste to Coal. The purpose of this study is to obtain the important parameters on process simulation for achieving highest H₂ and highest energy potential.

MATERIALS AND METHODS

1. Material

The coal calorific value, proximate analysis and ultimate analysis data are from Warukin formation, South Kalimantan. The Lignite coal is represented from Wara 120 and SubBituminous coal is represented from Tutupan 210 [3].

Table 1. Ultimate Analysis of Lignite and SubBituminous Coal [3]

Factor	Unit	Lignite	SubBituminous
Ash	wt.% db	6.11	2.87
C	wt.% db	61.52	62.45
H	wt.% db	6.24	5.91
N	wt.% db	0.68	1.08
O	wt.% db	25.45	27.69

Ultimate analysis is widely used to resolve the percentage of constituent elements, mainly : Ash, Carbon (C), Hydrogen (H), Nitrogen (N), Sulfur (S), Chlorine (Cl) and Oxygen (O) from the total element.

$$O[\%] = 100[\%] - \text{Ash}[\%] - \text{C}[\%] - \text{H}[\%] - \text{N}[\%] - \text{S}[\%] - \text{Cl}[\%] \quad (1)$$

Table 2. Proximate Analysis of Lignite and SubBituminous Coal [3]

Factor	Unit	Lignite	SubBituminous
Inherent Moisture	wt.%	9.78	8.83
Fixed Carbon	wt.%	28.94	35.1
Volatile Matter	wt.%	64.95	62.03
Ash	wt.%	6.11	2.87

Proximate analysis is used to determine the inherent moisture (IM) and ash content (the noncombustible components of coal), volatile matter (VM) and fixed carbon (FC).

$$FC[\%] = 100[\%] - \text{Ash}[\%] - \text{VM}[\%] \quad (2)$$

Table 3. Calorific Value of Lignite and SubBituminous Coal [3]

Factor	Unit	Lignite	SubBituminous
HHV	MJ/kg	31.59	31.70
LHV	MJ/kg	29.83	30.01

The calorific value of coal is directly proportional to the carbon content and inversely proportional to the ash content and inherent moisture. Low heating value (LHV) is the nett heat available for combustion of the coal while the high heating value (HHV) includes the latent heat of its vaporization. These are estimated based on the chemical composition of the coal material.

$$HHV_{Coal} = 0.3491x_C + 1.1783x_{H_2} + 0.1005x_S + 0.1034x_{O_2} + 0.0151x_{N_2} + 0.021x_{Ash} \quad (3)$$

$$LHV_{Coal} = HHV - 0.212x_{H_2} - 0.0245x_{IM} - 0.008x_{O_2} \quad (4)$$

2. Methods

The method of simulation for this study, based on the sequence workflow of the customized modified EquiPlasmaJet (mEPJ) model, with the coal properties as in the table 1, 2 and 3 to be key-in in the properties and input simulation of process block. Process parameters, defined in the table 5 as the main assumption will work as the boundary conditions, along with the decompose calculator and chemical stoichiometry, will work as the thermochemical

equilibrium reaction in the plasma gasification process modeling to gain the molar fraction of syngas fraction, temperature, volumetric flow and mass flow, which will be used to calculate the performance parameters which is Energy Potential.

3. Modelling

The plasma gasification reactor technology has been explored and considered through computational model which properly developed by applying the thermochemical equilibrium approach as stated in the introduction. Fig. 1 and Fig.2 shows the block diagram of plasma gasification model, called mEPJ, firstly developed by Minutillo et al. [6] namely EPJ, with the little modification by the introduction of RStoic for the chemical stoichiometric approach to determine the molar fraction of each syngas compound compositions, secondly developed by Sesotyo et al. [5].

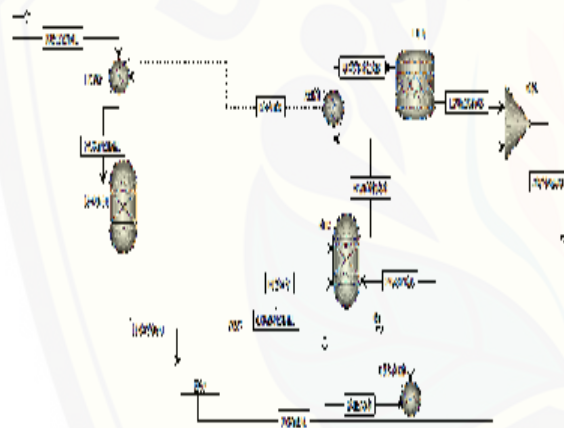


Figure 1. Gasification Process Model mEPJ with Gasifying Agent PS

For Fig.1 Modified EquiPlasmaJet (EPJ) with Gasifying Agent using Pure Steam with the variation of Lignite and SubBituminous coal

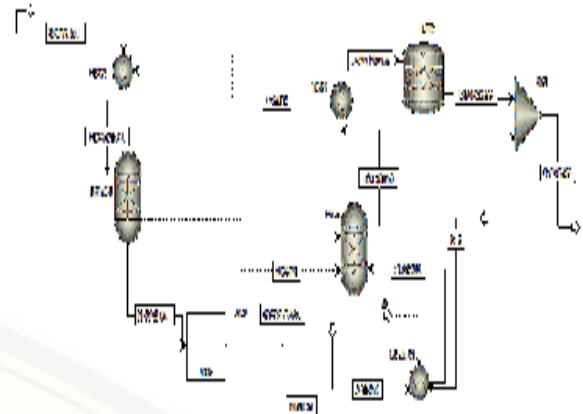


Figure 2. Gasification Process Model mEPJ with Gasifying Agent SA

For Fig.2 Modified EquiPlasmaJet (EPJ) with Gasifying Agent using Mixed Steam and Air with the variation of Lignite and SubBituminous coal. As the temperature inside the reactor will vary between certain zones, the temperature divided into two reaction zones for the convention of the modelling. There are two reactors, which will represent the two different temperature zones. The first reactor is the HTR (high temperature reactor), in which thermochemical equilibrium is gain by a non-stoichiometric method in high temperature environment and LTR (low temperature reactor), in which the thermochemical equilibrium is gain by a stoichiometric method in low temperature environment. Inside the HTR, the equilibrium composition is gain by direct minimization of the Gibbs free energy for a given set of expected products without the specific known chemical reaction. Table 4, shows the brief description of the block used. Since only the organic fraction of the coal is gasified, the mEPJ model will abandon the inorganic fraction, and not in the focus of this study.

Table 4. Process Block Diagram of Modified EquiPlasmaJet [5]

Block Name	Block Type	Description
DRYER	RYield	Non-Stoic reactor on common Yield Element Distribution
HTR	RGibbs	Meticulous hydrate reactor and multiphase equilibrium on Gibbs Free Energy minimization

LTR	RStoic	Stoichiometric reactor with common chemical reaction
HEX1 & HEX2	Heater	Plain Thermal Heat Exchanger
SEP	Separator	Moisture separator from feedstock
DC-ARC	Heater	Plasma Torch Generator
MIX	Mixer	Material Stream Mixer

Boundary condition and assumptions

The Plasma Gasification Reactor modified EPJ model is assumed to be:

- Steady state process
- The gasification process is considered isobaric and adiabatic The HCoalgen and DCoalligt property models were used to projection Non-Conventional formation enthalpy, specific heat capacity in stable pressure and chemical density based on the proximate and ultimate analysis.
- The element & compound used are : H₂, O₂, N₂, CO, CO₂, CH₄, H₂O, C, Cl, S, H₂S, S and COS.
- Ash is considered as a non-combustible solid.

Table 5. Boundary Conditions for the simulation

Variable	Unit	Value
Gasification Pressure	atm	1
Plasma Temperature	°C	4000 [6]
Steam Input Temperature	°C	200 [7]
Ambient Temperature	°C	25
Coal mass flow	Kg/s	1.39 *10 ⁻³ [7]
Steam mass flow	Kg/s	1.39 *10 ⁻³ [7]
Power for Steam Generation	MW	4.27 per 1 kg/s [5]
Power for H ₂ -CO Separation Process	kWh/ton	600 [8]
Plasma Generation Eff	%	90 [6]
Equivalent ratio for Air		0.18 [9]

RESULTS AND DISCUSSION

1. Simulation Result

The mEPJ model has been engaged to measure the syngas molar fraction composition, process temperature, volumetric flow and mass flow. Once those values are obtained, the calculation is performed to estimate the syngas Yield, syngas LHV. With help of energy conversion factors, one can estimate the energy potential and net energy potential, since the process itself consume massive energy, especially for plasma generation, steam generation, syngas purification (H₂-CO Separation).

The performance process parameter formula as our interest in this research, will be as follows :

$$LHV_{Syngas} = HHV - 10.79Z_{H_2} + 12.62Z_{CO} + 35.81Z_{CH_4} \quad (5)$$

Where Z is the % volume of specified syngas components and LHV in (MJ/Nm³)

$$Yield = \frac{v}{m} \quad (6)$$

Syngas Yield, with v as the volumetric flow rate (Nm³/s) and m as the mass flow rate (kg/s)

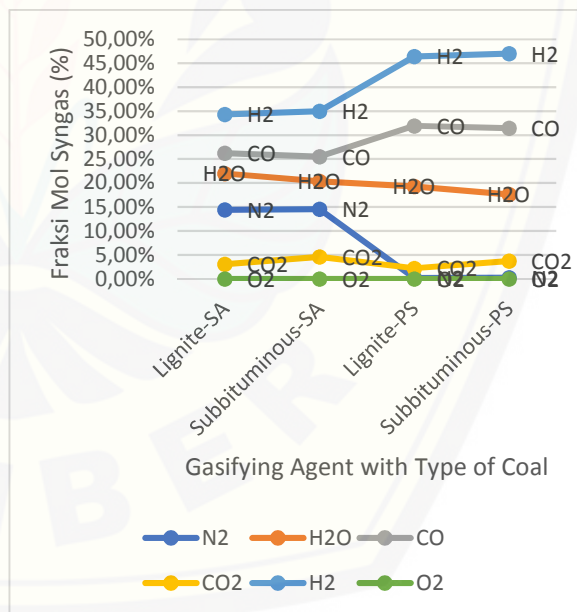


Figure 3. Trend Comparison of Syngas Molar Fraction of Different Type of Coal and Gasifying Agent

The energy potential of this plasma gasification process resides in H₂, which can be converted to LHV for Gasoline. The next step is that the Gasoline LHV is converted into Electric

Energy Potential using the conversion factor of gasoline to electricity.

$$\text{Energy Potential (kW)} = Y * \frac{\kappa H_2}{100} / N * \delta H_2 * GGE/CF \quad (7)$$

$$\delta H_2 * GGE/CF \quad (7)$$

With Y as Syngas Yield (Nm³/kg), κ sebagai molar fraction (%), N as Normalized, δ as (kg/m³), GGE as Gasoline Gallon Equivalent (kg) = 1.019 and CF as Conversion Factor (1/kWh) = 0.031.

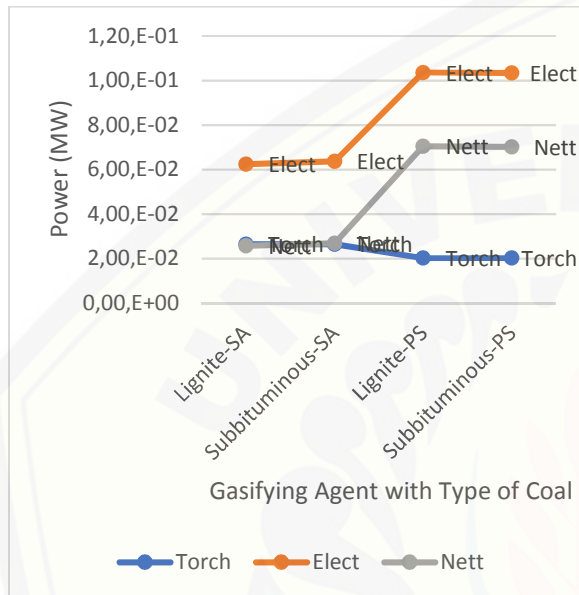


Figure 4. Trend Comparison of Process Efficiency of Different Type of Coal and Gasifying Agent

The Net of Potential Electric Energy, is the Potential of Electric Energy reduced by energy for Steam and the separation of H₂ with CO.

$$\text{Net Potential (kW)} = \text{Energy Potential} - P_{\text{Sep}} + P_{\text{Torch}} + P_{\text{Steam}} \quad (8)$$

With P_{Sep} as consumed by gas purification plant in (kW), P_{Steam} as consumed by steam generator in (kW) and P_{Torch} as consumed by plasma torch in (kW).

2. Analysis and Discussion

The reason to use SA or PS as the gasifying agent is to enrich the molar fraction of H₂ in the syngas [10] and has the advantage by propose more H₂ into the system, thereby improve the quality of the syngas, instead of using normal air. Disadvantage of using SA is the greater cost of power consumed compare to use only air as gasifying agent. As expected, the use of PS, resulting in greater partial pressure of water

vapor inside the reactor leading to the increase molar fraction of H₂.

The greater calorific value the low grade coal, which is Subbituminous is greater than Lignite, the better result of molar fraction of H₂. The less fraction of carbon and oxygen fraction in the ultimate analysis, incurred from a low LHV of the coal, resulting in not significantly plasma power consume, hence the chemical properties of each different coal resulting the significantly changes in gasifier temperature. Plasma torch power requirement also determined by the type of gasifying agent used.

Net energy potential from Lignite is greater than the Subbituminous with PS as the gasifying agent. This is because the more H₂ available in the Syngas with PS as gasifying agent [2]. But the net energy potential from Lignite is lesser than the Subbituminous with SA as the gasifying agent. This is because of Subbituminous contain higher Calorific Value than Lignite.

CONCLUSION

The highest mole fraction of hydrogen gas and highest energy potential is employed with the use of Pure Steam as a gasifying agent. But the type of coal, which is Subbituminous obtain the highest mole fraction of H₂, while the Lignite obtain the highest energy potential. To obtain the H₂ as the raw material, we can use the pure steam as the gasifying agent, but to obtain the energy potential, we can use the Lignite as the feedstock of process. The future work can be done by considering environmental impact of the process and by varying the type of process modeling with the other gasification reactor.

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A Review on Recent Chemical Technology Developed for Real-Time Monitoring of Heavy Metal Ions in Water

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ABSTRACT

Monitoring of heavy metal ions such as Pb(II), Cd(II), Cu(II) and Hg(II) in water usually done by direct sampling. The sample was preserved and analyze in a laboratory using instruments such as Atomic Absorption Spectroscopy (AAS), Fluorescent Spectroscopy, and Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS). These conventional methods are expensive and time-consuming. Hence, online/real-time heavy metal ions monitoring methods have been developed until now. To improve the sensitivity, selectivity, and accuracy of the developed methods, researchers used instruments such as Laser-Induced Breakdown Spectroscopy (LIBS), Plasma Spectroscopy, and Nuclear Magnetic Resonance (NMR). Researchers were also tried to develop static or mobile custom-built instruments. Electrochemical sensing devices were also designed by modification of the materials, making microfluidic and chip-based sensors. The instruments and devices could detect heavy metal ions more quickly than conventional methods. However, the development of instruments and electrochemical sensor prototypes is rarely followed up by the experimentation to communicate the prototypes with the internet. In addition, the developed instrument still cannot detect heavy metal ions in the mixture. It can be concluded that these studies are still in the laboratory scale which can be developed even further to get the best result of online/real-time monitoring methods for heavy metal ions.

Keywords: real-time; monitoring; heavy metal ions; water.

INTRODUCTION

Activities from the mining and agriculture industries produce heavy metal ions wastewater. Heavy metal cations such as Hg(II), Pb(II), Cd(II) and Cu(II) are discarded into the river. River water is consumed directly or indirectly by animals and humans. Their body needs those ions in certain concentrations. However, the accumulation of it can be toxic and carcinogenic. Therefore, monitoring of heavy metal ion levels is important.

Frequent measurements are very important for monitoring contaminant concentrations in water. Monitoring of heavy metal ions usually done by direct sampling. The sample was preserved and analyze in the laboratory using instruments such as Atomic Absorption Spectroscopy (AAS), Fluorescent Spectroscopy,

and Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS). These conventional methods are expensive and time-consuming. For this reason, the development of real-time monitoring is essential for the early detection of contaminants [1, 2].

Real-time measurement characteristics include robust, fast, sensitive, selective, and simultaneous. There have been many detection techniques with high sensitivity, rapid analysis, and measurements carried out in-situ. However, these techniques only detect certain metals at one time. Whereas, many factors can influence changes in the concentration of heavy metal ions in environmental measurement. Besides, the information obtained from the results of the analysis so far is still offline and static. The problem is, environmental management and control require dynamic data as a reference standard [1- 3].

A series of devices and settings are required to connect to the internet. Very few researchers have reported the fabrication of electrochemical

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instruments that can perform remote online monitoring of heavy metal ions. Up until now, many are still trying to develop electrochemical sensors because they are effective, sensitive, and selectively detect heavy metals with various advantages such as fast, cheap, and easy to carry everywhere [4]. Therefore, this article will discuss further the recent chemical technology developed for real-time monitoring of heavy metal ions in water.

METHOD

This recent chemical technology developed for real-time monitoring of heavy metal ions in water is a review. The study did collecting and reading papers with a similar topic. The essential concepts and thoughts were highlighted. After that, the report was written and processed to be an article.

RESULTS AND DISCUSSION

There were several kinds of studies to develop real-time/online monitoring for heavy metal ions. First, researchers tried to develop new methods by making and using huge instruments in the laboratory or at the sampling site. Secondly, they were making their custom built-instruments that are static or mobile. The last one was fabricating a sensing device that supports those devices called electrochemical sensors. The development of electrochemical sensors involved the advancement of materials, detection methods, or both.

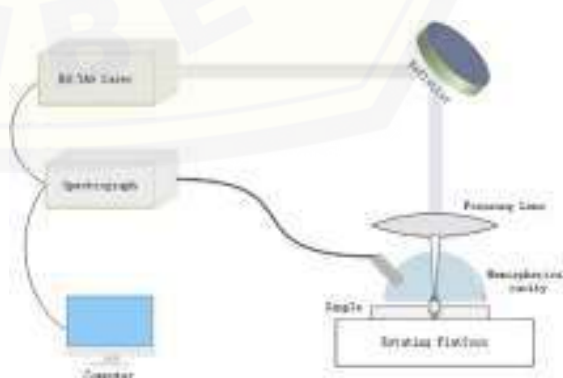
1. The development of new methods using huge instruments

The potential of laser-induced breakdown spectroscopy for on-line/on-site analysis of heavy metals in water was studied. A mixture of Pb(II), Cd(II), and Ni(II) solutions with known concentrations were used as a sample. The solution was added with KCl to increase conductivity. The study compared the heavy metal ions deposition in an electrode made from aluminum and graphite. The electrode enhancement-LIBS experimental system could be seen in figure 1. The laser was used as a light source and the concentration was detected by the spectrograph. The results showed that the limit of detection (LOD) of heavy metal ions in aluminum is in ppb while graphite is still in ppm.

However, the detection time of the aluminum electrode was more than 42 minutes while graphite showed less than 3 minutes. This indicated that graphite has the potential to be used as an electrode in real-time monitoring of heavy metal in water with a laser-induced breakdown spectroscopy method [5].

Another spectroscopy method using plasma-enhanced with an automated device named actively modulated pulsed power (AMPP) was introduced. The system used plasma as a light source but the beam was adjusted by AMPP automatically. The optical emission spectrometer was used as a detector. The schematic of the AMPP-Plasma spectroscopy system could be seen in figure 1. The sample was a solution containing Pb and/or Zn with 168 concentrations from 0.5 to 250 mg / L. Sodium and potassium nitrate solutions were used to adjust the conductivity. The results pointed out that the LOD of heavy metals still in ppm. The system was robust, could last for more than one week in online monitoring but contamination and erosion affected the emission intensity [3].

The time-domain nuclear magnetic resonance method (TD-NMR) was also very appealing to the industry because it was cheap and easy to implement. The experimentation consisted of real mine water sampling introduced until pH 12 and relaxation time measurements were performed using NMR with a frequency of 25.7 MHz. This study was done in an industrial site. The relaxation spin-times between mine water samples was close to clean water. It implied that the removal of metal ions carried out by the industry is successful [6]. Although the NMR was equipped with an online circuit, the study did not mention the process of connecting the instrument to the internet.



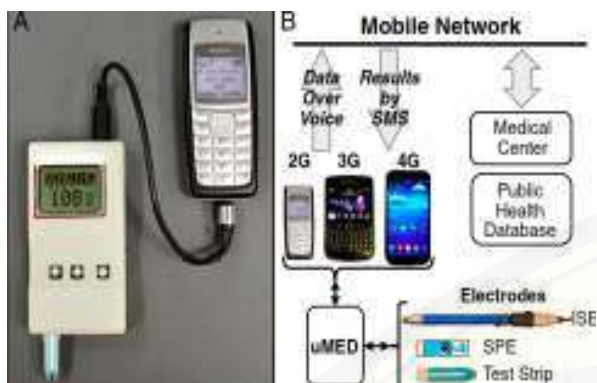


Figure 3. (a) The connection setup between portable devices and cell phone and (b) A schematic of data flow [7]

3. The development of electrochemical sensing

a. Material modification

Many studies for increasing the sensor sensitivity and selectivity for detecting one heavy metal ion have been carried out. However, real-time monitoring requires electrochemical sensing devices that can detect multiple metal ions. The enhancement that can be made is modifying the sensor materials.

The examination of selectivity, stability, and reproducibility of Fe_3O_4 , $\text{Fe}_3\text{O}_4/\text{MWCNT}$, and $\text{Fe}_3\text{O}_4/\text{F-MWCNT}$ materials as sensor electrodes for the simultaneous detection of $\text{Cd}(\text{II})$, $\text{Pb}(\text{II})$, $\text{Cu}(\text{II})$, and $\text{Hg}(\text{II})$ was done by square wave anodic stripping voltammetry (SWASV). The study was performed using river water containing $\text{Cd}(\text{II})$, $\text{Cu}(\text{II})$, $\text{Pb}(\text{II})$, and $\text{Hg}(\text{II})$. The method consisted of synthesis and characterization of Fe_3O_4 , $\text{Fe}_3\text{O}_4/\text{MWCNT}$, and $\text{Fe}_3\text{O}_4/\text{F-MWCNT}$ nanocomposites, fabrication of electrochemical sensors and the measurement and application. The selectivity, reproducibility, and stability of $\text{Fe}_3\text{O}_4/\text{F-MWCNT}$ were the best. The detection of heavy metals from the electrochemical sensor was not much different from ICP-MS or AFS. However, another interference might be deposited in the electrode [4].

Another advanced enhancement was materially based on bacteria. Bacteria could be utilized to increase the sensitivity and selectivity

of sensors against heavy metal ions. The surface of bacterial cells containing thiol groups from glutathione would make a covalent coordination bond with heavy metal ions. The fabrication of a fiber-optic sensor equipped with bacteria functionalized gold nanoparticle matrix was done by [8].

The schematic of the instrumentation system as shown in figure 4. The experimentation included the formation of bacteria-gold nanoparticle composites biosensor, setting up the instrument with localized surface plasmon resonance (LSPR), and tried the whole system to detect heavy metal ions in tap water. The detection limit of B40/PSS-PAH@AuNP for $\text{Hg}(\text{II})$ and $\text{Cd}(\text{II})$ was 0.5 ppb. This system was selective against $\text{Hg}(\text{II})$ and $\text{Cd}(\text{II})$, but could not distinguish any heavy metal ions [8].

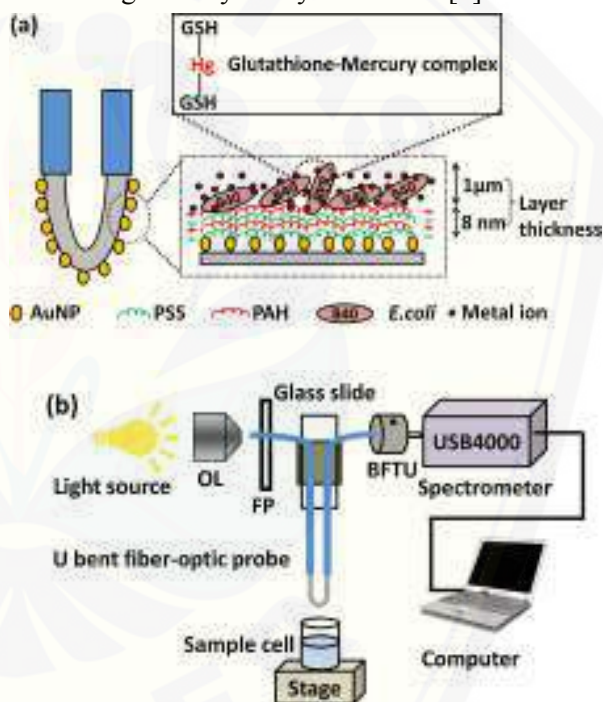


Figure 4. A schematic diagram of (a) sensor probes and (b) experimental set up [8]

The use of microbial fuel cell biosensor was also studied by [2]. This study investigated the application of MFC-based biosensors for annual real-time monitoring of heavy metal ions every 5-10 minutes' measurement interval. There was a proportional relationship between biosensor output and heavy metal toxicity. Contact with heavy metal ions caused a shift in the dominant bacterial community [8].

b. Material and/or detection methods

modification

The detection methods modification could be classified into a microchip or microfluidic devices. These devices' measurement was on micro-scale. It means that the amount of the sample needed was only one or two drops. The researchers also developed a sensing material suitable for the devices so that the high sensitivity could be obtained.

The study about polymer lab chip sensor with microfabricated planar silver electrode for continuous and on-site heavy metal measurement has been done previously. The sample was a Pb(II) solutions and the SWASV was used as a detection method. The LoD and sensitivity were good, but the device could not be used after 8 hours of long measurements because the heavy metals still remain in the electrode even after anodic stripping and electrochemical cleaning steps [9].

Another microchip method based on the DNA-nanoparticle probe was developed. The detection of Cu(II), Pb(II), and Hg(II) solutions with various concentrations with the device was observed. The schematic diagram of the device as shown in figure 5. The results showed that this prototype sensitivity and selectivity for Cu(II), Pb(II), and Hg(II) were high and the LoD is lower than the EPA standard. The study suggested the integration of the device and smartphone in future development [10].

The development of a 3D-printed microfluidic chip coupled with a sensor based on Graphene on SiC was done by [11]. Graphene was widely used as an electrode for metal ion detection. However, graphene had many disadvantages, including low reproducibility and not selective in a solution containing a mixture of heavy metal ions. Therefore, the performance of graphene on the surface of Si 4H-SiC was observed.

Figure 6 shown the instrumentation setup. The sensor was monolayer graphene grown on 4H-SiC and fabricated as a microfluidic chip. The sample was Pb(II) solutions with several concentrations (125 – 500 nM). The sensor could detect Pb(II) of 125 nM with the LoD of 95 nM. However, the sensitivity to detect Pb(II) in a real sample was still low [11].

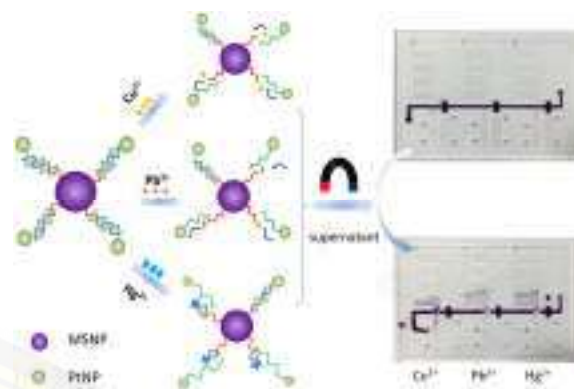


Figure 5. A glimpse of the device appearance and working principle to detect Cu(II), Pb(II), and Hg(II) [10]

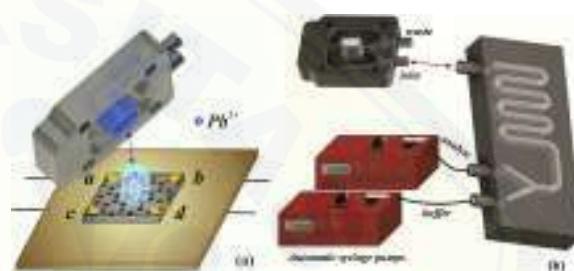


Figure 6. A schematic illustration of the (a) mounting process and (b) instrumental setup [11]

CONCLUSION

The development of new methods using huge instruments, custom-built devices, and electrochemical sensors for heavy metal ions real-time monitoring has been conducted. However, the experimentation to communicate the prototypes with the internet are rarely followed up by the researchers. In addition, the developed instruments still face a challenge such as interferences in the samples. It can be concluded that the study of integration between the prototype and cellphone is still necessary because many researchers only developed the basis of real-time/online monitoring for heavy metal ions in the laboratory scale.

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Aluminum Bioleaching from Water Treatment Sludge Using *Penicillium simplicissimum* and *Aspergillus niger*

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ABSTRACT

The high aluminum content in alum sludge from water treatment is caused by the use of aluminum sulfate as the coagulant. The high aluminum concentration is potential to be recovered. Bioleaching is one of the biological methods for dissolving aluminum from the sludge, which can be followed by recovery process. This study aims to examine the physical and chemical of the alum sludge, and to compare the performance of *Aspergillus niger* and *Penicillium simplicissimum* in aluminum bioleaching from the sludge. Bioleaching was carried out in laboratory scale using batch reactors. The alum sludge was mixed with potato dextrose broth (PDB) in varied PDB-sludge concentration ratios of 50/50; 25/75; 12.5/87.5; 0/100. The microbial concentration of 10% (v/v) was inoculated into each sludge-medium mixture. Sterilized sludge was used as a control. The bioleaching was performed within 15 days using reactors of 500 mL capacity with total volume of media and sludge of 300 mL. The inoculated sludge was incubated at room temperature for 15 days and agitated with a laboratory shaker at 150 rpm. Centrifugation was applied to separate dissolved metals from the suspended matters. The pH values and metal concentrations were measured every three days. The highest bioleached aluminum (39.4 mg/L) was observed in the *A. niger* reactor with PDB-sludge ratio 25/75. The pH value in this reactor decreased to 4. The control reactor showed a pH decrease to 5 and an aluminum concentration of 63 mg/L. The high aluminum concentration in the control reactor might indicate the existence of indigenous microorganisms, which involved in the bioleaching process.

Keywords: aluminum; bioleaching; drinking water sludge; fungi.

INTRODUCTION

Drinking water enterprises (PDAM) in Indonesia generally use river water as raw water in drinking water treatment facility (IPAM). The coagulation-flocculation process in the production of drinking water in PDAMs aims to remove suspended particles and colloids in the raw water. Aluminum sulfate ($\text{Al}_2(\text{SO}_4)_3$), or alum, is the most widely used chemical coagulant in the drinking water production process. It is hydrolyzed in water to form neutral aluminum hydroxide, which made colloids settled and precipitated as hydroxides.

The use of alum as a coagulant in the drinking water treatment process produces sludge, which contains high concentration of aluminum. The sludge is generally referred to alum sludge [14].

Karangpilang IPAM is one of the water treatment installations owned by PDAM Surya Sembada of Surabaya City. This IPAM serves water supply with a capacity of 1,450 L/sec [2]. The Karangpilang IPAM discharged 626 m³/day of alum sludge into Surabaya River, which contained aluminum of 1194 mg/L [8]. It might cause accumulation of aluminum in river sediment, which threatens aquatic biota, and human health.

One method that can be applied for alum sludge treatment is aluminum extraction for coagulant recovery. Aluminum extraction from the sludge can be done by biological process with

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bioleaching method [11]. Bioleaching is a microbial acidification method for extracting metals from various types of sludge. Biotechnology processes on a metal dissolution based on interactions between metals and microbes. Microbial activity is one of the factors that can change the form of the metal. This technique are environmentally friendly, simple, efficient, and economically feasible. Bioleaching of aluminum from the alum sludge can increase the efficiency of alum sludge application in the soil due to the loss of high aluminum and other metal concentrations, which may inhibit soil microbial activity [5].

This study aims to determine physical and chemical characteristics of the alum sludge, and to compare the performance of *Aspergillus niger* and *Penicillium simplicissimum* in aluminum bioleaching from the sludge.

MATERIALS AND METHODS

1. Sampling

Alum sludge samples were collected from accelerator drains at Karangpilang IPAM of PDAM Surya Sembada, Surabaya. Sampling was done by grab sampling in three accelerator units at the IPAM. The alum sludge samples were composited and preserved in polyethylene plastic containers at $<6^{\circ}\text{C}$ for 7 days [9] [6].

2. Alum Sludge Characterization

The alum sludge were characterized according to pH, chemical oxygen demand (COD), alkalinity, metals (Al, Fe, Pb, Cr, Cu), C-organic, N-total, nitrate, nitrite, N-organic, and P-total.

3. Research Plan Design

Research plan design for bioleaching is shown in Table 1.

Table 1. Factorial research design with varied inoculation types and ratios of media and sludge

No.	Media / Sludge	Media and Sludge (v/v)				Inoculum
		10%	20%	30%	40%	
1	Control (PDB)	40/20%	30/30%	20/40%	10/50%	Control
2	Control (alum. sludge)	40/20%	30/30%	20/40%	10/50%	Control
3	Uninoculated (alum. sludge)	40/20%	30/30%	20/40%	10/50%	Uninoculated
4	Uninoculated (alum. sludge)	40/20%	30/30%	20/40%	10/50%	Uninoculated

4. Bioleaching Mechanisms

4.1 Fungal Culture Preparation

A. niger and *P. simplicissimum* cultures were inoculated to 100 mL of potato dextrose broth (PDB) media and shaken at 150 rpm for 48 hours at room temperature.

4.2 Bioleaching Process

The bioleaching process was carried out for 15 days in 500 mL reactors. Sludge concentration used in this study was 15% (v/v) [5]. The alum sludge samples were added into the media according to media compositions as shown in Table 1. The total volume of medium, sludge, and fungal culture was 300 mL. All reactors containing 10% (v/v) inoculated sludge of the total volume [5]. The reactors were agitated at 150 rpm at room temperature using laboratory shaker.

RESULTS AND DISCUSSION

1. Characteristics of PDAM Alum Sludge

The alum sludge contained Al of 5900 mg/L (Table 2). This level exceeded the quality standard of 10 mg/L [14]. The high aluminium concentration was caused by the use of aluminum sulfate during the coagulation and flocculation processes [3]. Meanwhile, Fe, Mn, Zn, Pb, Cu, and Cr concentrations were; 3800 mg/L; 1041 mg/L; 400 mg/L; 43.01 mg/L; 10.75 mg/L and 0.0021 mg/L, respectively (Table 2). These values exceeded the effluent standard according to State Ministry for the Environment Decree No. 5/2014 [14]. These high metal concentrations might be caused by the untreated industrial waste water discharge along the Surabaya River. The high Mn and Fe concentrations were most probably sourced from the river sediment [13].

The BOD and COD concentration of the alum sludge were 2345 mg/L and 4914 mg/L,

respectively. These BOD and COD values indicated the organic content in alum sludge that possibly sourced from domestic and industrial activities [5]. The alkalinity of the alum sludge as HCO_3^- was 353.33 mg/L.

Table 2. Alum sludge concentration

No	Organisme	Jumlah (mg/L)	Daya Garam (mg/L)	Salinitas
1	A	500	1000	1000
2	B	300	600	600
3	C	200	400	400
4	D	100	200	200
5	E	50	100	100
6	F	25	50	50
7	G	12,5	25	25
8	H	6,25	12,5	12,5
9	I	3,125	6,25	6,25
10	J	1,5625	3,125	3,125
11	K	0,78125	1,5625	1,5625
12	L	0,390625	0,78125	0,78125

2. Sludge and Medium Composition in Bioleaching

The pH values decreased from 6 to 4.58 in 3 days and increased to 5.39 on the 6th day. Then the pH slightly decreased up to 5.13 in 15 days of bioleaching using *A. niger* in 50:50 of medium and sludge compositions (Figure 1). In bioleaching using *P. simplicissimum*, the pH decreased from 6 to 4.29 on the 6th day and increased to 8.03 on the 9th day. The pH further slightly increased up to 8.14 on the 15th day of bioleaching in 50:50 of medium and sludge compositions (Figure 1). Furthermore, the pH values decreased from 6.21 to 4.43 on the 6th day and increased to 7.22 on the 9th day, then slightly increased up to 7.71 on the 15th day of bioleaching using *A. niger* in 25:75 of medium and sludge compositions (Figure 2). In bioleaching using *P. simplicissimum*, the pH decreased from 6.21 to 4.43 on the 6th day and increased to 7.35 on the 9th day, then slightly increased up to 8.71 on the 15th day of bioleaching in 25:75 of medium and sludge compositions (Figure 2). In the all compositions of medium and sludge, the lowest pH values was reached on the 6th day of bioleaching. Thus, after the 6 days of bioleaching the pH values slightly increased. Therefore, the aluminum concentrations were decided to be analyzed until the 6th day of bioleaching.

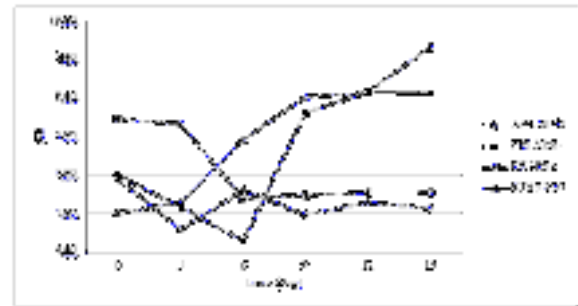


Figure 1. Values of pH of incubated mixtures in 50:50 PDB-sludge ratio

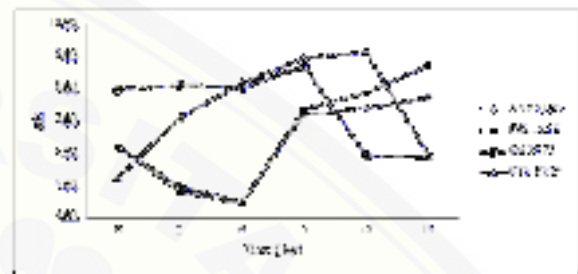


Figure 2. Values of pH of incubated mixtures in 25:75 PDB-sludge ratio

The decrease of pH values (Figure 1 and 2) were caused by pyruvic acid which was produced by fungi. The pyruvic acid was resulted from glycolysis which bound the coenzyme A to form acetyl- CoA, one NADH molecule, and CO_2 . Then, the pyruvate carboxylase enzyme became active to produce oxaloacetic acid which was needed for citric acid biosynthesis [7].

The decreasing pH values (Figure 1 and 2) due to organic acids, which were produced by fungi, was not sufficient to reduce the buffering capacity. Thus, fungi could not leach metal properly. The buffering system was formed by the high alkalinity of the sludge [12].

3. Results of Aluminum Bioleaching

The highest aluminum concentrations were observed capacity in 25:75 of medium and sludge composition. These aluminum concentrations were 39.4 mg/L and 29.36 mg/L in bioleaching using *A. niger* and *P. simplicissimum*, respectively. The highest efficiency of aluminum recovery was 2.97 % (Figure 4) in bioleaching using *A. niger*.

A. niger could lower the pH to 4 on the 6th day of bioleaching, whereas in the sludge treatment process. *A. niger* was more resistant to alum sludge, so it was faster in leaching the acid when compared to *P. simplicissimum*. Besides, *A. niger* produces more organic acid so that it can

survive by adapting or mutating at high concentrations of toxic heavy metals. Adaptation of fungi to heavy metal ions has been tested in increasing fungal tolerance for the bioleaching process [1].

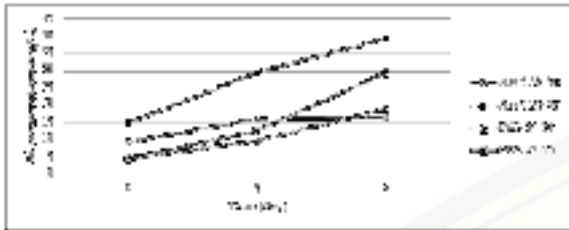


Figure 3. Aluminum concentrations (mg/L)

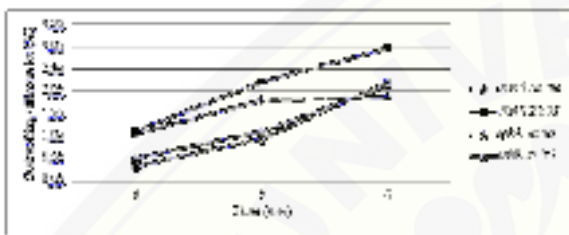


Figure 4. Aluminum bioleaching efficiencies (%)

CONCLUSION

The alum sludge contains high concentration of aluminum (5900 mg/L), which is potential to be recovered. *A. niger* and *P. simplicissimum* showed low aluminum bioleaching efficiencies, although both species could lower pH value of the media from 7.4 to 4.0.

ACKNOWLEDGEMENT

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The Effect of using Open-Plan Workspaces on Employee Performance of Interior Architecture Consultant

(Case study : Fine Team Studio, Jakarta)

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ABSTRACT

An office is a second home for the majority of people, because they spent their most of life time there. In fact, it could be that someone spends more time with coworkers in the office, than with family. By this reality, it is not surprising that the quality of the office will greatly affect the quality of employees performance. The issue to be discussed is the effect of applying the open plan concept to employee performance in an interior architecture consultant studio in Jakarta. The design method used a user oriented and data mining was done by Focus Group Discussion (FGD). From the results of data collection was found that the majority of respondents felt more productive and easily interacted and collaborated. However, there were shortcoming in the application of the open plan workspaces, among others there were no clear territorial boundaries, sometimes the atmosphere was not conducive, and more susceptible to contracting disease. Strategies that can be carried out to overcome the weaknesses of the open plan concept are increasing awareness and empathy of each individual to be more sensitive to colleagues and the surrounding environment, carrying and placing goods according to the needs and office's stuffs, discipline in managing work hours and rest hours, as well as routine to open openings (windows) and exercise together. By this strategy, the application of open plan concept in the interior architecture consultant studio will be more optimal. Application of the open plan concept in an interior architecture office promotes the exchange of ideas through interaction, communication, and collaboration because the close distance between employees made them faster and easier to exchange ideas, thereby increasing performance and productivity.

Keywords: office; open plan; productivity; interior architecture consultant studio.

INTRODUCTION

In the current 4.0 industrial era, every human being is required to be able to utilize technology and time optimally. This certainly adds value to efficiency in a work environment where time management is considered as something vital and very needed by industry players. In addition, good time management will exponentially impact the quality of a company's employee performance. With the increasingly fierce competition at this time, especially in the field of creative industries that require a lot of inspiration and collaboration, they are required to produce a functional and innovative work in accordance with client needs.

One of the fields included in the creative industry is an interior architecture consulting company. An architect and an interior designer must have the creativity and ability to collaborate in creating unique designs and be able to solve their clients problems.

A comfortable, safe and pleasant work environment is one of the ways that the company can improve its employees performance. For the majority of people, the office is a second home because it was not just their little time was spent in this place. In fact, it could be that someone spends more time with coworkers in the office, than with family. By this reality, it is not

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surprising that the quality of the office will greatly affect the quality of the performance of its employees. Employees can improve their performance to the maximum with the support of an appropriate work environment. The work environment influence on employee performance can be seen from the employees of the Jakarta Fine Team Studio Office in producing architectural and interior works. This consulting office applies the workspaces open plan concept in its layout arrangement. The literature revealed that good office design has a positive effect on employee productivity; this hypothesis is being tested in this study. This study was limited to the influence of the workspaces layout selection in an office and did not discuss other aspects of the work environments.

MATERIALS AND METHODS

Many people argued that a better workplace will produce better results. In a company, many factors affect productivity such as employees, technology, and company goals. It also depends on the workplace design and its effect on employee health and performance. The design method used a user oriented approach with 2 internal students, 2 senior interior designers, and 2 senior architects. Data mining was done by Focus Group Discussion (FGD) and direct field observations.

2.1 Literature

2.1.1 Office Layout

The term layout can be translated into the word "arrangement". There are several opinions regarding the definition of office layout stated by several experts, as follows: The first opinion was stated by The Liang Gie (2007: 186), the office layout is the determination of space requirements and about the detailed use of a room to prepare a practical arrangement of physical factors that are considered necessary for the implementation of office work with decent cost. Then, Sedarmayanti (2009: 125) which in his book mentioned office layout is the arrangement and adjustment of all office machines, equipments, and furnitures in the right place so that employees can work well and comfortably, freely and unimpeded to move in order to achieve work efficiency. Therefore Office layout can be defined as the arrangement of office layout and the preparation of office equipment and tools on

the existing office space and is useful to provide facilities for employees.

2.1.2 Office Layout Planning purposes

The following are some important office layout goals, including:

- Easy flow of communication at work, because an easy work flow will affect the communication flow. The movement of information between superiors and subordinates is referred to as vertical information movement, and horizontal information movement is between employees who will be influenced by effective and efficient room management.
- Use the room as effectively as possible where all available area is used in a useful way.
- Facilitates the leadership in supervising the subordinates performance and also makes it easier to reach the archive storage, especially active archive. Cabinets or other filing equipments must be easily accessible by employees who manage the archive so that if needed and can find it again quickly.
- A Layout also aims to keep equipment away from the employees concentration at work. We can arrange it in such a way. In addition to the arrangement of the room in such a way will provide a sense of comfort and feel at home while working, even though the work is a lot, if the atmosphere is supportive, then as much as many works will not feel bored and will always be enthusiastic at it.

2.1.3 Types of Office Layouts

According to Harmon Chaniago, there are three forms of office space (beside the virtual office) :

- Opened office, in this arrangement the room used for work space is not separated or does not use insulation, but all activities are carried out in one large open room so that all employees can be easily observed from one perspective.
- Closed office, a layout is separated or closed if the arrangement of work space is divided into several areas.
- Combined office, combining the form of opened and closed office space.

2.1.4 Performance

According to Mangkunegara (2004: 67) the intended performance is the work of quality and quantity achieved by an employee in carrying out their duties in accordance with the responsibilities given to them. Simanjuntak (2005: 122) stated that performance is the level of achievement of the results of the implementation of certain tasks. According to Simamora (2006: 338), performance appraisal is a process used by organizations to evaluate the work performance of individual employees and groups. With the performance appraisal, the company will have information about the ability of employees to carry out the tasks assigned by the company.

2.1.5 Interior Architecture Consultant Studio

Architecture and Interior are closely related to other fields of science. Interior architecture consultants must master the rules of engineering such as construction, structure, and engineering and development technology. An interior architecture consulting firm has a role in the fields that support an urban planning, interior design of a building, furniture design, area / environment design, can act as a surveyor / quantity surveyor whose job is to estimate the cost and development budget, can act as the executor of the construction (contractor). An interior architecture consulting company can be in the form of Commanditaire Vennootschap (CV) or Limited Liability Company (PT). Interior architecture consulting companies that have developed must have an office in which there are architects, interior designers, site supervisors, to the project manager.

METHODS

This research design method used a user oriented approach using a qualitative approach. Data mining was carried out by Focus Group Discussion (FGD) with 2 interns, 2 senior interior designers, and 2 senior architects. According to Coloumbia and Hening (1990) they suggest that Focus Group Discussion is an interview of a small group led by a resource person or moderator whose task is to encourage participants to dare to speak openly and spontaneously about matters that are considered important but are related to the topic of discussion being discussed . In addition to the

Focus Group Discussion (FGD), direct field observations were also carried out for 4 months. This research was conducted in one of the interior architecture consulting offices located in Jakarta under the name of the company Fine Team Studio. Fine Team Studio is a consulting company engaged in the field of architecture and interiors. Fine Team Studio was founded in 2013 by three alumni architects from one private university in Jakarta. At present there are 15 permanent workers consisting of three Co-Founders, four senior interior designers, two junior interior designers, four senior architects, one admin, one site supervisor, and four interns. Fine Team Studio usually handles commercial, residential, hospitality and healthcare projects.

RESULTS AND DISCUSSION

This research focused on five indicators related to the selection of office layout forms and has been considered to be a discussion during Focus Group Discussion (FGD). These indicators are productivity, innovation process, collaboration, privacy and territoriality, as well as company values and culture. (See Fig. 1).



Figure 1. Five indicators that affect the choice of office layout

Effect of Open Plan Workspace on Employee Productivity

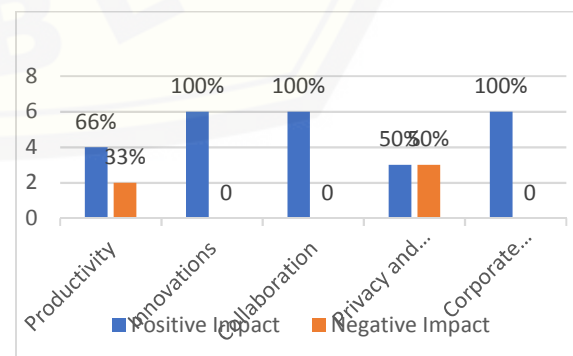


Figure 2. Overall mean according to employee performance

Based on Figure 2, which is a summary of data from Focus Group Discussion (FGD) results showed that 4 out of 6 employees (66%) feel more productive working in offices that implemented open plan workspaces. They argued that productivity was influenced by people and the environment around them. By using a room that did not have a divider and the distance to sit between employees that are close together, it made easier for employees to communicate with each other, interact with each other so as to streamline time and energy (no need to walk far). But on the other hand, the application of open plan workspaces according to other employees was considered less productive because there was distraction from people around them, for example there were those who suddenly invite to chat or discuss while being focused on their work.

3.2. Influence of Open Plan Workspace on Employee Innovation and Collaboration

According to the results in Figure 2, all Focus Group Discussion (FGD) participants felt facilitated by the implementation of the open plan workspace, because the process of finding ideas was easier. With frequent discussions, ideas that appear even more diverse. Not necessarily with a large discussion, for example when someone passes by and approaches the work desk, sometimes providing useful input or suggestions. Company leaders will more easily monitor the projects of an ongoing team if using this open office layout, because each member will be easy to monitor and information will also be more easily disseminated to every member on the team. With easy communication between employees and between employees and superiors will create a work environment that develops positively. If employees feel comfortable and happy at work, their productivity at work will increase and be more effective.

3.3. Influence of Open Plan Workspace on Employee Privacy and Territoriality

Based on data from Focus Group Discussion (FGD) results, it showed that 3 out of 6 employees (50%) do not feel disturbed by their privacy and territorial limits when using open plan workspaces. When in the office, 3 of the respondents felt they did not really need high

privacy. Meanwhile, according to 3 other respondents, the application of open plan workspaces disturbs privacy and territory limits, employees do not have a private room because there is no divider, so if they will have a private conversation or pick up the phone they must find a closed place or go to the bathroom first to pick up the phone.

3.4. Influence of Open Plan Workspace on Company Culture

According to the results in Figure 2, all Focus Group Discussion (FGD) participants agreed that the implementation of the open plan workspace was influential and in accordance with company values and culture. Fine Team Studio is a consulting company engaged in the field of architecture and interiors. So that employees are required to have creativity and good performance in order to produce quality designs. The open plan workspace will make it easier for architects and interior designers to produce quality building works.

3.5. Strengths and Weaknesses of Open Plan Workspace

The advantages of implementing Open Plan Workspace in an office:

- Maximize the area of existing space without including the use of insulation or walls that can equal a lot of land. Can accommodate more employees even though space is limited. This makes the costs incurred more efficient.
- Facilitate communication with rooms that do not have dividers, so this will make it easier for employees to communicate with each other, interact with each other.
- Simplify the exchange of ideas Distance that is close together and not hampered by the barrier will make it easier for each employee to exchange ideas.
- Leaders will be easier to supervise and guide their employees in working. Because everything in the room is a short distance away. So that the leader does not need to go around to every room, the leader can see from the front or back to supervise his employees. This will also help in solving problems quickly.

- Relationships between employees and superiors because of the ease between the two parties in communicating and the work environment will develop positively. If employees feel comfortable and happy at work, their productivity at work will increase and be more effective.
- Team projects are completed more quickly because the leader will be easier to monitor the projects of an ongoing team if using this open office layout, because each member will be easy to monitor and information will also be more easily disseminated to every member in the team.
- Use of facilities such as air conditioning, lighting and electricity costs will also be more efficient. Because air conditioners can be installed at several points, unlike closed offices that must install air conditioners in each room. Therefore the costs incurred will be more efficient.
- Layout will sometimes change if there are more employees or fewer employees. The layout design of an open office space will make it easier to change the layout if employees increase or decrease.
- Increase awareness and empathy of each individual to be more sensitive to colleagues and the surrounding environment.
- Carrying and placing goods according to the needs and needs of the office.
- Discipline in managing work hours and rest hours.
- Routinely opening openings (windows) and exercising together.
- Use noise canceling headphones as a sign not to be disturbed.
- Using the Flip Mood Chart, so you can see the mood between one another.

CONCLUSION

Analysis of the data collected revealed that the choice of office layout configuration had a major influence on employee performance. From the results of data collection it was found that the majority of respondents felt more productive and easily interacted and collaborated by applying the implementation of the open plan workspace at the office. However, there were weaknesses in the application of the open plan concept, among others, there were no clear territorial boundaries, sometimes the atmosphere was not conducive, and more susceptible to contracting disease. Strategies that can be taken to overcome the weaknesses of the concept of open plan are increasing awareness and empathy of each individual to be more sensitive to colleagues and the surrounding environment, carrying and placing goods according to the office's needs and stuffs only, discipline in managing work hours and rest hours, as well as routine to open openings (windows) and exercise together. By doing this strategy, the application of the open plan concept in the interior architecture consultant studio will be more optimal. Application of the open plan concept in an interior architecture office facilitated the exchange of ideas through interaction, communication, and collaboration because the close distance between employees, made them faster and easier to exchange ideas in order to increase performance and productivity.

Lack of implementation of Open Plan Workspace in an office:

- The number of employees in the same room and without barriers will disturb privacy between employees. Because the sound of the telephone, the sound of chatting, typing sound and other noisy sounds will be heard very clearly when using this open office layout.
- Every employee must take care of their respective duties and goods, because there is no tight security in the opened office layout.
- In open office layout, diseases such as flu, cough will easily spread because there is no barrier between employees.
- In this opened office design, debate will easily occur, because all employees use the facilities together. Among employees have different tastes, such as determining the temperature of air conditioners, the selection of deodorizers in the room. This will often occur in open offices.

Strategies to deal with the shortcomings of implementing Open Plan Workspace in an office:

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Bioleaching of Aluminum in Drinking Water Sludge using *Acidithiobacillus ferrooxidans* and *Pseudomonas fluorescens*

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ABSTRACT

Drinking water treatment uses aluminum sulfate in coagulation process, which generates large amount of alum sludge. The sludge potentially causes detrimental effect to the environment. Bacteria can be used for removing aluminum and other metals through bioleaching. This research aimed to determine the bioleaching performances of *Acidithiobacillus ferrooxidans* and *Pseudomonas fluorescens* in varied sludge concentrations. The alum sludge samples were collected from clearator unit at Karangpilang water treatment plant in Surabaya City, Indonesia. The alum sludge was characterized according to pH, metals, COD, BOD, phosphate, and nitrogen concentrations. The bioleaching was carried out for 15 days in batch system using reactors of 500 mL capacity. Varied bacterial medium and sludge compositions of: 0/100, 12.5/87.5, 25/75, 50/50 v/v were used during the experiment. The alum sludge characteristics were: pH 6.7; Al 5900 mg/L; Fe 3800 mg/L; Mn 1041 mg/L; Zn 400 mg/L; Pb 43.01 mg/L; Cu 10.75 mg/L; COD 4914 mg/L; BOD₅ 2345 mg/L; total P 0.456 mg/L, and TKN 9.3 mg/L. Highest bioleached aluminum concentration (340.7 mg/L) was observed in *A. ferrooxidans* reactor with sludge and medium composition of 50/50 v/v, which lowered the pH up to 2.77.

Keywords: aluminum, bioleaching, drinking water sludge, recovery of alum

INTRODUCTION

The use of aluminium sulfat as a coagulant in water treatment process causes the sludge to contain aluminum, commonly referred to as alum sludge. Previously, researchers reported that the alum sludge contained high aluminum concentration of 250 mg/L in dry weight of sludge [1]. The alum sludge, which is discharged into rivers might cause siltation, potential risk to human health, and disrupt the life of river biota due to the high aluminum and heavy metal contents [2]. Bioleaching is one of biological methods for dissolving aluminum from the sludge.

In bioleaching of metals, the pH of the solution is a critical factor in metal extraction because metals dissolve in acids. The metals are extracted by using microbes which secretes acids. These microbes can thrive well even in the extreme conditions like low or high temperature or pH thus known as extremophiles (Hebert, R. A., 1992). Earlier reports suggest that microbes have immense potential in the bioleaching process. Therefore it will essential to explore the bacterial communities which are useful in enhancing the bioleaching process. The bacterium, *Pseudomonas fluorescens* has a lot of significant function for bioremediation. It can extract the metals from the mineral ores. Metal can be extracted from the solid waste material or from different sources using *P. fluorescens* [3].

Acidithiobacillus ferrooxidans is an acidophile, living in environments with an optimal pH range of 1.5 to 2.5 [3]. As the *A.*

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ferrooxidans is a metal extracting bacterium usually grown on 9K medium [4], because the bacterium needs ferrous sulphate as a major constituent from which sulphuric acid is produced and the metals are dissolved in this acid. In addition, this bacterium has the ability to oxidize the Fe^{2+} to Fe^{3+} which results in the reduction of other metal ions [5]. It is also reported that *A. ferrooxidans* have the iron reducing activity, therefore, it can extract iron and other metals too. Previous studies focused on the bioleaching of Al and Fe [3].

The work on the bioextraction of aluminum from drinking water sludge has not been much focused earlier. Considering these facts the effect of substrate concentration (sludge density) on the metal extraction was studied in this investigation. Different substrate concentration was tried (50, 75, 87.5, and 100 v/v %), keeping other parameters such as the agitation time, agitation speed, temperature constant. Further, in the present work, the effect of sludge density of drinking water sludge on the extraction of aluminum was carried out employing the *P. fluorescens* and *A. ferrooxidans*.

MATERIALS AND METHODS

1.1 Sample Collection

The sludge sample was collected from clarator unit at Karangpilang water treatment plant in Surabaya City, Indonesia. The samples were collected using the grab method and immediately sealed with polythene containers. The collected sample was stored in the refrigerator at 6°C until use [6].

2.2 Microorganisms

The bacteria used was *A. ferrooxidans* and *P. fluorescens*. *A. ferrooxidans* was grown in 9K medium [composition ammonium sulphate ($(\text{NH}_4)_2\text{SO}_4$) 3.0 g/L, magnesium sulphate ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$) 0.5 g/L, potassium hydrogen phosphate (K_2HPO_4) 0.5 g/L, potassium chloride (KCl) 0.1 g/L, calcium nitrate ($\text{Ca}(\text{NO}_3)_2$) 0.01 g/L, ferrous sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) 21.00 g/L] and pH was adjusted to 2.0 with 10 N H_2SO_4 [4]. Whereas, *P. fluorescens* was grown in Kings Medium with composition protease peptone 20 g/L, glycerin 15 mL/L, magnesium sulphate ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$) 5.0 g/L, di-potassium hydrogen phosphate (K_2HPO_4) 2.5 g/L, distilled water 1000 mL pH = 7.2 [7]. The medium was

inoculated with 24 hours [3]. The culture was grown under a sterile condition in 1000 mL Erlenmeyer flasks containing 500 mL of bacterial medium. The inoculated was agitated on a rotary shaker at the constant agitation of 150 rpm and incubated at room temperature [8].

2.3 Sludge Physical and Chemical Characterization

The sludge was characterized according to the physical and chemical parameters. The measured physical parameters were temperature, sludge density and pH. The measured chemical parameters were Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), alkalinity, aluminum, iron, lead, mangan, zink and copper concentrations. These analyses were according to the standard methods [9]. The Al, Fe, Pb, Zn, Mn and Cu concentrations in the sludge were measured using Inductively Coupled Plasma - Optical Emission Spectrometry (ICP-OES).

2.4 Bioleaching Technique

To study the effect of substrate concentration on the bioleaching of metals, the experiment was carried out by the shake flask method. The biological leaching experiments were carried out in a 500 mL tank reactor with a working volume of 300 mL. Varied bacterial medium and sludge compositions of: 0/100, 12.5/87.5, 25/75, 50/50 v/v were used during the experiment. Microbial concentration of 10% (v/v) was inoculated into each sludge-medium mixture. For control-the flask was containing the bacterial medium only to find out whether this bacteria is capable to reduce pH. The bioleaching was carried out under a sterile condition on a rotary shaker at the constant agitation of 150 rpm and incubated at room temperature. All the experiments were run for 15 days [8].

2.5 Analytical methods

The pH value was measured using pH meter (OHAUS Starter 3100 pH Bench). Samples (15 mL) were collected at 3-day intervals from the flasks for metal and pH analyses. The samples were centrifuged at 4000 rpm for 20 minutes and the supernatant was filtered through a 0.45- μm membrane filter [8]. Analysis of metal (Al, Fe, Mn, Cu, Pb, and Zn) was carried out using Inductively Coupled Plasma - Optical Emission Spectrometry (ICP-OES).

RESULTS AND DISCUSSION

1. Sludge Physical and Chemical Characterization

Table 1 shows the physicochemical characteristics of the sludge. The average temperature of the alum sludge was 25.33°C during the sampling period in summer season 2019. The average density of alum sludge was 2.2 g/mL. The sludge density is influenced by raw water quality. The alum sludge has an average pH value of 6.7. This value is in accordance to typical pH of alum sludge from some WTPs in Indonesia and the other compared countries, which were in a range of 6.0–7.5 [10]. The average BOD and COD values of the alum sludge were 2345 mg/L and 4919 mg/L. The BOD/COD ratio of alum sludge was 0.48. The BOD/COD value was too low for biological processes [11], so in this experiment was the addition of nutrients as an element of biodegradable organic compounds to increase the BOD/COD ratio. The phosphate and nitrogen concentrations value of the alum sludge were 0.46 mg/L and 9.30 mg/L. The alkalinity of alum sludge as HCO_3^- was 353.33 mg/L.

The results of ICP-OES analyses of the fresh sludge showed very high aluminum, iron and mangan concentrations of 5900 mg/L, 3800 mg/L and 1041 mg/L, respectively. The zink, lead and copper concentrations in the fresh sludge were of 400 mg/L, 43.01 mg/L and 10.75 mg/L, respectively. The high aluminum concentrations in the sludge has the potential for recovery coagulant.

Table 1. Characterization of alum sludge from Karangpilang WTP, Surabaya City, Indonesia

Parameters	Unit	Concentrations
Temperatures	°C	25.33
Density	g/mL	2.2
pH	-	6.7
Biochemical Oxygen Demand (BOD)	mg/L	2345
Chemical Oxygen Demand (COD)	mg/L	4919
Total Kjeldal Nitrogen (TKN)	mg/L	9.30
Total P	mg/L	0.46

Alkalinity as HCO_3^-	mg/L	353.33
Aluminum (Al)	mg/L	5900
Iron (Fe)	mg/L	3800
Zink (Zn)	mg/L	1041
Mangan (Mn)	mg/L	400
Lead (Pb)	mg/L	43.01
Copper (Cu)	mg/L	10.75

3.2 Bioleaching of Aluminum by *P. fluorescens*

Figure 1 shows the pH trend during the bioleaching process by *P. fluorescens*. In the control run, the pH decreased gradually from 7.25 to 3.12 after 12 days, then increased to 5.11 in the following 12 days, and then displayed a slight reduction trend until the 15 days. The decrease in pH for the control samples resulted in the formation of organic acid by *P. fluorescens* metabolism. Organic acids in a bacterial growing medium can reduce pH. These organic acids produced by *P. fluorescens* was citric acid, glutamic acid, succinic, lactic, oxalate, malic and fumaric [13].

From the results, reactor with bacterial medium and sludge compositions of 50/50 (v/v), the pH rapidly decreased from 7.57 to 6.02 after 6 days. And then increased to 9.30 in the following 6 days, and then displayed a slight reduction trend until the 15 days. Whereas, reactor with bacterial medium and sludge compositions of 25/75, 12.5/87.5, and 0/100 (v/v) was not decreased the pH value. The pH value in reactor with bacterial medium and sludge compositions of 25/75, 12.5/87.5, and 0/100 (v/v) conversely an increase from 7 to 9 until the end of bioleaching. The results of the pH analysis do not match from the results of several studies, that bioleaching aluminum with *P. fluorescens* can reduce pH to 3.1. Whereas in this study pH was not achieved even some reactors did not experience a decrease in pH [3].

The increase pH value because the high alkalinity of alum sludge. The results of the characterization of alum sludge (Table 1) shows the alkalinity of alum sludge as HCO_3^- reached 353.33 mg/L. The HCO_3^- content can react with organic acids produced by *P. fluorescens*. Protons (H^+) derived from organic acids will bind hydroxyl and carboxyl groups [14].

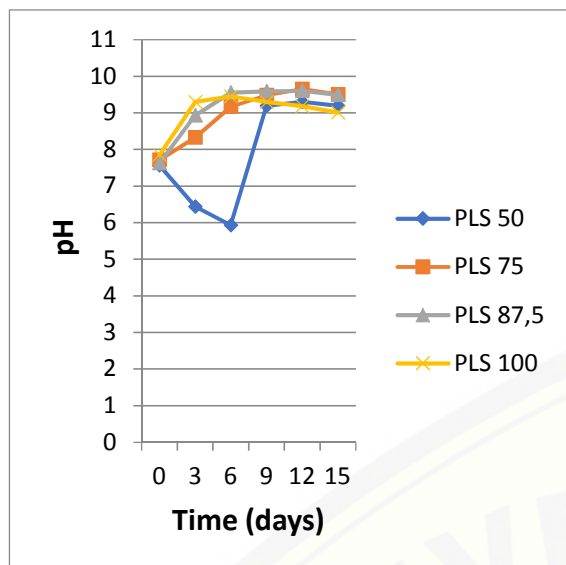


Figure 1. the pH trend during the bioleaching process by *P. fluorescens*

Aluminum hydroxide solids can dissolve in high acids (in pH values 1-3) or in high bases (in pH values 8-14) [15]. So in determining the effect of sludge density data analysis is used to 15th day when the highest pH on the reactor. As shown in Table 2, after 15 days of bioleaching, concentration of aluminum extracted in reactor with 50/50, 25/75, 12,5/87.5 and 0/100 of bacterial medium and sludge compositions was 8.14, 6.63, 3.38 and 2.22 mg/L, respectively. The 50/50 v/v of bacterial medium and sludge compositions was found better for aluminum extraction by *P. fluorescens*. The reactor with the bacterial medium and sludge compositions of 50/50 v/v showed the extraction of aluminum was 8.14 mg/L and percentage it was 0.28 %. Further, it was noted that with the increase in the sludge concentration the extraction of metals was also got decreased. This is because high solid content increases buffering capacity, inhibits the diffusion of gases, and increases the metal content of the sludge [16].

Table 2. Effect of sludge density on extraction of aluminum from alum sludge by *P. fluorescens* after 15 days bioleaching process

Bacterial medium and sludge compositions (% v/v)	Initial Aluminium Concentration in Sludge (mg/L)	Aluminium Extracted (mg/L)	Bioleaching Efficiency of Aluminium (%)	pH
H	2950	8.14	0.28	9.19
25/75	4425	6.63	0.15	9.50
12.5/87.5	5162	3.38	0.07	9.49
0/100	5900	2.22	0.04	9.01

3.2 Bioleaching of Aluminum by *A. ferrooxidans*

The biological activity is confirmed by the pH trend, that always remains at low values during the process: this behaviour indicates that the production of sulphuric acid, due to the bacterial activity, is responsible for the progressive metals solubilization. Figure 2 shows the pH trend during the bioleaching process by *A. ferrooxidans*. In the control run, the pH decreased gradually from 3.34 to 1.52 after 9 days, then increased to 2.73 in the following 9 days, and then displayed a slight reduction trend until the 15 days. The decrease in pH for the control samples resulted in the formation of ferrous sulfate during the oxidation of ferrous iron.

In reactor with bacterial medium and sludge compositions of 50/50 (v/v), the pH rapidly decreased from 5.07 to 2.77 after 9 days. And then retained this slight reduction until the end of bioleaching. The lowest pH decrease occurred in this reactor. In reactor with bacterial medium and sludge compositions of 25/75 and 12.5/87.5 (v/v), the pH rapidly decreased from 5 to 3 after 3 days until the end of bioleaching. Whereas reactor with bacterial medium and sludge compositions of 0/100 (v/v), the pH rapidly decreased from 6 to 4 after 3 days until the end of bioleaching. The results of the pH analysis are in accordance with research conducted by Shaikh *et al.* (2018), that bioleaching with *A. ferrooxidans* can reduce pH up to 2 [3].

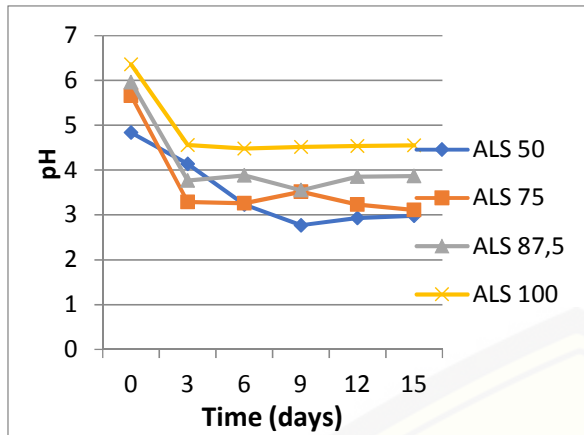


Figure 2. the pH trend during the bioleaching process by *A. ferrooxidans*

As shown in Table. 3, an increase in content of sludge solids generally leads to a decrease in metal solubilization. After 9 days of bioleaching (day obtained the lowest pH), concentration of aluminum extracted in reactor with 50/50, 25/75, 12,5/87.5 and 0/100 of bacterial medium and sludge compositions was 340.70, 278.80, 173.30 and 13.83 mg/L, respectively. The 50/50 v/v of bacterial medium and sludge compositions was found better for aluminum extraction by *A. ferrooxidans*. The reactor with the bacterial medium and sludge compositions of 50/50 v/v showed the extraction of aluminum was 340 mg/L and percentage it was 11.55 %.

Table 3. Effect of sludge density on extraction of aluminum from alum sludge by *A. ferrooxidans* after 9 days bioleaching process

Bacterial medium and sludge compositions (% v/v)	Initial Aluminum Concentration in Sludge (mg/L)	Aluminum Extracted (mg/L)	Bioleaching Efficiency of Aluminum (%)	pH
50/50	2950	340.70	11.55	2.77
25/75	4425	278.80	6.30	3.11
12.5/87.5	5162	173.30	3.37	3.87
0/100	5900	13.83	0.23	4.55

CONCLUSION

The results of this study showed that the sludge concentration influenced the bioleaching of aluminum. The 50/50 v/v of bacterial medium and sludge compositions was found better for

aluminum extraction by *P. fluorescens* and *A. ferrooxidans*. The bioleaching of aluminum from the sludge was found better by *A. ferrooxidans*. Highest bioleached aluminum concentration by *A. ferrooxidans* was 340.7 mg/L which lowered the pH up to 2.93.

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The Role of Supply Chain Integration to Improve SMES Performance - A Case Study of The Fisheries Industry in Aceh

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ABSTRACT

This article proposes an approach to determine the underlying dimensions of Supply Chain Management integration and its relation to performance among small firm with special emphasis on tuna industry in Aceh, Indonesia. The overall aim of the study is to better understand successful SCM practices which have been implemented by small industry in Aceh and the challenges faced in the process. This paper uses qualitative data, which was collected from open-ended interviews with stakeholders in a leading Aceh tuna business, together with the SCOR model, which is used to define supply chain processes and associated performance indicators. The result of this research indicates that the industry regards flexibility, efficiency and quality as the most important indicators in their supply chain operation. However, factors such as financial, SCM expertise, infrastructure and resource create a barrier in implementing an effective supply chain. Further to this, Successful SCM strategies improving SCM performance were identified based on each performance indicators. The result of this paper is expected to contribute to theoretical and practical knowledge of SCM practice, and to develop recommendation for future development of industry with small-scale capabilities.

Keywords: Supply Chain Management; SCOR model; Aceh.

INTRODUCTION

Today, SCM practices are becoming essential for organizations to achieve a competitive advantage in the global market. Since the number of competitors is escalating in both local and global markets, making it more challenging for small and medium enterprise (SME) to survive and grow. These constraints highlight the importance of managing and improving organizational performance to produce and maintain products and services that are distinct from other industries. As a result, many enterprises have begun to integrate supply chain management practices to achieve efficient

management and develop competitive advantages. Aceh is a coastal province in Indonesia with a potentially valuable marines and fisheries sector. Dominated by SMEs, the sector contributes to the employment of over 80,000 people either directly or indirectly and had an estimated total production of 150,000 fish in 2014 [1]. Traditionally, most of these fisheries products have been sold to local markets, with export-quality fish delivered to North Sumatra for export. Recently, to adapt to changes in the market regulation, the tuna industry in Aceh has experienced transformation in its supply chain system. An SME that traditionally operated as a supplier of raw (unprocessed) tuna to several industries in another province in Indonesia has transformed into a direct exporter of processed tuna to foreign markets. This transformation not only changed the relationships and networks among the stakeholders of the firm, but also

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shifted the business processes and management system within the company. Thus, the transformation has led to the integration of a new systematic supply chain system. By integrating a new complex supply chain system, SMEs will be more attuned to the sensitiveness of the business environment.

SCM practice offers organizations a reduction in cycle time and inventory, while also providing the company an accurate resource planning mechanism. In addition, flexibility to respond to customer demands and rapid decision-making behavior make organizations more able to adapt to constantly changing regulations and advancing technologies [2]. However, due to the nature of SMEs and their resource limitations, knowledge and financial results in SMEs having fewer advantages in supply chain practice, compared with larger enterprises. This paper focuses on supply chain integration strategy in the fisheries industry in Aceh and explores the success factors in managing this supply network. The main objective of the study is to examine and to achieve better understanding of how the SME in Aceh increase performance of the newly integrated, and to explore the obstacles faced in the implementation of this system.

MATERIALS AND METHODS

This paper analyses the tuna processing industry in the city of Banda Aceh, Indonesia, which has a newly integrated supply chain management network to fulfill the export demand for tuna products. This paper employs qualitative data, which was collected from open-ended interviews with stakeholders in a leading Aceh tuna business and together with the SCOR model, which is used to define supply chain processes and associated performance indicators. In this context, the SCOR (Supply Chain Operation References) model is used as a reference and benchmark to determine the most incremental indicators that have highest contribution organization's performance.

RESULTS AND DISCUSSION

1. Supply chain management practice of the fisheries industry in Aceh

The majority of fishing industry in Aceh is dominated by small and medium enterprises (SMEs), with the sector contributing up to 6.5 %

of regional GDP and providing direct and indirect employment for over 80,000 people in the surrounding area [3]. Due to lack of processing facilities, previously most catches were sold to the local market, and with export quality fish exported as unprocessed product through North Sumatra as the main distribution channel. In this scenario, the tuna industry had a limited responsibility for controlling the supply chain network, because most of the process were handled by different companies outside of Aceh. However, industry experts in Aceh believed that the supply chain line had an unfavorable impact to the industry, for several reasons. First, products value continues to deteriorate due to the 12 hours distance from Aceh to North Sumatra, which gradually reduced the selling price of the product.

The price of fish products is generally determined by its distribution system, with longer distribution systems proven to reduce the price of products and increase production and distribution costs [4]. Secondly, agri-food sector-based industries are always under pressure to adapt and critical to a sudden change in requirements, issues and customer demands [5]. Unfortunately, due to the limited access and direct end customer approach of the system, the industry had low flexibility toward customer demand which resulted in low capacity for reaction and poor coordination in managing company costs and resources [6]. To resolve these problems, the industry has recently transformed into a more global supply chain system, in which companies are now directly responsible to the processing (from whole unprocessed tuna to tuna loin) and distribution to export destination. Additionally, to support this new initiative, the industry has been required to implement new systems, management, and processing plant and to improve stakeholder relationship. Although, the nature of SMEs poses significant limitations of resources in terms of finance and expertise, the industry claims that the new supply chain line brought about a significantly positive result in terms of financial and resource management. In addition, the current supply chain theories define that SCM integration provides various potential benefits to an industry in the long term. SCM practice offers organizations a reduction in cycle time and inventory, while also providing the enterprise with an accurate resource planning tool [7]. In

this newly integrated scenario, the Aceh fisheries industry is now less dependent on cold chain infrastructure and costumers have a better information which consequently improve the industry's performance.

2. The challenge and barrier of implementing supply chain management

Supply chain management plays a crucial role in determining the survival and growth of a company, and in developing the competitive advantage of a company. Several studies have found the benefit of supply chain integration for company performance. However, the actual benefits of supply chain integration initiatives and their relation to performance may differ according to the organization, due to the differing capacities of companies to minimize barriers and challenges in implementing supply chain management systems. Govindan et al. [8] identified technology, knowledge, and involvement and support as some of the barriers to supply chain management adoption.

Meanwhile, Fawcet et al. [9] indicate that information access and human behavior are the chief barriers, because the ability of a firm to maximize the direct function and quality of its resources is clearly dependent on the ability of human processing. In the context of the tuna industry in Aceh, the supply chain management system is intended to achieve several goals, such as improvement in the valued added of the product, efficiency, and improvement in financial performance. However, as a relatively small firm, the tuna business in Aceh faces certain barriers and challenges in achieving optimal performance. SMEs differ from large companies in their ability to adopt new systems and, based on the interview with tuna industry expert in Aceh, a number of aspects have been identified that obstruct the adoption of a supply chain system in Aceh. The factors include: first (i) the inability to implement advanced information management system, since insufficient of information expertise and the cost of technology create boundaries for implementing information management techniques, a proper information handling will surely impact the lead time and production planning of the company. Secondly (ii) fluctuation supply of raw material also create huge obstacle for the company to earn continual

profit, which resulted to a lower investment in a new resource. And thirdly, (iii) low bargaining power over price that force the SMEs to employ an efficient production and management technique to gain profitable outcomes but still need to maintain the highest quality standard of product and operation, which can be really expensive for the company to strive.

3. The goal of supply chain integration in the Aceh tuna Industry

a. To gain new market access

With the growing global population and increasing demand for protein, especially for seafood, the potential market for fishing industries is becoming increasingly wider. the world population is expected to growth to approximately 9 billion by 2050, with the global food requirement predicted to grow by 70% in value due to increased food consumption. Furthermore, the forecast for total seafood consumption is expected to rise by 3.7% by 2021, with a growing revenue that continues to grow at 0.9% and 2.7%, respectively, between 2015-16 and 2020-21 [10]. Though this opportunity will likely present potential benefit for the industry, in the previous system, the fishing organization could sell the product to only one exporter. Thus, the new supply chain integration system is expected to open new potential market for the industry.

b. To achieve better customer satisfaction

Efficient and effective SCM practice is one of the most effective technique in achieving excellency in customer service and it directly dictates the two most crucial components of customer satisfaction: cost and distribution. Efficient supply chain helps company to achieve a high competitiveness index to beat business competitors on product over product sale and resulted to an increase in profitability thus by having prominence-level performing operations can also help the company to exceed the end users' expectations on the delivery of the goods and consequently increase customer satisfaction and loyalty toward the product [11]. Effective SCM allows a business to achieve the desired outcomes. By choosing the most suitable systems, approaches, and networks helps to control the products chain from conception to delivery, reducing errors and increasing inventory efficiency. Thus, more optimized

supply chain will achieve better the customer satisfaction and provide direct impact on creating profit for the firm.

c. To achieve improvement in financial performance

One of the most crucial aspects of SCM is to provide a contribution to the financial growth of an organization. Traditional initiatives aimed at financial growth concentrate on cost effectiveness: the streamlining of inventory level to minimize inventory carrying costs, automating of fulfillment operations to reduce the cost of labor, consolidating of orders to cut shipment spending, etc. In contrast, the more successful enterprise use supply chains to develop differentiation, improve sales, and to gain new markets access, as a way to develop the competitiveness and shareholder value [12]. A separated focus on expenses and revenue generation facilitates supply chain practitioner to identify the structural identity of supply chain initiatives. As the enterprise put more strategic emphasis on SCM, management capabilities need to alter from a series of day to day process to a strategic system with supply chain integrators who expertly handle cross-functional and cross-company complexities. Thus, in this scenario, supply chain practitioner needs to understand the relation and interdependencies between enterprise and to withstand any blockage of handling supplier and costumer relationship.

4. Key Performance indicators (KPI) in the Aceh tuna industry

This study hypothesizes efficiency, flexibility, responsiveness, innovation, and food quality as the framework of key performance components that build the performance perspectives for the supply chain system. Based on the interview with the case study of the tuna firm, the key performance indicators that were regarded as the most influential factors in the supply chain line are as follows.

Table 1. Key performance indicator of the case study company

Attributes	
Efficiency	The agility in which the supply chain responds to changes in demand and new regulation to achieve competitive advantages the criteria's in flexibility are
quality	

customer satisfaction and costumer relationship

Two major criteria that are employed in the supply chain management, namely, the cost-efficiency criteria and the profit-maximization criteria

The attribute relates to the concern and expectation of the process quality and product quality to the costumer

The most consistent indicators for the performance of the case study supply chain network appeared to be revenue in efficiency aspect, product and process quality in quality and customer satisfaction which are characterized in Flexibility. In this regard, the goals of the supply chain integration can be obtained if the supply chain improves its performance.

5. How did the fisheries industry in Aceh improve its supply chain performance?

This section presents the strategies implemented by Aceh fisheries industry in aligning the performance of the supply chain based on the KPI criteria.

5.1 Flexibility

5.1.1 Improving value added of the product

With the rise in global competition, the demand of providing the optimal product to the costumer continues to expand. Companies need to improve the product offering by increasing the value added of the product. To increase the value, the tuna industry in Aceh employs a new processing technique that process a raw tuna to a tuna loin before export. the export costumer pays higher price for processed tuna rather that unprocessed raw material. In addition, a raw whole tuna possesses a chemical acid in the innards system of the fish, the acid can alter the flavor and quality of the tuna overtime which consequently lower the tuna quality before reaching the costumer. In addition, by adding the processing system before the export increase the delivery flexibilities due to the weight reduction after processing. Thus, industry invest in a new processing facility to maintain the quality of the product at a premium level before export process.

5.1.2 Effective Logistics Cost Management Techniques

The fishing industry in general is faced with certain variation in the supply chain operation, as a chain that heavily depend on nature, natural phenomena will heavily impact the harvest yield. This variation creates a barrier for a company to maintain the upstream demand. To anticipate this, the organization needed to invest in major new supporting cold chain infrastructure as a way to ensure inventory level. However, as a small firm with low financial resource, the industry was struggled to invest in those high-priced infrastructures. In this regards, the Aceh's industry believes that effective inventory system management is the only way to cope with the challenge. The industry uses just in time (JIT) inventory and logistic system that schedules delivery by supplier readiness. JIT is intended to have minimum stock in the inventory as it aims to have business produce just enough products to meet demand [14]. JIT ensure the continuous production and distribution flow to the costumer where consumer order drives the management of the inventories. In addition, the industry shifts the distribution technique from using sea-cargo to the air-cargo. The advantages of using air-cargo is the distribution cost was not based on certain volume or surface area of the cargo of the goods, but calculated on the total weight of the product, which are suitable for JIT production system. For large, heavy shipments, shipping via ocean is often much less expensive. However, as shipment sizes decrease due to the new JIT initiative, the margin between air and ocean prices also decreases. With a system that more responsiveness with supplier readiness, the company can reduce the unnecessary expense and risk especially with a low infrastructure to maintain the inventory and product quality.

5.1.3 Low Products Variation

SMEs with successful supply chain strategies only employ shorter ranges of the goods in the supply chain system. Many industries regard that lower range of product offer better efficiency in managing production lead time and achieve higher delivery reliability than a company with higher product ranges [15] The same statement also applied in context of the tuna industry in Aceh, the owner regards that by focusing on only limited classified product, the industry able to achieve higher efficiency in processing. In

addition, lower product range also reduce the risk of contamination which is one of the biggest concerns of the global fisheries market.

5.2 Process and Product quality

5.2.1 Improving Management Capabilities

Supply chain management (SCM) is repeatedly defined as a complex process, involving various actors and scenarios. Organizations seek competitive capabilities that deliver customers' preferences and increase their financial performance. Supply chains are not only a network between firms and communities, but also a bridge network between products and information that impossible to be achieved without functional support from human resources to control and manage the system. The owner of the industry explained that in order to support a good the management and capabilities, the industry is working collaborate with the local government and several universities in Aceh to provide a training and module to the internal management of the company and the local Aceh fisherman (supplier). The training was intended to provide a knowledge on proper post-harvest handling and maintaining good quality standard. Furthermore, the owner also stated that the industry is highly acceptance to any student or organization who want to conduct a research in the company, the owner expect that the research will provide new dimension or perspective in solving a problem within the company network. The advantage of having top management capabilities will help the competitive dimension of the company, which will also drive innovation and collaboration within the company. This advantage will create significant impacts toward collaborative goals in the supply chain.

5.2.2 Food Safety Standardization and certification

Currently, there has been a shift of food standardization form individual level recognition to government or regional regulation. The new market demand and international regulation enforce a mandatory standard of product and production safety which forbade uncertificated product to enter the designated market [16]. Thus, to compete with those industry and to be accepted in the international market. The tuna industry in Aceh employ food and safety certification in the both post and pre-harvesting production. The industry also worked with

coastal communities to improve fish handling and hygienic practices and preservation techniques. This initiative presents a better prices per catch as well as reduction in losses.

CONCLUSION

This research project sought to understand the successful SCM integration process that has been implemented by the fisheries industry in Aceh, Indonesia. In-depth interviews with the relevant members of this company were conducted, and SCOR was used as a framework for supply practice. The fisheries industry is a thriving business with limited capabilities and resources and was able to survive and grow in the complex supply chain system. In their business process, the industry experienced fluctuation in material supply, inadequate information technologies and low bargaining power over prices. Thus, to anticipated the challenge in the supply chain system. industry consider the basic steps needed to improve the supply chain are focused on improving information access, improving the value added of the product, and improving management capabilities of both suppliers and the internal management of the company. The findings of this research are relevant not only to the case study case, but also offer implications for other emerging industry in the same patterns with limitation in resources and capabilities that liaise with international buyers, which are major SCM challenges.

ACKNOWLEDGEMENT

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Static Analysis of FGM Plate Using MITC3 Element

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ABSTRACT

This paper presents a static analysis of one of the components of green building, which is the use of materials that have good performance and efficiency in buildings, one material that has such properties is FGM (Functionally Graded Material). FGM is a material consisting of a mixture of ceramics and metals through varying volume fractions, ceramic material as a heat barrier at the high-temperature side and metal material that has tough properties and high conductivity at the low-temperature side, FGM can be applied in many fields, which one of its applications can be used as a building material for important objects storage that must be maintained from high temperatures. In this paper, the FGM material is used as a finite element plate and analyzed using one of the most widely used finite element plate theory, MITC3 (3-node Triangular Mixed Interpolation of Tensorial Components). The MITC3 element is a triangular element that gives good results on the isotropic plate, furthermore, it can be used to analyze FGM plate problems. Numerical analysis conducted to observe the performance and convergence behavior of the MITC3 FGM plate element, numerical analysis is carried out in the case of skew plates with varying skew plate angle. From the analysis, it can be concluded that the MITC3 plate element gives good results and convergent to the reference solution on FGM plate problems.

Keywords: Green Building; FGM; MITC3.

INTRODUCTION

One of the important things to build a good structure on a building is the material used. Green building structures can be achieved by using friendly materials. Composite material attracts the attention of many researchers due to its wide range of applications. This material is lighter but gives stronger resistance compared to non-composite material. However, this material has a problem of stress concentration among its layers [1]. To overcome this limitation, FGM is proposed. This material is formed from two or more constituent material with material properties that continuously vary from one side to another side and eliminate the stress concentration that appears on the composite material [2].

To support the numerical analysis of FGM structures, finite element method can be used. In plate bending structures, the MITC3 element (3-node Triangular Mixed Interpolation of Tensorial Components) are very simple to use. The research and development of this element can be found in [3-6]. In this paper, we use the MITC3 element on FGM skew plate problems to observe its convergence behavior. Reference solutions from the literature then used to validate the performance of this element.

MATERIALS AND METHODS

In this paper, we use MITC3 element to analyze the FGM plate problems. FGM has many advantages compares to the conventional composite material and MITC3 element is one of the plate elements that widely used by researchers or in commercial software.

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2.3 Stiffness matrix of MITC3

Stiffness matrix due to effect membrane, bending, membrane-bending, and shear is:

$$[k] = [k_m] + [k_b] + [k_{mb}] + [k_{mb}]^T + [k_s] \quad (6)$$

where,

$$[k_m] = \int_A [B_m]^T [H_m] [B_m] dA \quad (7)$$

$$[k_b] = \int_A [B_b]^T [H_b] [B_b] dA \quad (8)$$

$$[k_{mb}] = \int_A [B_m]^T [H_{mb}] [B_b] dA \quad (9)$$

$$[k_s] = \int_A [B_s]^T [H_s] [B_s] dA \quad (10)$$

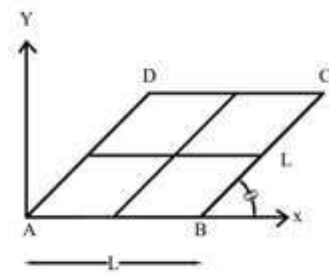
RESULTS AND DISCUSSION

1. Numerical Analysis

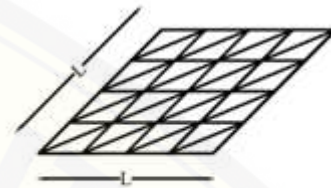
To analyze the convergence behavior of MITC3 element on FGM plate case, we use soft simply supported ($w=0$) skew plate problem with several skew angle (θ) of 15° , 30° , 45° , 60° and 75° under uniform loading f_z . To validate the performance of MITC3 element, the central displacement given by kp -Ritz is used as a reference solution [8]. The reference of central displacement is given by:

$$w_c = 1600w_c h^3 / (12(1-\nu^2)) f_z L^4 \quad (11)$$

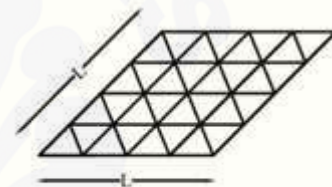
We use multiple meshes ($N \times N \times 2$) of $4 \times 4 \times 2$, $8 \times 8 \times 2$, $16 \times 16 \times 2$, $32 \times 32 \times 2$, $64 \times 64 \times 2$, and two types of variation diagonal mesh direction of mesh A and mesh B in Fig. 3. We use the results with $128 \times 128 \times 2$ is used as a reference solution in the absence of the reference solution. Using three types power law index of $n = 0$ (ceramic), $n = 1$ (FGM) and $n = \infty$ (metal), FGM material used is Al/ZrO₂-1 with the property materials of aluminum ($E = 70$ GPa) and Zirconia ZrO₂-1 ($E = 200$ GPa), Poisson ratio assumed constant ($\nu = 0.3$) on this FGM.



(a)



(b)

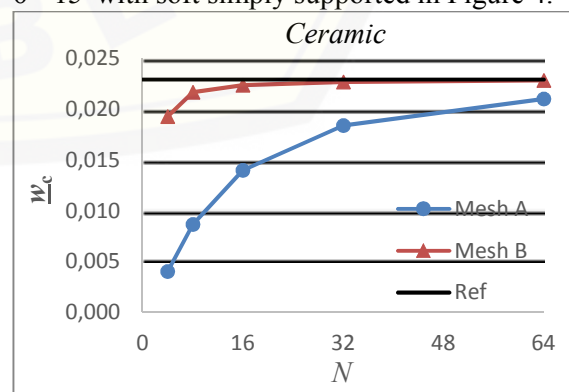


(c)

Figure 3. MITC3 with 5 DOF per node. (a) The skew plate model with $N \times N \times 2 = 4 \times 4 \times 2$, variation (b) mesh A and (b) mesh B

1.1 Skew plate with skew angle $\theta = 15^\circ$

Conducting static analysis and obtain the results of the convergence of central deflection w_c ($L/h = 100$) of the skew Al/ZrO₂-1 plate $\theta = 15^\circ$ with soft simply supported in Figure 4.



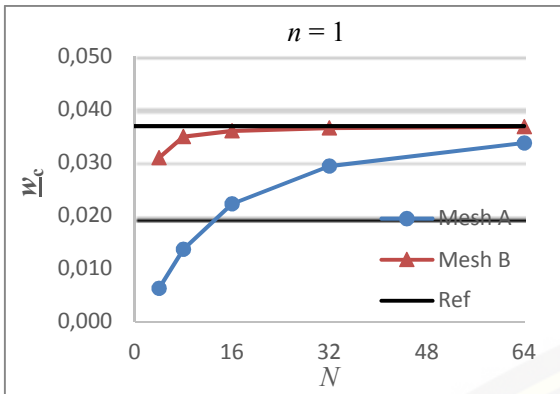


Figure 4. Convergence of deflection w_c ($L/h = 100$)

The analysis result shows that the MITC3 element convergent to the reference solution, but the results of mesh B converges faster than mesh A.

1.2 Skew plate with skew angle $\theta = 30^\circ$

Conducting static analysis and obtain the results of the convergence of central deflection w_c ($L/h = 100$) of the skew Al/ZrO₂-1 plate $\theta = 30^\circ$ with soft simply supported in Figure 5.

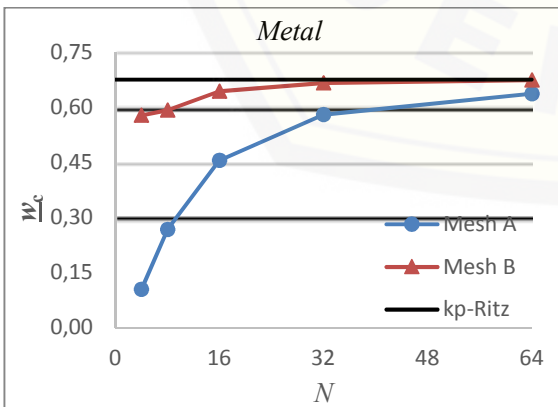
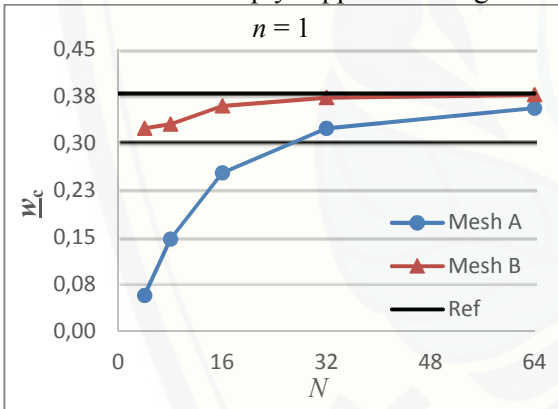


Figure 5. Convergence of deflection w_c ($L/h = 100$)

The analysis result shows that the MITC3 element convergent to the reference solution, the gap of convergence results of mesh A toward mesh B has decreased on the skew angle $\theta = 30^\circ$ than $\theta = 15^\circ$.

1.3 Skew plate with skew angle $\theta = 45^\circ$

Conducting static analysis and obtain the results of the convergence of central deflection w_c ($L/h = 100$) of the skew Al/ZrO₂-1 plate $\theta = 45^\circ$ with soft simply supported in Figure 6.

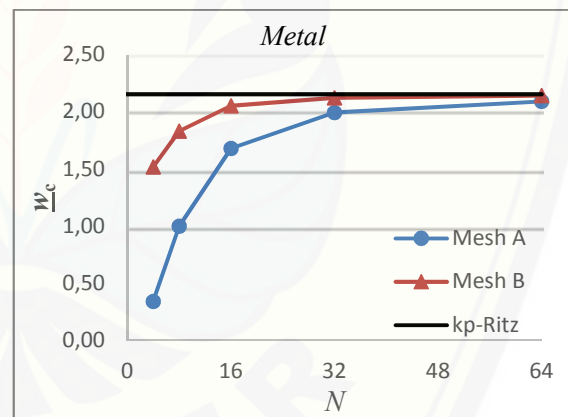
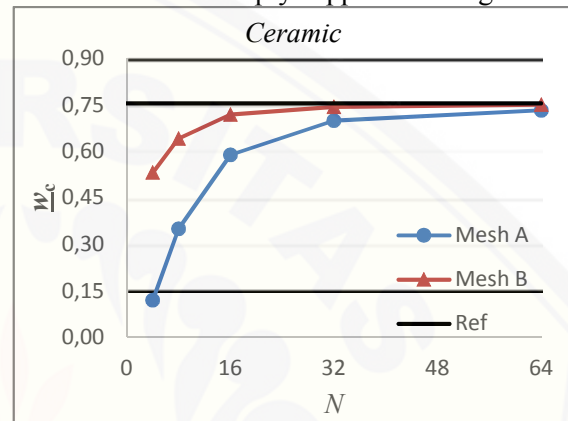


Figure 6. Convergence of deflection w_c ($L/h = 100$)

The analysis result shows that the MITC3 element convergent to the reference solution, the gap of convergence results of mesh A toward mesh B has decreased on the skew angle $\theta = 45^\circ$ than $\theta = 30^\circ$.

1.4 Skew plate with skew angle $\theta = 60^\circ$

Conducting static analysis and obtain the results of the convergence of central deflection

w_c ($L/h = 100$) of the skew Al/ZrO_2-1 plate $\theta = 60^\circ$ with soft simply supported in Figure 7.

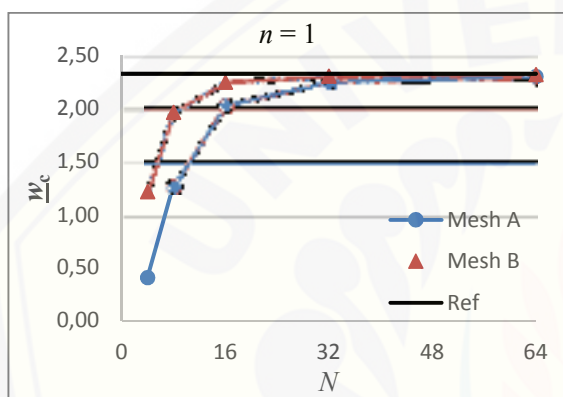
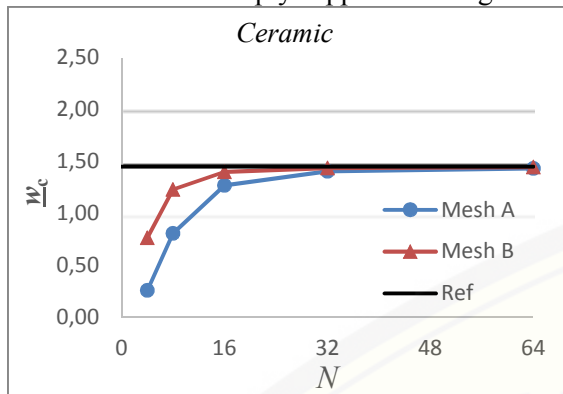


Figure 7. Convergence of deflection w_c ($L/h = 100$)

The analysis result shows that the MITC3 element convergent to the reference solution, the gap of convergence results of mesh A toward mesh B has decreased on the skew angle $\theta = 60^\circ$ than $\theta = 45^\circ$.

1.5 Skew plate with skew angle $\theta = 75^\circ$

Conducting static analysis and obtain the results of the convergence of central deflection w_c ($L/h = 100$) of the skew Al/ZrO_2-1 plate $\theta = 75^\circ$ with soft simply supported in Figure 8.

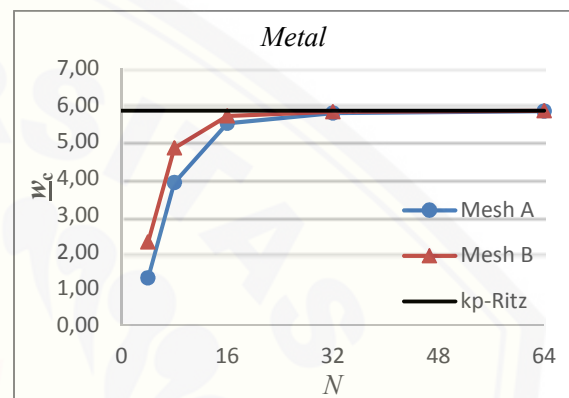
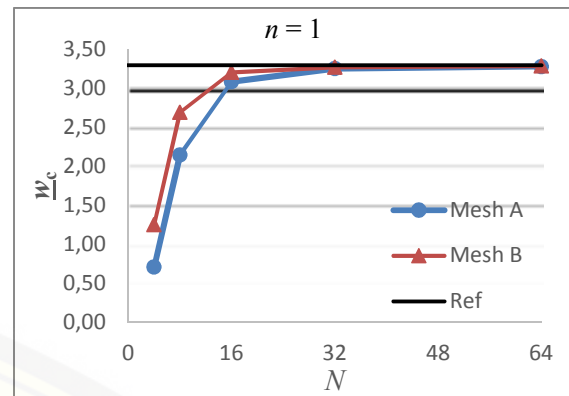


Figure 8. Convergence of deflection w_c ($L/h = 100$)

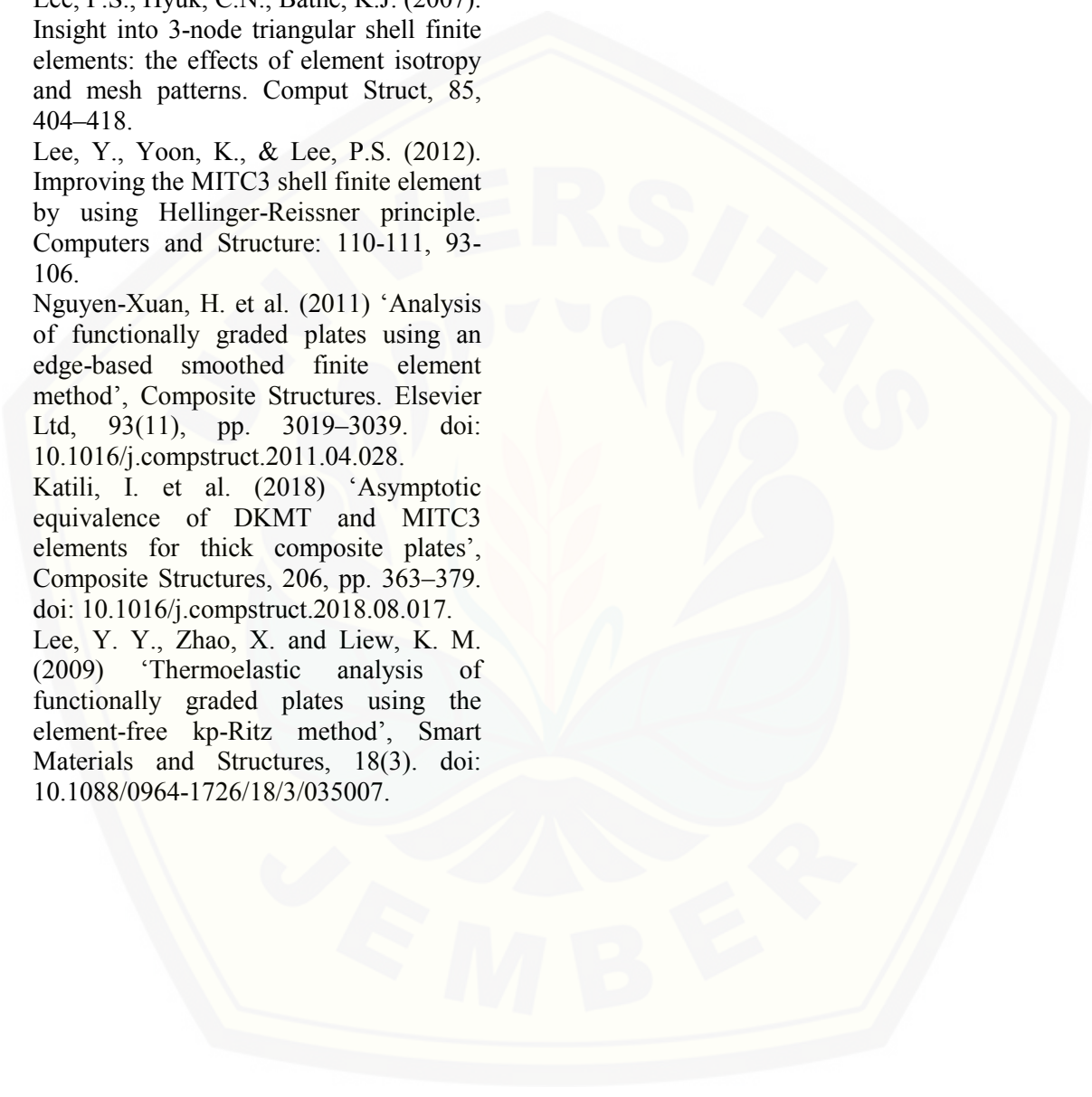
The analysis result shows that the MITC3 element convergent to the reference solution, there is not the gap of convergence results of mesh A toward mesh B on the skew angle $\theta = 75^\circ$.

CONCLUSION

We conducted a static analysis of MITC3 element on FGM skew plate case with two variations diagonal mesh, we observe that MITC3 converges to the references solution and Mesh B have Good convergence than mesh A, therefore, MITC3 element can be used to analyze FGM structure in buildings or others. Future work we can conduct the free vibration analysis of MITC3 on the FGM plate.

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Static Analysis of FGM Plate Using DST-BK Element

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ABSTRACT

Functionally graded material (FGM) is one of the environmentally friendly materials which is a component of green building. This material get the attention of many researchers because its physical properties. It's proven that FGM better than traditional composite materials with smooth transition properties along with the thickness of the plate. FGM material can reduce damage due to delamination that occurs in composite materials. The same as a composite material, this material can be formed from two or more materials, which is very beneficial because two of the sides of the plate can be adapted to environmental conditions. In this paper, the DST-BK (Discrete Shear Triangle-Batoz Katili) element is used to analyze FGM plate problems. The formulation of elements on the plate must be able to minimize or be free from the effects of shear locking. DST-BK is an element that was developed to overcome these problems. The DST-BK element is a triangular element developed from the DKT (Discrete Kirchhoff Triangle) and DST-BL (Discrete Shear Triangle-Batoz Lardeur) concept that has shown good results on the isotropic plate. The purpose of this study is to develop the DST-BK element on the FGM plate numerically tested, several numerical test cases for the FGM plate include a static test of skew plates and then compare the results to the reference solution.

Keywords: Green Building; FGM; DST-BK.

INTRODUCTION

Nowadays the development of material increase rapidly due to a large number of infrastructures that requires special material with physical characteristics that are strong enough and lightweight. Humans began thinking to create a variety of products consisting of a combination of more than one material to produce a material that is stronger and lighter [1], composite is one of the answers. The composite material has sharp concentration always appears on the surface causing faulty components in the process of delamination, matrix cracking and the separation of adhesive bonds [3].

To overcome the deficiencies of composite materials emerging FGM material, which is a better material than composites, formed from two or more constituent materials with a material property that continuously varies from one side to the other and eliminates the concentration of sharp appearing on the composite [2]. Numerical method is needed to analysis FGM problems in the complicated infrastructure with the absent of the exact solution. One of the numerical methods are finite element method. A good element must free shear locking and give a good convergence behavior in thick or thin case problems. DKT (Separate Kirchhoff Triangle) element which is valid for thin plate problem is introduced by Batoz and Lardeur [14] and [15]. The development of DST element for thick plate problem called DST-BL (Discrete Shear Triangle-Batoz elements Lardeur) in 1989 was introduced in [14] but this element did not pass the patch test. To overcome this problem, the

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DST-BK element (Discrete Triangular Slide-Batoz Katili) is proposed in 1992 [14]. This paper analyzed FGM plate problem by using DST-BK element and then compared the results to the reference solution.

MATERIALS AND METHODS

With the advantages of the FGM plate as above, it has drawn a lot of attention for researchers. FEM becomes a numerical approach used for the development of FGM, and DST-BK element is used to get it's convergence behavior in FGM plate problems.

1. Functionally Grade Materials (FGMs)

The FGM material replaces a sharp interface with a gradient interface that generates a subtle property transition from one constituent material to another [1]. The material is on the top surface of the ceramic-rich plate (P1) whereas the metallic-rich surface material (P2).

$$P(z) = (P_1 - P_2)V_c(z) + P_2 \tag{1}$$

$$V_c(z) = \left(\frac{2z+h}{2h}\right)^n \tag{2}$$

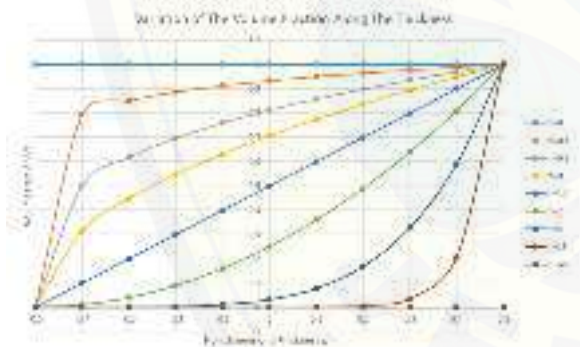


Figure 1. Distribution of FGM Material Properties Along with Thick Based on Power Law Index

Changes in the fraction volume can be seen in (Figure. 1) above. The FGM material is material with the change in the material property changes smoothly according to the change in the fraction volume. for calculations using the finite element method, the change in material FGM can be calculated by integrating the thickness with the limitation that changes in the direction of the plate length and width are considered constant.

then arranged Hooke's matrix using the function of the power law[1].

2. Formulation of DST-BK FGM

The DST-BK formulation (Discrete Shear Triangle-Batoz Katili) is an element with the Reissner-Mindlin element base applied to the triangular element and detail will be shown at [14]. DST-BK is also a development of the DST-BL element to be able to pass the patch test [11,12]. This element has 5 Degree of Freedom (DOF) per node as shown in the figure below [11]:

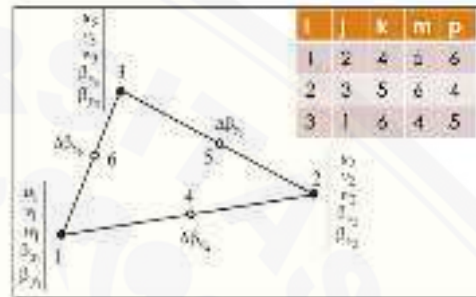


Figure 2. Kinematic Variable of Corner Node & Temporary Variable at Mid Side ij

The displacement of any point in the plate element can be define in the following form in below :

$$\begin{aligned}
 u &= \sum_{i=1}^3 N_i u_i \\
 v &= \sum_{i=1}^3 N_i v_i \\
 w &= \sum_{i=1}^3 N_i w_i \\
 \beta_x &= \sum_{i=1}^3 N_i \beta_{x_i} + \sum_{k=4}^6 P_k C_k \Delta \beta_{sk} \\
 \beta_y &= \sum_{i=1}^3 N_i \beta_{y_i} + \sum_{k=4}^6 P_k S_k \Delta \beta_{sk}
 \end{aligned} \tag{3}$$

with the linear shape function value associated with the nodal point:

$$N_1 = 1 - \xi - \eta ; N_2 = \xi ; N_3 = \eta \tag{4}$$

And the quadratic shape function are :

$$\begin{aligned}
 P_4 &= 4\lambda\xi - \frac{2}{3}(1-2\eta) + \frac{1}{6} \\
 P_5 &= 4\xi\eta - \frac{2}{3}(1-2\lambda) + \frac{1}{6} \\
 P_6 &= 4\lambda\eta - \frac{2}{3}(1-2\xi) + \frac{1}{6}
 \end{aligned} \tag{5}$$

from [14] we can see the formation of the plate stiffness matrix derived from the energy equation with an additional matrix size due to the effect of membrane and couple membrane bending energies on the FGM plate. The matrix of membrane deformation can be seen below:

$$[B_m] = \begin{bmatrix} N_{i,x} & 0 & 0 & 0 & 0 \\ \dots & 0 & N_{i,y} & 0 & 0 & 0 \dots \\ N_{i,y} & N_{i,x} & 0 & 0 & 0 \end{bmatrix} \quad i=1,3 \tag{6}$$

The stiffness Matrix of DST-BK element for FGM plate are [15]:

$$[k] = [k_b] + [k_s] + [k_m] + [k_{mb}]^T + [k_{mb}] \tag{9}$$

RESULTS AND DISCUSSION

1. Numerical Analysis

To see the convergence behavior of DST-BK element in FGM plate problem, static numerical test with two types of patterns *A* and *B* with $N \times N \times 2$ as shown in (Figure 3) below. The configuration is slightly modified by tilting the plate as in figure *A* with different theta variations of $15^\circ, 30^\circ, 45^\circ, 60^\circ$ as shown in (Figure 4) [8].

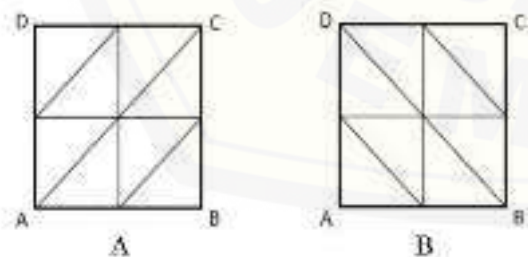


Figure 3. Two configurations on the square plate, Mesh A and B

For properties of FGM materials in this research are formed from two materials, ceramic on the top surface with the modulus of elasticity 200 GPa and metal with the modulus of elasticity

70 GPa in the bottom surface. Where the constant Poisson ratio is 0.3 with L/h ratio is 100. The value of power Law (n) on this research is taken towards infinity with other meanings the plates behave like metal plates with soft simply supported ($w=0$) boundary condition and uniform load ($f_z = 1$) on the surface plate[8].

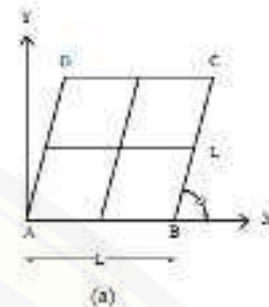
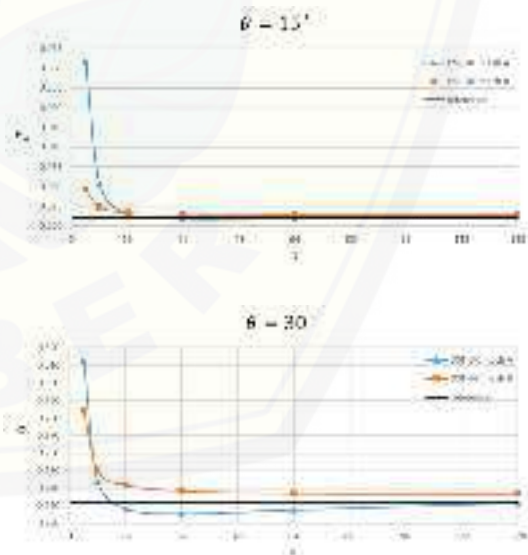


Figure 4. The skew plate model with slope θ

The result of numerical analysis is presented as below. Due to the absence of a reference solution for skew plates with power-law index $n=2$, the results refer to the value of $N=128$ itself, assuming that the isotropic value on the DST-BK FGM has given good results as shown in the graphs. For the displacement in the center of plate, the results from [8] will be used as reference solution.



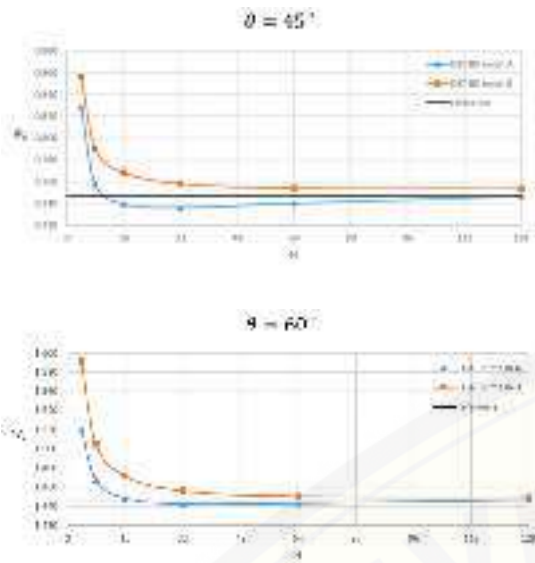


Figure 5. Convergence Result of Ceramic Plate

It can be seen from (Figure. 5) that the DST-BK element with mesh pattern B on a ceramic plate with a power-law index $n = 0$ looks closer to the reference. the displacement value at $N=64$ are close to the reference solution.

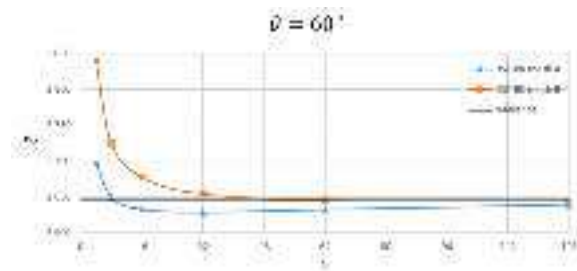


Figure 6. Graph of Convergence Result of FGM ($n = 2$) vs Reference

It can be seen from (Figure.6) that the DST-BK element with mesh pattern B on the FGM plate with power-law index $n=2$ looks closer to the reference. seen displacement value is approaching the reference at $N=64$.

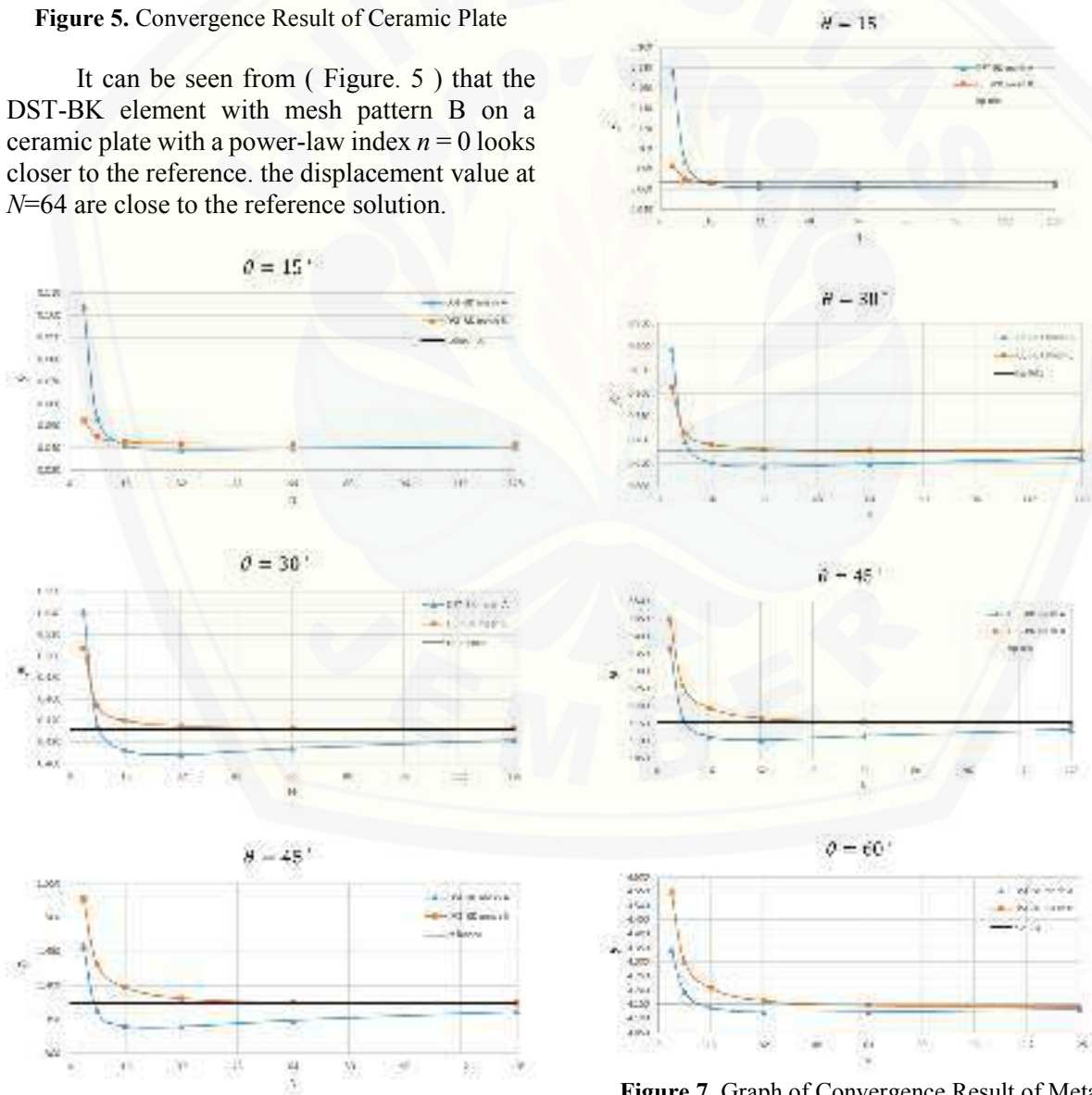


Figure 7. Graph of Convergence Result of Metal Plate vs Reference

It can be seen from (Figure. 7) that the DST-BK formulation with pattern B on a metal plate with a power-law index $n=\infty$ looks closer to the reference. seen displacement value is approaching the reference at $N=64$.

CONCLUSION

Based on the analysis results, the DST-BK element has a good convergence behavior, converge towards the reference solution. The DST-BK element gives a good result in the FGM plate analyzed in this paper. Mesh B give better convergence behavior compared to the mesh A. For the next research, the author will try to develop the free vibration analysis of DST-BK element on the FGM plates.

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Static Analysis of FGM Plate Using DST-BL Element

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ABSTRACT

DST-BL (Discrete Shear Triangle - Batoz Lardeur) element is a generalized triangular element of DKT (Discrete Kirchhoff Triangle) element developed using ASSF (Assumed Shear Strain Field) method specifically expressing transverse shear deformation through the constitutive flexural and transverse shear equation. DST-BL (Discrete Shear Triangle - Batoz Lardeur) does not pass the patch test for thick plates but passes the patch test for thin plates (identical to DKT elements). This was corrected to DST-BK element (Discrete Shear Triangle - Batoz Katili). FGM (Functionally Graded Material) material was first discovered by Japanese researchers in 1984 as the main goal of an aerospace project that requires a thermal barrier with an external temperature of 2000K and an internal temperature of 1000K on an element having a thickness of 10 mm. In this research, static analysis on composite plates will be analyzed in the form of FGM (Functionally Graded Material) using the DST-BL (Discrete Shear Triangle - Batoz Lardeur) formulation element. This test is carried out on various plates and boundary conditions. Numerical tests are carried out using the help of the MATLAB program. Programming was carried out for the 15 degree of freedom DST-BL elements for isotropic plates and FGM plates. Programming in MATLAB is done to get the value of displacement. The results show that the static analysis for square plates and skew plates is convergent and approaching the research results that has been done by previous researchers.

Keywords: green building; FGM; DST-BL

INTRODUCTION

Material has an important role in human life from ancient times until now; and continues to grow from iron, pure metal to composite materials [4]. The composite material is quite interesting to many researchers because this material has a wide range of applications [14]. The composite material is lightweight and strong and provides a flexible design [13], but this material has a sharp property transition between two constituent materials [12, 14] and shows a material property mismatch due to the binding of two separate materials [4]. The stress concentration always appears on the surface which causes components to be damaged in the process of delamination, matrix cracking and adhesive bond separation [13]. To overcome this, FGM (Functionally Graded Material) was found,

which a better material than composite. FGM material is formed from two or more constituent materials with material properties that continuously vary from one side to the other [14]. The idea of FGM (Functionally Graded Material) plate material was made to prepare a new composite material using ceramics as a heat barrier at the high temperature or temperature side, and tough metal with high thermal conductivity at the low-temperature side with varying composition gradually from ceramic to metal [1, 11].

Meanwhile, the plate is a three-dimensional solid structure with a plane surface that is straight, flat (not curved) and thickness is much smaller compared to other dimensions [5]. The plate is one element that is often found in civil engineering buildings. There are two plate theories used in the finite element method analysis namely the Kirchhoff plate theory [6] and the Reissner-Mindlin plate theory [7]. The

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Kirchhoff plate theory, commonly used for thin plates, uses C^1 continuity, while the Reissner-Mindlin plate theory uses C^0 continuity. The finite element method is one of the structural calculation methods that uses numerical analysis to solve various problems of continuous mechanics. Advances in computer software have simplified the process of engineering calculation, including numerical procedures of the finite element method. In his analysis, the finite element method uses discretization techniques in structure [8].

In this research, the author will analyze static testing on composite plates in the FGM (Functionally Graded Material) form using the DST-BL (Discrete Shear Triangle - Batoz Lardeur) element formulation. This test is carried out on various plates and various boundary conditions.

MATERIALS AND METHODS

The research carried out in the form of a static analysis study on FGM (Functionally Graded Materials) plates using DST-BL (Discrete Shear Triangle - Batoz Lardeur) elements. Research on this thesis will begin by analyzing the formulation of DST-BL 15 dof (degrees of freedom) elements. Then the element will be created using MATLAB software and programmed to analyze the static test on the FGM plate to get the value of displacement and internal forces. Programming the DST-BL (Discrete Shear Triangle - Batoz Lardeur) element formulation is done with 5 degrees of freedom (dof) at each nodal point. This convergence program was tested first on an isotropic plate. If the programming of the DST-BL element formulation is declared convergent, it can be tested on the FGM composite plate. In this paper, DST-BL (Discrete Shear Triangle - Batoz Lardeur) element is reformulated from e DOF to 5 DOF as shown in Figure 1.

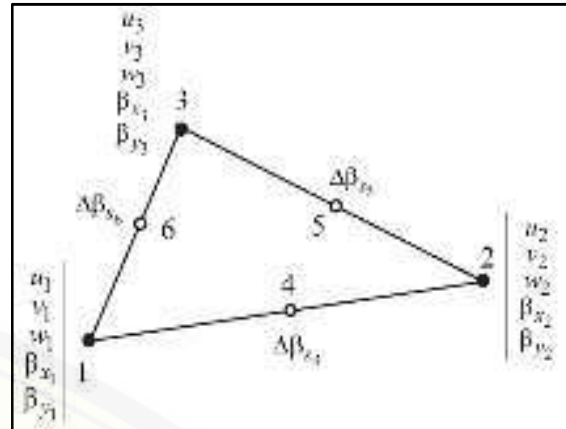


Figure 1. Kinematic variable of corner node and temporary variable at mid-side ij [9]

The formulation of the DST-BL (Discrete Shear Triangular - Batoz Lardeur) element was proposed by Batoz and Lardeur [3] in 1989. The purpose of the DST-BL is to take into account the transverse shear effect starting with the DKT formulation [2] but without the introduction of additional nodal variables. The equation for the displacement function [9]:

$$\begin{aligned}
 u &= \sum_{i=1}^3 N_i u_i ; & v &= \sum_{i=1}^3 N_i v_i ; & w &= \sum_{i=1}^3 N_i w_i ; \\
 \beta_x &= \sum_{i=1}^3 N_i \beta_{x_i} + \sum_{k=4}^6 P_k C_k \Delta \beta_{s_k} ; \\
 \beta_y &= \sum_{i=1}^3 N_i \beta_{y_i} + \sum_{k=4}^6 P_k S_k \Delta \beta_{s_k}
 \end{aligned} \tag{1}$$

Where N is a linear shape function with continuity of C^0 [10]:

$$N_1 = 1 - \xi - \eta ; \quad N_2 = \xi ; \quad N_3 = \eta \tag{2}$$

P_k is a quadratic function [10]:

$$P_4 = 4N_1N_2 ; \quad P_5 = 4N_2N_3 ; \quad P_6 = 4N_1N_3 \tag{3}$$

Then the structural stiffness matrix [9] of the DST-BL (Discrete Shear Triangle-Batoz Lardeur) elements on the FGM (Functionally Graded Material) plates is as follows:

$$[k] = [k_m] + [k_{mb}] + [k_{mb}]^T + [k_b] + [k_s] \tag{4}$$

where [9]:

$$[k_m] = \int_A [B_m]^T [H_m] [B_m] dA \tag{5}$$

$$[k_{mb}] = \int_A [B_m]^T [H_{mb}] [B_b] dA \tag{6}$$

$$[k_b] = \int_A [B_b]^T [H_b] [B_b] dA \tag{7}$$

$$[k_s] = \int_A [B_s]^T [H_s] [B_s] dA \tag{8}$$

RESULTS AND DISCUSSION

In analyzing the convergence behavior of DST-BL elements on the FGM (Functionally Graded Material) skew plate, soft simply supported ($w=0$) is used as a boundary restraint with angular variations (θ) skew $15^\circ, 30^\circ, 60^\circ$, and 75° . References used to analyze displacement at the center of the plate [12] are:

$$w_c = \frac{1600w_c E_c h^3}{12(1-\nu^2)f_z L^4} \tag{9}$$

To get good results, we use a variety of mesh variations with values $N = 4, 8, 16, 32, 64$ and 2 different diagonal directions mesh A and mesh B as in the Figure 2 below. The variation of power law index used is $n = 0$ (ceramic), $n = 2$, and $n = \infty$ (metal). The FGM material used in this analysis is Aluminum (Al) ($E_c = 70$ GPa) and Zirconia (Al/ZrO₂)-1 ($E_m = 200$ GPa) and poisson's ratio (ν) expressed constant with $f_z = 1$. In this paper mesh $128 \times 128 \times 2$ used as a reference material/solution.

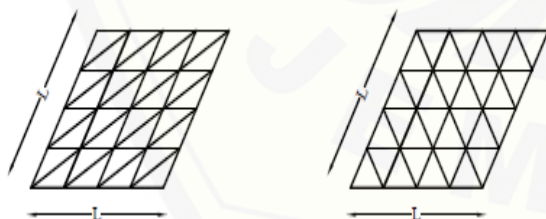


Figure 2. Mesh A and mesh B with $N = 4$

1. Skew plate with $n = 0$ (ceramic)

The static analysis results of skew angle $\theta = 15^\circ, 30^\circ, 60^\circ, 75^\circ$ with $n = 0$ at the center of displacement (deflection) w_c ($L/h = 100$) can be shown in Figure 3 and Figure 4.

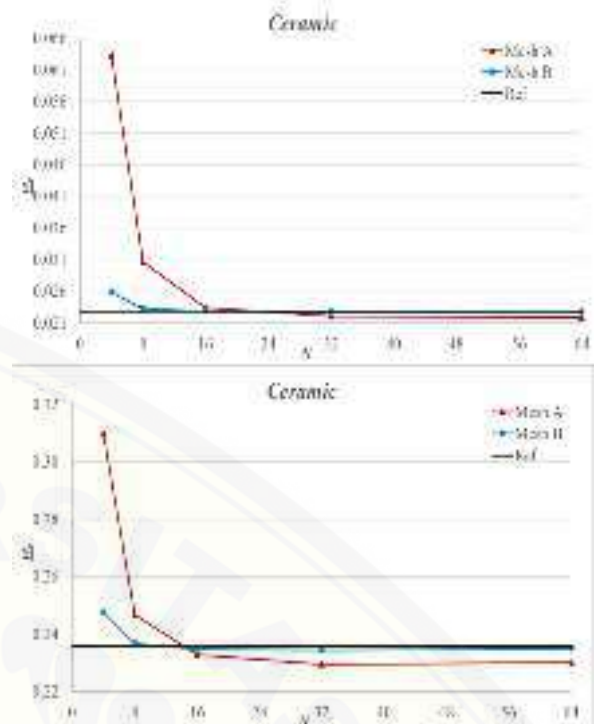
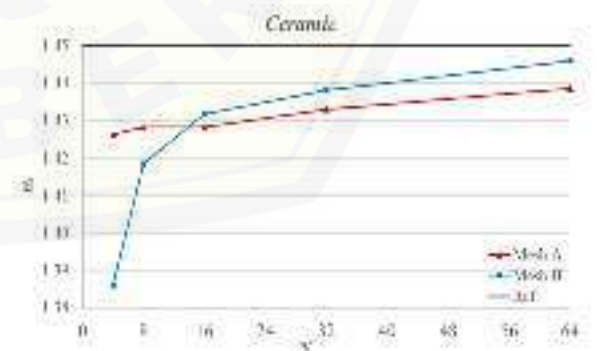


Figure 3. Graphic of convergence result for skew $\theta = 15^\circ, 30^\circ$ with $n = 0$ (ceramic) for mesh A and mesh B

From the results of calculations with Matlab programation for skew $\theta = 15^\circ$, mesh A is convergent at $N = 16$, and mesh B convergent at $N = 8$. Both mesh A and mesh B convergent at center of displacement 0.023 (Figure 3 left). Meanwhile, at skew $\theta = 30^\circ$, mesh A is also convergent at $N = 16$ and mesh B convergent $N = 8$. Both mesh A and mesh B convergent at center of displacement 0.235 as shown in Figure 3 (right).



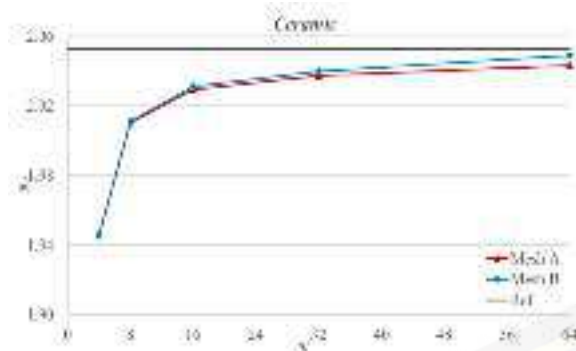


Figure 4. Graphic of convergence result for skew $\backslash = 60^\circ, 75^\circ$ with $n = 0$ (ceramic) for mesh A and mesh B

The results of calculations with Matlab programation showed that for skew $\backslash = 60^\circ$ it is seen that mesh A convergent at $N = 64$ with center of displacement 1.44, and that at mesh B convergent at $N = 64$ with center of displacement of 1.445. (Figure 4 left). Meanwhile, at skew $\backslash = 75^\circ$, mesh A and mesh B convergent at $N = 64$, at center of displacement 2.06 as shown in Figure 4 (right). In Figure 3 and Figure 4 it can be stated that the DST-BL element with mesh B is more converging to the reference solution than mesh A.

2. Skew plate with $n = 2$

The static analysis results of skew angle $\theta = 15^\circ, 30^\circ, 60^\circ, 75^\circ$ with $n = 0$ at the center of displacement (deflection) w_c ($L/h = 100$) can be shown in Figure 5 and Figure 6. From the results of calculations with Matlab programation for skew $\backslash = 15^\circ$, mesh A is convergent at $N = 16$ and mesh B convergent at $N = 8$. Both mesh A and mesh B convergent at center of displacement 0.04 (Figure 5 left). Meanwhile, at skew $\backslash = 30^\circ$, both mesh A and mesh B convergent at $N = 8$ at center of displacement 0.44 as shown in Figure 5 (right).

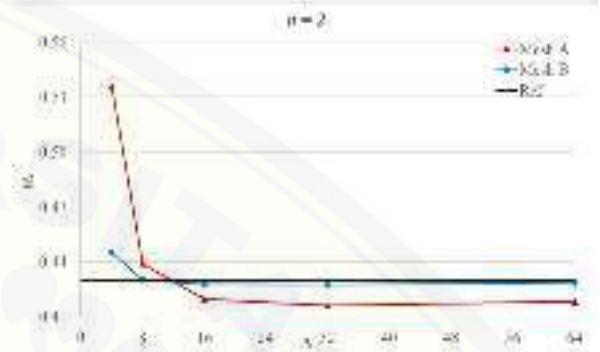
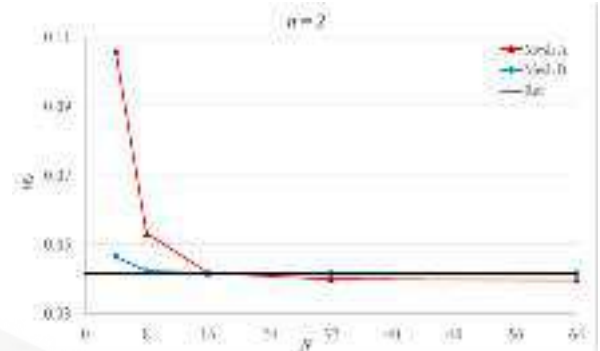


Figure 5. Graphic of convergence result for skew $\backslash = 15^\circ, 30^\circ$ with $n = 2$ for mesh A and mesh B

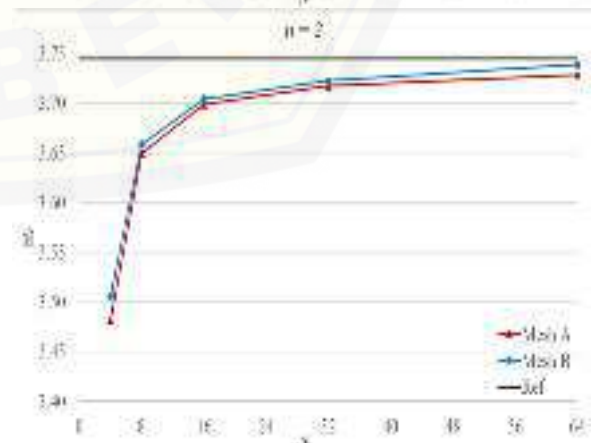
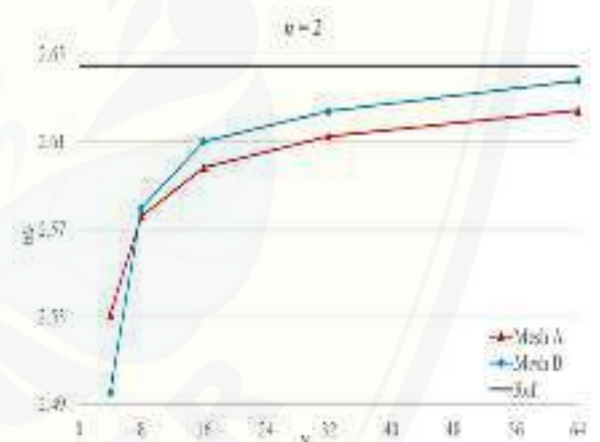


Figure 6. Graphic of convergence result for

skew $\backslash = 60^\circ, 75^\circ$ with $n = 2$ for mesh A and mesh B

From the results of calculations with Matlab programation for skew $\backslash = 60^\circ$, it is seen that both mesh A and mesh B convergent at $N = 64$ at center of displacement between 2.61 - 2.65 (Figure 6 left). Meanwhile, at skew $\backslash = 75^\circ$, both mesh A and mesh B also convergent at $N = 64$ at center of displacement 3.73 - 3.75 as shown in Figure 6 (right). In Figure 5 and Figure 6 it can be stated that the DST-BL element with mesh B is more converging to the reference solution than mesh A.

3. Skew plate with $n = \infty$ (metal)

The static analysis results of skew angle $\theta = 15^\circ, 30^\circ, 60^\circ, 75^\circ$ with $n = \infty$ at the center of displacement (deflection) w_c ($L/h = 100$) can be shown in Figure 7 and Figure 8.

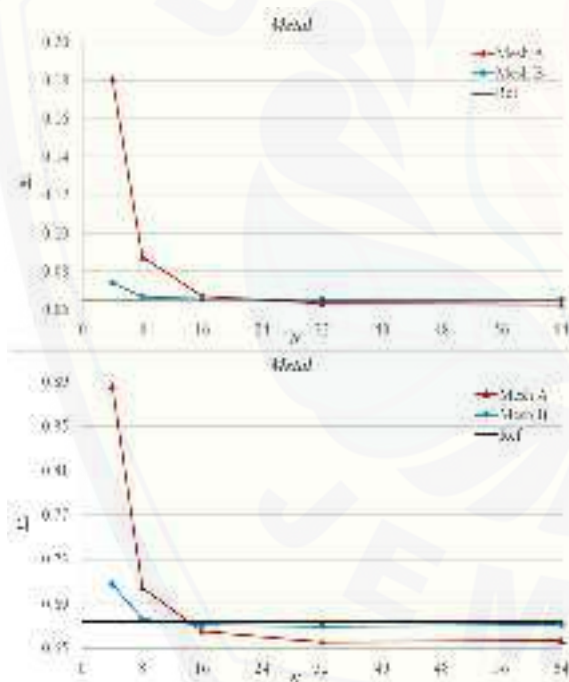


Figure 7. Graphic of convergence result for skew $\backslash = 15^\circ, 30^\circ$ with $n = \infty$ (metal) for mesh A and mesh B

The results of calculations with Matlab programation for skew $\backslash = 15^\circ$ showed that mesh A convergent at $N = 16$ and mesh B convergent at $N = 8$. Both mesh A and mesh B convergent at center of displacement 0.065 (Figure 7 left). Meanwhile, at skew $\backslash = 30^\circ$, mesh A convergent

at $N = 16$ and mesh B convergent at $N = 8$. Mesh A and mesh B convergent at center of displacement 0.67 as shown in Figure 7 (right).

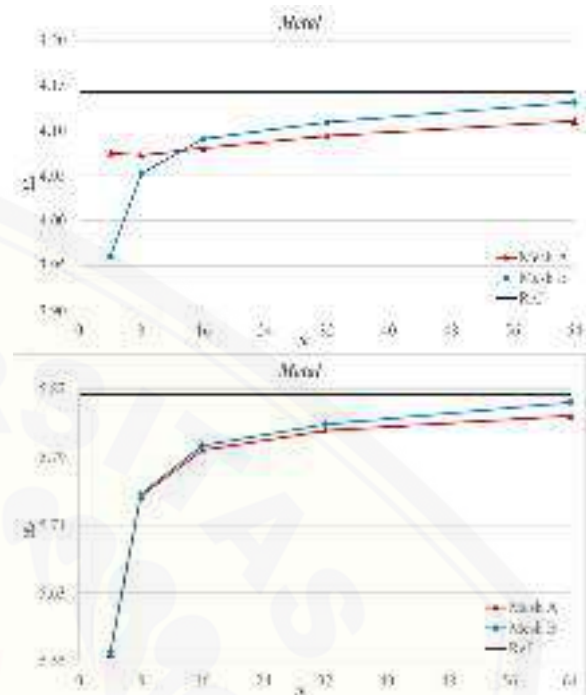


Figure 8. Graphic of convergence result for skew $\backslash = 60^\circ, 75^\circ$ with $n = \infty$ (metal) for mesh A and mesh B

The results of calculations with Matlab programation showed that for skew $\backslash = 60^\circ$ it looks that both mesh A and mesh B convergent at $N = 64$ at center of displacement between 4.10 - 4.15 (Figure 8 left). Meanwhile, at skew $\backslash = 75^\circ$, both mesh A and mesh B also convergent at $N = 64$ at center of displacement 5.83 - 5.85 as shown in Figure 8 (right). In Figure 7 and Figure 8 it can be stated that the DST-BL element with mesh B is more converging to the reference solution than mesh A.

CONCLUSION

The results showed that the DST-BL element on the FGM plate with Mesh A and Mesh B increasingly converges to the reference solution when the tilt angle approaches. This shows the DST-BL element on the FGM plate is suitable for use with static loading on all types of buildings.

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The Importance of Customary Law In Indonesia That Protected By National Law

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ABSTRACT

Customary law is a law that develops and applies in communities in an area that is not written and is not stipulated by the authorities but is strictly adhered to by the local community because it is considered to have legal force. Legal development in Indonesia cannot only be based on western legal literature but we must also maintain existing customary law with norms that regulated in it because it is the identity of the Indonesian people. As an example, we take the customary law in Aceh, which is Caning Law or Qonun Jinayat. Because in Indonesia the principle of legality in customary law is recognized. Recognition of this customary law is listed in Article 18B paragraph (2) of the 1945 Constitution. Purpose: This paper is intended to research and analyze the importance of customary law in Indonesia. Method: This research uses a legal research method through a qualitative approach by giving views to the public and the government in knowing the importance of customary law in Indonesia. Finding: With this we find that customary law in Indonesia is very important and even customary law in Indonesia is protected by national law that governed by the principle of legality of customary law, recognition of this customary law is contained in Article 18B paragraph (2) of the 1945 Constitution. Customary law is recognized because it is considered as the legacy of our ancestors, and has original noble values from each region in Indonesia. An example is the caning law (Qanun Jinayat) in force in Aceh continues to apply because the law is considered to be in accordance with the values that exist in the Aceh community.

Keywords: Customary, Law, Caning Law, Nation Law

INTRODUCTION

Customary law is a legal system that lives in a community environment where it has legal sources in the form of unwritten regulations as a manifestation of a rule that develops in positive community life. The existence of customary law has been recognized by the Government of Indonesia after the enactment of the Constitution Amendment to the 1945 Constitution Article 18B paragraph (2) which states: "The state recognizes and respects the customary law community units along with their traditional rights as long as they are alive and in accordance with developments. society and the principles of

the Unitary Republic of Indonesia, which is regulated in law ". Prior to the above statement, Indonesian traditional law has also been recognized by the Dutch East Indies Government as a positive legal system that was explored by the Indonesian people in Article 131 paragraph (6) IS which states "Indonesian law is positive law for the Indonesian people".

Contrary to this, there is a principle of legality that requires the law to be written if the law wishes to inflict a crime. However, the principle of legality must in fact be broken by the emergence of Article 5 paragraph 3 Sub-b of Emergency Law No. 1 of 1951 which states that customary law on criminal matters can be carried out even though the customary law is not written down if there is a despicable act and threatens the community in accordance with the provisions of the penalties applicable in these indigenous

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peoples. Take an example from the Customary Law that applies in the area of Nangroe Aceh Darusallam, namely the caning law imposed on the convicted person as a punishment.

With what has been explained above, the author, wrote this paper with the intent as a discussion of some very important things to maintain and maintain the existence of Indonesian customary law as a law that lives in the Indonesian community (Living Law). The paper is also written as an objective of the important things why customary law can be protected by National Law as a law that has values and norms that have been considered in accordance with the customary areas of each custom in Indonesia. with the intention as a discussion material on several things that are very important to maintain and maintain the existence of Indonesian customary law as living law in the Indonesian community (Living Law). The paper was also written as an objective of the important things why customary law can be protected by National Law as a law that has values and norms that have been considered in accordance with the customary area of each custom in Indonesia.

METHOD

In this paper, I use a qualitative research method that has descriptive analytical properties that have the main goal of getting wider and in-depth data on Customary Law that needs to be confirmed as a law that lives in the community and has the opportunity to be a valid law in Indonesia. Research is also based on several sources such as national journals, international journals and several articles that have gone through several researches so that the published data will be more reliable. Then the data will be filtered to examine its suitability with the themes or topics raised in this paper and will be discussed in the results and discussion.

RESULTS AND DISCUSSION

1. Result

Based on the data presented in Article 18B paragraph (2) of the 1945 Constitution concerning recognition of the existence of customary law in force in Indonesia and subsequently reinforced in the data of Article 5 paragraph 3 Sub-b of Emergency Law No. 1 of

1951 which explains the criminal conviction to someone who commits a disgraceful act (adultery) with the sentence imposed or the usual sentence imposed if the things the convict does in accordance with the law. The results of the data from the Law listed above regarding Customary Law in Indonesia is to apply customary law as a law that lives in the community and has been considered in accordance with the values and norms prevailing in indigenous peoples. Also, customary law that is recognized is customary law which is still clearly alive, clear material and the scope of indigenous peoples. An example is the caning law (Qonun Jinayat) that applies in Aceh

2. Discussion

In 1983 the term Customary Law was introduced by Snouck Hurgronje in his book *De Atjehnese*. The customary law (Adatrecht) meant by Hurgronje is the law that applies to the son's earth (native Indonesians) and foreign east people during the Dutch East Indies. However, customary law only had a technical juridical understanding after C. Van Vollenhoven issued his book entitled *Adatrecht*. He was the first to state that customary law is the law that applies to the native people of Indonesia.

Customary law is a system of law that lives in the scope of indigenous peoples (certain regions in Indonesia) where the source of the law is in the form of unwritten regulations as a manifestation of a rule that develops in positive community life. Although Adat Law is an unwritten law, the assumption that the implementation of adat law is due to the values in the law is considered to be in accordance with the traditional identity of the community itself. Values that live in society in the form of behavior may at first be a habit which then arises into a feeling in a society that embraces the habit into something appropriate.

The existence of customary law, basically has been included in the 1945 Constitution Article 18B paragraph (2) which states: "The state recognizes and respects the customary law community units along with their traditional rights as long as they are alive and in accordance with the development of society and state principles Unity of the Republic of Indonesia, regulated in law ". In its recognition, most

Customary Laws are unwritten. In fact, in a state of law, applies a principle which is the principle of legality. The principle of legality states that there is no law other than what is written in the law. This is to guarantee legal certainty. But on the one hand if the judge cannot find the law in written law, a judge must be able to find the law in the rules that live in society. Recognized or not, but Customary Law also has a role in the National Legal System in Indonesia.

Then the statement of the Principle of Legality must be addressed better with the Recognition of Customary Law in Article 5 paragraph 3 Sub-b of the Emergency Law Number 1 of 1951. Concerning Customary Criminal Law Jurisprudence, namely if the unwritten legal provisions assume that action as a despicable act, then there is no reason for the judge not to impose a crime for the aforementioned act with customary law in force in the community. If we take an example, we take the Whip Law (Qonun Jinayat) that applies in Aceh. The law is a noble value unearthed from the Acehnese indigenous people where the law is in accordance with the identity of the Aceh region, the law is also a pure law originating from Indonesian territory instead of Foreign Government Law that needs to be protected by National Law.

The fundamental reason why customary law is important is because it existed before other laws emerged. Customary law which is patented law as a matter of habit in local communities (adat) is also referred to as a source of law. This proves that Customary Law (Custom) has an existence that needs to be highlighted again in the legal system in Indonesia. The main drawback that makes customary law forgiven is the scarcity of customary law in Indonesia which is written, in this sense customary law is enforced based on the norms and values of adat itself without written evidence. When a rule is not obeyed or even violated, then the law in force in an adat community will become a criminal law for those who break it. An example is, if there is an act of adultery. Under national law, such actions may be subject to sanctions in the form of prison for several months in accordance with the provisions. However, it is different from traditional law in force in Aceh. Adultery will be subject to sanctions in the form of caning or

Qonun Jinayat. This can provide insight if in Indonesia, besides there are national laws with sanctions, there are also customary laws which impose their own sanctions. Their law applies to values that are considered the best and are suitable within their territory as a way to bring order to the public towards something more directed.

Therefore, Customary law as the original law of Indonesia is a law that always follows the soul of the Indonesian people, because it always grows and lives from culture the community where the customary law applies. And customary law is one embodiment of the personality, soul and structure of the community / nation. Thus the existence of customary law up to now still has an important role, especially in the formation of future national law, especially in the field of family law. Although the written law dated by the Government of Indonesia is the most priority, but it is best if the customary law which is a cultural heritage of Indonesia needs to be examined and protected, rather than discarded and forgotten its existence.

CONCLUSION

Customary law is an unwritten rule that lives in the indigenous community of an area that will remain alive as long as the community still fulfills the customary law that was passed on to them from their ancestors before them. Therefore, the existence of customary law and its position in the national legal system cannot be denied even though customary law is not written and based on the principle of legality is illegal law. Customary law will always exist and live in the community. Customary law is a law that truly lives in the conscience of the conscience of the community which is reflected in the patterns of their actions in accordance with their customs and socio-cultural patterns that do not conflict with national interests. While the customary law can still be well dated and able to regulate its citizens in an orderly manner in accordance with the principles of the Pancasila and the 1945 Constitution, the customary law requires a protection as a form of maintaining the original Indonesian heritage law in accordance with the identity of Indonesian citizens.

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The Importance of Law Enforcers to Know Legal Psychology in the Investigation Process

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ABSTRACT

Protecting and respecting human rights by not discriminating is a major pillar of the duty of the state. But if a human right is neglected or deliberately violated and the state cannot overcome it. Then the state cannot be called a state of law. In the legal process there is the principle of presumption of innocence until the person concerned receives a court decision that has permanent legal force. In the process of providing information both a witness and a suspect to be set forth in the Police Investigation Report is the realm of the law enforcer. For this reason, it is very necessary for the mastery of legal psychology enforcer to prevent violence, and also the person being examined or the person who will provide the information is not under pressure. Because this will affect the formation of legal processes that uphold human rights. The purpose of this study is to determine the role of legal psychology in the investigation process to ensure the protection of human rights. The formulation of the problem is How do the police conduct investigations in Indonesia? and Why do law enforcers need to understand the legal psychology?. This study uses a method with a normative juridical approach by examining literature sources. The results obtained in this study are the importance of law enforcers to understand the legal psychology in order to better protect the rights of suspects. Then also the legal psychology can increase effectiveness in the investigation process, because law enforcers can determine the right and appropriate ways in digging information on suspects.

Keywords: Legal Psychology; The Law Enforcer; Investigation Process.

INTRODUCTION

Article 1 paragraph (3) of the 1945 Constitution The Third Amendment states that the state of Indonesia is a state of law. This means that the Unitary State of the Republic of Indonesia is a state of law (*rechtstaat*) and is not based on mere power (*machtstaat*) and that the government is based on a constitutional system and not based on absolutism. The consequences of Article 1 paragraph (3) of the 1945 Constitution The Third Amendment is that there are 3 (three) basic principles that must be upheld by all Indonesian Citizens (WNI), namely: rule of law, equality before the law, and law enforcement in ways that are not contrary to law. Indonesia is a democratic rule of law.

Understanding the rule of law is closely related to understanding the welfare state (*welfare state*) or understanding the rule of law material material in accordance with the essence of the fourth paragraph Opening of the 1945 Constitution. The implementation of the understanding of the rule of law material will support and accelerate the realization of the welfare state in Indonesia [1].

One of the characteristics of the rule of law is the recognition and protection of human rights. Related to the recognition and protection of human rights, national law reforms are carried out in various fields, one of which is in the field of Criminal Procedure. This can be seen from the revocation of the provisions of the Criminal Procedure Code contained in the *Het Herziene Inlands Regulation (HIR)* which was replaced with Law No. 8 of 1981 concerning the Criminal

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Procedure Code (KUHAP). The Criminal Procedure Code (KUHAP) highly respects human rights and provides guarantees and respect for human dignity. This can be seen from the guaranteed rights of suspects from the preliminary level, namely at the investigation stage up to the defendant level, namely at the stage of implementing a judge's or court's decision.

The Criminal Procedure Code (KUHAP) in addition to regulating the provisions regarding the procedure of criminal proceedings also regulates the rights and obligations of someone involved in criminal proceedings. The criminal process in this case is the investigation stage of the suspect (interrogation) at the investigation level. Investigation of a suspect is an attempt to gather various evidentiary materials, namely to obtain information or clarity regarding the occurrence of a criminal act that may involve the suspect. The interrogation is carried out by the investigator so that the investigator has a very important role in the implementation of law enforcement. Investigation is an activity or process carried out by investigators on suspects who commit criminal acts. Someone can be named a suspect if the person concerned has committed a crime. The investigation must be carried out objectively so that justice can be created in the community and the investigation can be guaranteed its objectivity.

The objectivity of an investigation can be guaranteed when an investigator who is a member of the Indonesian National Police (POLRI) in carrying out his duties and authority has professionalism. Professionalism is the ability of members of a profession to carry out and improve their abilities continuously [2]. The attitude of Professionalism as Investigators in conducting investigations can be realized if the Investigator is able to master the technical aspects of law and other assistive sciences, one of which is psychology, therefore, around the 1960s a new field of science was born, namely Legal Psychology. The issues raised by researchers in this study are: 1) how do the police conduct investigations in Indonesia? and 2) why do investigators need to know the legal psychology?

MATERIALS AND METHODS

1. Research Specifications

This research was conducted descriptively analytically, that is to give a picture as accurately as possible about the existing facts in the form of secondary data and primary legal materials such as secondary data and secondary material in the form of expert opinions, research results, the work of law and legal material tertiary form of data obtained from the internet related to research. This research is expected to provide a clear and comprehensive picture of matters relating to the urgency of investigators to find out the legal psychology in the investigation process.

2. Approach Method

The method of approach used is juridical normative, which is a method in which the law is conceptualized as a norm, principle, principle, or dogma. The method of approach in this study uses secondary data consisting of primary legal materials, secondary legal materials, and tertiary legal materials related to the urgency of investigators to understand the legal psychology in the investigation process.

3. Research Stage

This research was conducted in two stages, namely:

1. Library Research
2. Field Research

4. Data Collection Technique

Data collection techniques in this research has been carried out in two ways, namely:

4.1 Document Study

Data collection through document study is used to collect secondary data. This method is a consequence of normative research / literature based on secondary data.

a Primary Legal Materials.

Namely binding legal materials, consisting of

- Basic norms / rules namely the Preamble of the 1945 Constitution
- Basic Regulations, namely the Body of the 1945 Constitution, namely Article 1 paragraph (3) of the 1945 Constitution the Third Amendment.
- Criminal Procedure Code.
- Law Number 2 of 2002 concerning the Indonesian National Police (POLRI)

- Regulation of the Head of the Republic of Indonesia National Police Number 14 of 2012 concerning Management of Criminal Investigations

b Secondary legal material

Namely materials that are closely related to primary legal material and provide an explanation of primary law.

c Tertiary legal material

Namely materials that provide instructions and explanations for primary and secondary legal materials, for example websites.

5. Data Analysis Method

Data analysis was conducted by using qualitative juridical analysis methods, namely research methods that started from the norms, principles, and existing legislation as positive legal norms which were then analyzed qualitatively.

RESULTS AND DISCUSSION

1. Implementation of Investigations by the Police in Indonesia

Investigation is the most important stage in the framework of the Criminal Procedure Code in Indonesia because in this stage, the Investigator tries his best to reveal various facts and evidence of the occurrence of criminal acts to find suspects of the perpetrators of these crimes. Before the investigation process is carried out, the investigation process is first carried out in a criminal case that occurred.

Article 1 number 5 of the Criminal Procedure Code (KUHP) states that:

"Investigation is a series of investigative actions conducted by investigator to search for and find an occurrence that is allegedly a criminal offense to determine whether or not an investigation can be carried out in the manner stipulated in the law."

Based on this understanding it can be perceived that the investigation is an action at the first stage at the beginning of the investigation. At the investigation stage, the emphasis is placed on the act of searching and finding an occurrence that is considered or suspected to be a criminal offense [3]. In investigations, the emphasis is on the act of searching and gathering evidence so that the criminal act found can be clear and to be able to find and determine who did it. Basically there is almost no difference between the

meaning of investigation and investigation, the two are interrelated and complement each other so that an examination of a crime can be completed [3]. The success of the investigation of a criminal offense will affect the success or failure of the prosecution of the Public Prosecutor at the examination stage in a court hearing.

The definition of investigation can be seen in Article 1 number 2 of the Criminal Procedure Code, which states that:

"Investigation of a criminal offense is a series of investigative actions in terms of and in the manner regulated by the law to search for and collect evidence which with this evidence makes clear about the criminal acts that occurred and to find the suspect".

The same definition of investigation can also be found in Article 1 number 13 of Law Number 2 of 2002 concerning the Indonesian National Police (POLRI) :

"Investigation is a series of investigative actions in terms of and according to the way stipulated in the law to search for and collect evidence which with clear evidence of the crime that occurred and in order to find the suspect".

The investigation was carried out among others by the police who were the Investigators. Based on the provisions in Article 1 number 10 of Law Number 2 of 2002 concerning the Indonesian National Police (POLRI), the Investigator is an official of the Indonesian National Police who is authorized by the law to conduct an investigation. Police as Investigators have a certain management in the process of investigating someone who commits a crime. This is based on the provisions contained in the Regulation of the Head of the Republic of Indonesia National Police Number 14 of 2012 concerning Management of Criminal Investigations. The basis for an investigation by an Investigator is regulated in Article 4 of the Regulation of the Head of the Indonesian National Police Number 14 of 2012 concerning Management of Criminal Investigations, as follows: Police / complaint report, Task Order, Investigation Report, Investigation Order, and Notice of Commencement of Investigation (SPDP).

Based on the provisions in Article 17 of the Republic of Indonesia National Police Chief Regulation Number 14 of 2012 concerning Management of Criminal Investigations, before

starting an investigation, the Investigator is obliged to make an investigation plan. The investigation plan is submitted to the investigator's supervisor in stages and must contain at least the following:

1. Number and identity of the Investigator.
2. Target investigation.
3. Activities to be carried out according to the investigation stage.
4. Characteristics and anatomy of the case to be investigated.
5. The time for completing the investigation is based on the weight of the case.
6. The need of Investigation budget.
7. The Completeness of administrative investigation.

The purpose of the investigation plan is to carry out investigations in a professional, effective and efficient manner.

2. The Importance of Investigators Need to Know Legal Psychology

Legal psychology consists of 2 (two) words, namely psychology and law. The etymological understanding of psychology is from Greek, which is derived from the word psyche which means soul and logos which means knowledge. Psychology literally means knowledge about the soul [4]. Psychology can also be interpreted as science that investigates the symptoms of the soul [4]. According to Yusti Probowati, psychology is the study of the soul / human psychic so that in every human life, psychology always tries to explain the various problems that occur. In Indonesia, psychology is divided into several fields, namely clinical psychology, the development of general and experimental psychology, social psychology, educational psychology, industrial and organizational psychology and legal psychology.

Legal psychology is a field of science that was born around the 1960s as one of the empirical studies that view law in its form as behavior or human behavior in the field of law when humans behave, whether the behavior is right or wrong according to legal standards. Legal psychology in this case wants to clarify between individual behavior and group behavior, between normal behavior and abnormal behavior and various other typical classification of legal psychology. According to Soerjono Soekanto, legal psychology on one hand discusses

psychological factors that encourage people to obey the law but on the other hand also examines factors that might encourage people to break the law [5]. Sofia S dan Anna Gandra mentioned that : [6]

“Legal psychology describes empirical, psychological research of the law, legal institution, and the person who are in contact with the law. This field encompasses contributions made in teaching/training, developmental, cognitive, clinical practice, social, public policy and clinical psychology”.

Legal psychology has been understood as the implementation of the science of psychology to law and laws, although, as Arce points out it can develop theories and methodologies that not only affect the proceedings of the law, but goes beyond that by addressing aspects of human behaviour related to criminal act. According to Acre, the relationship between psychology and law would give rise to a great variety within legal psychologym although it is the one related to the scope and forensic antisocial and criminal behaviour which enjoys greater recognition [7].

Legal psychology includes a variety of empirical studies, namely psychological research on law, about legal institutions and about people related to law. Legal psychology is typically a study that refers to social fundamentals and theories and principles that are cognitive, to be applied to various issues in the legal system, such as eyewitness memory, jury decision making, investigations, interviews and others. Psychology has a very important role in the implementation of law enforcement at the investigation level, especially in examining suspects. This is because psychology considers more at the background, behavior and actions of the suspect by means of a psychiatric approach so that it is expected to expedite the task of interrogating or examining suspects without any compulsion or emphasis. Investigators are thus required to master the legal psychology which is a science of assisting in investigating suspects. The use of psychology in this case is intended to improve examination techniques with the aim of enhancing legal skills and discipline in order to apply protection of human rights.

CONCLUSION

1. Implementation of Investigations by the Police in Indonesia

The basis for an investigation by an Investigator is regulated in Article 4 of the Regulation of the Head of the Indonesian National Police Number 14 of 2012 concerning Management of Criminal Investigations, which is as follows: Police / complaint report, Task Order, Report on Investigation Results, Investigation Order, and Notice of Commencement of Investigation (SPDP).

Based on the provisions in Article 17 of the Republic of Indonesia National Police Chief Regulation Number 14 of 2012 concerning Management of Criminal Investigations, before starting an investigation, the Investigator is obliged to make an investigation plan. The purpose of the investigation plan is to be able to carry out investigations in a professional, effective and efficient manner.

2. The Importance of Investigators Need to Know Legal Psychology

Investigators are thus required to master the legal psychology which is a science of assisting in investigating suspects. The use of psychology in this case is intended to improve examination techniques with the aim of enhancing legal skills and discipline in order to apply protection of human rights.

3. Suggestion

- 1) Investigators who are members of the Indonesian National Police (POLRI) must increase their professionalism, especially in carrying out investigations.
- 2) The National Police of the Republic of Indonesia should immediately make changes to Law Number 2 of 2002 concerning the National Police of the Republic of Indonesia to explicitly regulate the need for investigators to understand the legal psychology as a tool.

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APPLICATION OF THE NESTING METHOD TO BABY WITH LOW BIRTHWEIGHT (LBW)

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ABSTRACT

Premature born Babies are identical with low birth weight that requires babies to adapt the external environment hard, premature babies also have to face threats to their survival due to organ maturation that has not been reached at birth, so they are at risk of experiencing high morbidity and mortality. The purpose of this study was to find out how the application of nesting to the babies weight gain in. This research method used a quasi-experimental design method with a pretest-posttest group with 34 respondents treated in the perinatology room at Dr Sudirman Kebumen Hospital selected using accidental sampling techniques. The steps of measuring on the intervention respondents are to measuring the babies weigh first before being given nesting, then after weighing it is applied to nest throughout the day and weighed again after the first 24 hours and until for 7 days. Data analysis used a paired t-test. Criteria for respondents in this study were premature babies or LBW, premature babies who did not experience congenital abnormalities. The results showed an average gestational age of 33.5 weeks with the youngest age of 28 weeks and the oldest age of 37 weeks with an average weight of 1790 grams, then after the application of the use of nesting showed an average increase in infant bodyweight of 17 respondents in the intervention group there were no differences with the 17 control groups. The conclusion from this study there was no significant effect on the weight gain of the babies who received the application of the nesting method.

Keywords: nesting method; low birth weight

INTRODUCTION

The prevalence of low birth weight babies (BBLR) is estimated at 15% of all births in the world with a limit of 33%-38% and more common in developing countries. BBLR is obtained in developing countries and the mortality rate is 35 times higher than in infants with a birth weight of more than 2500 grams. The WHO will achieve a 30% reduction in the number of infants born with a weight lower than 2500 grams in the year 2025 (World Health Organization, 2014). The WHO Records Indonesia is ranked nine worlds. The percentage of children aged 0 – 59 months with a birth weight of less than 2500 grams (BBLR) in

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Indonesia as much as 6.9% from target 2019 as much as 8% (Riskesdas, 2018).

Some research is done to increase comfort in infants so that it will affect the increase in weight in infants is the ability of babies to suck breast milk. The method of kangaroos, using the principle of infants is always in the mother's dewhen thus increasing comfort in infants and increasing the ability of infants to baby-sucking Reflec (Silvia, 2015). The form of nursing intervention in addition to the Kangaroos method that can be done on BBLR is nesting. Nesting is used to provide precise position in neonatal. Nesting is used as a baby sleeping position so that it remains in the position of flexion, it is intended to avoid changes in the drastic position of the infant which can result in the loss of much energy from the neonatal body (Tomey & Alligood, 2009). Flexion position on giving nesting expected babies are discharging

the actual energy which is still important for growth and development (Kenner & McGrath, 2009).

Based on data from General Hospital of Dr. Sudirman Kebumen there are 62 Low Weight Babies (LWB-BBLR) patients in 2016-2017, with the death of (LWB-BBLR) infant are 10 patients, discharge home baby with weighing less than 2500 grams are 44. About 80% of premature babies and Low Weight Babies use nesting that are placed in the incubator or glass box.

The purpose of this research is to know the effect of application of nesting method to increase weight in low birth weight babies (BBLR).

METHOD

This type of research is a quantitative study which is an experimental study using Pretest Posttest Group Design research. This research was conducted at Soedirman Hospital Kebumen in November 2018-March 2019. The research sample used 34 respondents according to inclusion criteria. Sampling using accidental sampling technique.

The method that will be used is by giving a roll of 3 sheets then bound both ends so that 2 rolls are obtained from 6 sheets prepared. Then use tape to hold the sides of the roll, 1 roll is made half a circle, so from the 2 roll sheets just looks like a circle, then the baby is placed in Nest with a flexion position on the feet made like a holder using a cloth.

This research instrument uses observation sheets to match the application of nesting according to SOP. Data analysis uses frequency distribution analysis for univariate and paired t-test analysis with 95% confidence level for bivariate.

RESULTS AND DISCUSSION

1. Characteristics of Respondents the by Age of gestation

Based on table 3.1, it is known that the average gestational age is 33.5 weeks with the youngest age is 28 weeks and the oldest age is 37 weeks. The results of the equality test showed that the gestational age of the intervention and control groups was not equivalent (p value <0.05). In accordance with the characteristics of preterm infants gestational age less than 37 weeks (Ernawati, 2017). Anatomy and physiology of immature organs, premature babies tend to experience varied problems. This must be anticipated and managed in the neonatal period. The problems that occur are hypothermia, hypoglycemia, intracranial hemorrhage, susceptible to infection, hyperbilirubinemia, damage to skin integrity and respiratory distress syndrome (Pantiawati, 2010). Associated with this study to support the ability of premature babies to adapt to their weaknesses, the application of nesting to support infant development, facilitate the development of premature babies in the form of physiological and neurological conditions (Murniati, et al, 2016).

Table 3.1 Characteristics and Equality test for gestational age in Melati Ward RSUD.dr. Sudirman Kebumen November 2018 - March 2019 (n= 34)

Variabel	Group Type	n	Mean	Median	SD	Min-Max	P value
Age of Gestation	Intervention	17	32	32	2,288	28-37	0,265
	Conrol	17	34	35	2,106	28-37	
	Total	34	33	33,5	2,197	28-37	

2. Characteristics of Respondents Based on birth weight of infants

Table 3.2 Characteristics and Equality tests of birth weight of infants in Melati Ward Dr. Soedirman Kebumen Regency in November 2018 - March 2019 (n = 34)

Variabel	Group Type	n	Mean	Median	SD	Min-Maks	P value
Baby Birth Weight	Intervention	17	1530	1580	4,624	1180-2230	0,085
	Control	17	2000	2000	3,334	1200-2360	
	Total	34	1765	1790	3,979	1190-2295	

Based on table 3.2 it is known that the average birth weight of babies weighing 1790 grams with the smallest birth weight of 1190 grams and the largest birth weight of 2295 grams. The results of the equality test showed that the birth weight of infants in the intervention and control groups was not equivalent (p value < 0.05). In accordance with the category of low birth weight babies are babies born with birth weights less than 2500 grams regardless of the gestational period (Damanik, 2012). Premature babies generally have a low birth weight, so it requires effort to adjust to extrauterine life which is heavier than babies who are full term. Premature babies also face threats to their survival due to organ maturation that has not yet been reached at birth. The prognosis of babies weighing more than 1800 grams is better than babies weighing between 1500 and 1800 grams (Bobak, Lowdermilk & Jensen, 2005). This can affect the speed of the infant development in both physically and neurologically (Murniati, et al, 2016).

3. Effects of Nesting application on weight gain of low weight baby birth before and after getting the nesting method.

Based on table 3.3 it is known that the increase in baby's weight on LBW who received nesting before and after the intervention was 0 with p value > 0.05 . An increase in body weight of babies who did not get nesting increased by an average of 230 with (p value > 0.05).

The absence of an increase in baby weight in premature babies with birth weight less than 2500 grams before and after the application of nesting due to the average gestational age of babies aged 33.5 weeks and the average baby

birth weight of 1790 grams requires the baby to adapt more severe in meeting their physiological needs (Murniati, et al, 2016). Premature babies also face threats to their survival due to organ maturation that has not yet been reached at birth. The prognosis of babies weighing more than 1800 grams is better than babies weighing between 1500 and 1800 grams (Bobak, Lowdermilk & Jensen, 2005).

The results of the study in the control group there are body weight gaining compare to the infants who did not get nesting on average increased by 230 with (p value > 0.05). This is due to the average of gestational age of 35 weeks and an average birth weight of an infant of 2000 grams, in the control group is higher than in the intervention group, so that the physiological adaptation ability of infants is better in the control group. The maturity level of the function of the neonatal organ system is a requirement to be able to adapt to life outside the womb. Diseases that occur in premature babies are related to gestational age when the baby is born. The younger the gestational age, the more imperfect the organs. Anatomy and physiology of immature organs, premature babies tend to experience various problems (Pantiawati, 2010).

Table 3.3 Effects of Nesting application on Increasing body weight of Low Birth Weight Before and After Obtaining the Nesting Method in Jasmine Ward Dr. Soedirman Kebumen Regency in November 2018 - March 2019 (n = 34)

Group	Mean Before	Mean after	Diference Mean	SD Diference	p value
Intervention	1530	1530	0	0,388	0,830
Control	2000	2230	230	1,716	0,830

CONCLUSION

From the results of research conducted at Dr. Soedirman Kebumen Hospital in November 2018-March 2019 to 34 respondents it can be concluded that there is no significant effect on weight gain in low birth weight babies (LBW) who get the application of the nesting method.

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Effectivity PRP Using USG Guided Method in Morbus Hansen With Polyneuropathy : A Serial Case

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ABSTRACT

Introduction: Morbus Hansen mainly attacks the peripheral nervous system and Schwann cells are host to *Mycobacterium leprae*. The sensory component is the earliest nerve affected and most severely affected. Conservative management of Morbus Hansen with neuropathy is often not satisfying. Platelet Rich Plasma (PRP) is an innovative and promising approach in tissue regeneration. **Objective:** To report the effectivity of the treatment of perineural autologous PRP injection using the ultrasound-guided method as choice of therapy in morbus hansen with neuropathy. **Method:** This serial case involved three Morbus Hansen patients with polyneuropathy, which one patient was treated with conservatives therapy. While two patients were treated with PRP injection using ultrasound-guided (USG guided). All three patients were evaluated for 4 weeks using electromyography (EMG) and 2 point discrimination examination. **Result:** These three patients were then evaluated, in the first patient was no clinical improvement (before and after conservative therapy, the EMG results still showed moderate axonal demyelinating motoric sensoric polyneuropathy and patients also still felt plantar type hipesthesia until dorsum pedis bilateral). While the second and third patients showed clinical improvement in sensory palms and feet with a two point discrimination examination, and EMG results before injection showed moderate axonal demyelinating motoric sensoric polyneuropathy and after injection showed mild axonal demyelinating motoric sensoric polyneuropathy. **Conclusion:** The treatment of perineural injection of autologous platelet rich plasma by ultrasonography-guided method in multibacillary morbus hansen patients can improve sensory peripheral neuropathy.

Keywords: Polyneuropathy; Morbus Hansen; Perineural; USG; PRP.

INTRODUCTION

Morbus Hansen is one of the most common infectious diseases associated with the peripheral nervous system and often lead to disability if early treatment is delayed. Reviews of patients referred to the Tropical Disease Hospital in London, England, showed the average time from symptom onset to diagnosis of 1.8 years (0.2-15.2). Before their arrival, patients have come to dermatologists, neurologists, orthopedic surgeons, and rheumatologists. Delay in diagnosis occurs in 82% of cases, and misdiagnosis, as in other neurological conditions, is an important cause of delay. As a result, 68% of patients experience disfigured nerve damage. In countries more familiar with

leprosy, delayed diagnosis tends to be less severe, there is still a possibility of improvement. Increased migration from countries with high leprosy rates to areas with low incidence rates will further compound the problem with the clinical picture of leprosy [1].

Morbus Hansen primarily against the peripheral nervous system, although most of the established diagnostic criteria are related to the skin lesion itself. *Mycobacterium leprosy* has a unique capacity to against Schwann cells and this invasion causes nerve damage and sensory disturbance which is central to the pathogenesis and clinical manifestations of the disease.² Signs and symptoms of leprosy are varies, depending on the type of leprosy. Sensory neuropathy is far more common than motor neuropathy, but pure motor neuropathy can occur. Mononeuropathy

and multiplex mononeuritis can occur, with ulnar and common peroneal nerves most commonly involved. Symmetrical peripheral neuropathy can also occur [2].

Platelet Rich Plasma (PRP) is an innovative and promising approach in tissue regeneration. PRP is defined as an autologous platelet concentrate containing growth factors in plasma. Platelets are a natural source of various growth factors.⁴ Giannesi et al. Conducted an experiment in animals like rat, that concluded that PRP can increase peripheral nerve regeneration [3].

METHOD

This serial case involved three Morbus Hansen patients with polyneuropathy, which one patient was treated with conservatives therapy. While two patients were treated with PRP injection using ultrasound-guided. All three patients were evaluated for 4 weeks using EMG and 2 point discrimination examination.

RESULTS AND DISCUSSION

This case report discusses 3 cases of male patients with a diagnosis of Multibacillary Morbus Hansen with polyneuropathy. The first case is a male, 55 years old with a chief complaint of thick / numbness in both feet. Based on history and physical examination, stocking type hypesthesia was obtained from plantar to dorsum pedis D-S (dextra-sinistra), with enlargement of N. Tibialis D-S and patient's dermatological status shows hypopigmented and skin-colored nodules and plaques throughout the patient's body, and erythematous macules in the abdomen. During the Slit Skin Smear examination, the patient obtained very large amounts of acid-resistant bacilli (BI +6). Electromyography (EMG) examination showed moderate axonal demyelinating motoric sensoric polyneuropathy. Patients treated with MDT-MB (Rifampicin 600 mg/month, Dapsone 100 mg/day, Clofazimin 300 mg/month and 50 mg/day), amitriptyline 1x12.5 mg, vitamin B6 1x25 mg.

Evaluation was done 4 weeks and found clinical improvement with nodul, the makula and hyperpigmentation patch begin to disappear. But the thick taste in the soles and dorsum of the feet has not get improvement, based on a static two

point discrimination check with sharp edges, there was no sensory improvement in both the sole and dorsum of the foot. EMG results are still being obtained moderate axonal > demyelinating motoric sensoric polyneuropathy.

In the second case, male, 40 years old, the main complaint was thick on the sole of the foot and right palm. Based on history and physical examination, glove and stocking type hypesthesia was obtained from the plantar to the dorsum pedis D-S and palmar manus D. On dermatological examination on the patient's entire body, hyperpigmentation patches, multiple, firm borders, irregular edges, varying size and shape. examination of skin smear slit by staining the Ziehl Nielsen method obtained bacterial index +1. The results of the examination of the two-point discrimination test obtained anesthesia on palmar and digiti II, III, IV manus dekstra; digiti I-V and lateral plantar pedis dekstra and sinistra. The toe area cannot feel the touch and describe the point. The patient was treated by continuing the fourth month of multidrug multidrug therapy (MDT MB). To overcome the sensory problems in the right palm and both soles of the feet, autologous platelet rich plasma (PRP) therapy is done with perineural injection in the nervus medianus dekstra, nervus tibialis posterior dekstra and sinistra with USG-Guided area.

At the fourth week visit after perineural injection, based on an examination of the discrimination of two static points with sharp edges, there is a sensory increase in the sole of the foot in the lateral area, the patient can feel two points. In the right palm there is a sensory improvement.

In the third case, it was male, 39 years old, the main complaint was thick on both feet. Based on history and physical examination, stocking type hypesthesia was obtained from plantar to dorsum pedis D-S. On dermatological examination on the patient's entire body, hyperpigmentation patches, multiple, firm borders, irregular edges, varying in size and shape. On the Slit Skin Smear examination, the results of the left ear lobe were BI +2, right ear lobe +3, and perinodule +3. Electromyography (EMG) examination showed moderate axonal demyelinating motoric sensoric polyneuropathy (motoric : N. peroneus D-S poor respon, N. tibialis D-S poor respon, SNAP : N. suralis D-S no respon, F wave : N. tibialis D-S no respon).

Patients were treated by continuing eleventh month multibacillary multidrug therapy (MDT MB). To handle sensory problems in both feet, using autologous platelet rich plasma (PRP) therapy with perineural injection to nervus tibialis posterior dekstra and sinistra, and the patient signed an informed consent for perineural injection by the ultrasound-guide method.

At the fourth week after perineural injection, based on the examination of discrimination of two static points with sharp edges, there is a sensory increase in the sole of the foot in the lateral area, the patient can feel two points. Whereas on electromyographic examination (EMG) after 4 weeks of perineural injection there is improvement to mild axonal demyelinating motoric sensoric polyneuropathy (CMAP : N. peroneus D-S low amplitude, N. tibialis D-S low amplitude, SNAP : N. suralis D-S normal respon, F wave : N. tibialis D-S normal latensi).

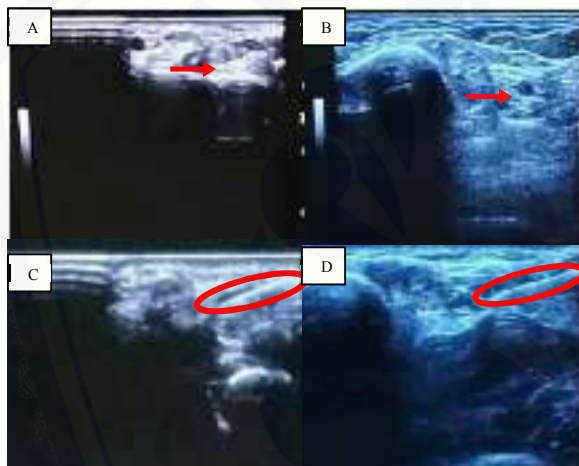


Figure 1. Result from USG guided. A. Median nerve B. Posterior tibial nerve C. The area circled: the direction of needle to the median nerve D. The area circled: the direction of needle to the posterior tibial nerve.

Schwann cells (SC) are the main target of infection by *M. Leprae* causing nerve injury, demyelination, and resulting in disability. The binding of *M. leprae* to SC induces demyelination and loss of axonal conductance. It has been shown that *M. leprae* can attack SC with a protein that binds to laminin from 21 kDa in addition to PGL-1. PGL-1, the main characteristic glycoconjugate on the surface of *M. leprae*, binds laminin-2, which explains bacterial predilection for peripheral nerves. Identification of *M. leprae* for SC, dystroglycan (DG) receptors, suggested the role of this

molecule in early nerve degeneration. *Mycobacterium leprae*-induced demyelination is the result of direct bacterial ligation of neuregulin receptors, ErbB2 and Erk1 / 2 activation, and signal delivery and subsequent proliferation of MAP kinases [4,5].

The loss of Schwann cells from the nerves that surround them, may result not only from tissue damage, but also from the direct effects of CD4+, cytolytic T cells. These T cells play a role in controlling the division of *M. leprae* in lesions by activating macrophages that are infected with *M. Leprae*, besides killing the organism. Unfortunately, when an infected Schwann Cell dies, this can cause nerve damage, which may lead to irreversible loss of peripheral nerve tissue. Although this process can involve both CD8 + 28 and CD4 + cytotoxic T cells, the last cell may be very important, because CD4 + T cells appear in large numbers in the granulomata center of patients with RR (Reversal Reaction). Enhanced cellular immune responses may be beneficial in terms of cleaning up bacteria, because they strengthen the mechanism by which organisms are killed. However, accompanying parts in and around infected nerve tissue, or around nerves that are close to the lesions that are created automatically can cause severe and irreversible damage in a matter of days, if treatment is insufficient. Clinically detected nerve involvement occurs in about 10% of paucibacillary (PB) leprosy patients and 40% of multibacillary (MB) patients, especially in patients with RR [6].

In addition to nerve damage due to Schwann cell-T-cell interactions, nonspecific side effects are also involved in triggering nerve damage. Possible mediators are TNF α , protease, and urokinase. Regarding MH disease, TNF α mRNA and protein are more common in lesions in patients with RR. TNF α is mainly produced by *M. leprae*-responsive, type-1 T cells originating from patients experiencing RR, but infected and active macrophages can also be responsible for production. TNF α itself has little toxic effect on Schwann cells, but combined with growth factor (TGF)- β transformed, has been reported to cause significant release and lysis of Schwann cells. TNF α -mediated lysis has been reported to affect mycobacterial viability similar to FAS / FAS-L mediated lysis, but this observation has not been universally accepted with respect to FAS or TNF α [1,6].

The neuropathy pattern on MH can be in the form of mono or polyneuropathy. Spread of nerve involvement in the upper and lower extremities, including the ulnar, median, radial, cutaneous branches of the ulnar nerve and superficial radial in the upper limb, and the communal peroneal, peroneal nerve and superficial suralis in the lower limb. Clinical evaluation shows the extent of decreased sensory perception with a pattern consistent with symmetrical polyneuropathy. This pattern is compatible with lepromatous leprosy. In both cases there was a feeling of thickness in the soles of the feet, while one case felt a thick feeling in both the soles of the feet and right palms.

As the disease progresses, nerve involvement causes areas of anesthesia and part of body weakness. Motor manifestations often occur in MH patients and occur later than sensory symptoms. In these three patients, motor symptoms that the patient complained of or based on the results of physical examination had not yet been obtained.

Various techniques were developed to assess sensory functions such as Semmes-Weinstein nylon monofilament for pressure perception, tuning forks for vibration thresholds and two-point discrimination checks to measure the sensitivity of the mechanoreceptors. Two-point discrimination tests are widely used because they are easily performed for the evaluation of peripheral nerve injuries and sensory recovery after nerve damage or repair. Two point discrimination check is the ability to feel two objects close together that touch the skin [7].

Usually this examination uses two points in neurological examination and reflects the extent of good innervation in the skin area. During the discrimination test, the individual being evaluated determines one or two points that touch the area being pressed. The smaller the distance detected between the two ends, the higher the innervation density of fibers and functional skin receptors in the skin [7]. Based on the discrimination test in case 2, anesthetic disorders were found on both the sole of the foot and fingers of the patient's right hand. The area of the affected nerve in the soles of the feet is the posterior tibial nerve while the right fingers are the median nerve. Whereas in cases 1 and 3 there were anesthetic disorders on both feet.

After EMG, in case 1 and case 3 the conclusion of the moderate axonal demyelinating

motoric sensoric polyneuropathy is concluded. However, clinically, there is no motor deficit found in these two patients, so it needs to be monitored and educated to patients regarding the subsequent neuropathy due to the risk of motor deficit. Motor manifestations often occur in MH patients and occur later than sensory symptoms. Whereas in case 2 EMG was not performed because the patient refused on the grounds of cost.

The basis of nerve damage in MH is the unique ability of *M. leprae* to invade, proliferate, and inoculate in Schwann cells. In *M. leprae* infection, Schwann cells lose their ability to proliferate and synthesize DNA, resulting in impaired Schwann cell proliferation and damage to the regeneration response. Permanent nerve damage cannot be avoided due to infection [8].

Assessments to prevent or reduce the phase of leprosy reaction can minimize nerve damage. This regeneration ability is the target of therapy because peripheral nerve cells will have a better prognosis than central nerve involvement, so it is hoped that secondary manifestations can be avoided [1].

Platelet rich plasma (PRP) is considered quite promising for neuropathy therapy with no side effects. In recent years, platelet rich plasma (PRP) has been used as an alternative therapy for tissue repair. Cases of neuropathy that do not improve with conservative treatment can be treated using PRP. After whole blood centrifugation, growth factor is concentrated and when injected has the potential to trigger the direction and proliferation of tenocytes, stem cells and endothelial cells [9]. Giannesi et al. explained that the use of PRP is not only as a source of bioactive protein, but also can guide nerves to resist scar reactions so as to induce axonal regeneration [3].

PRP contains various neurotrophic factors such as neurotrophin-3 (NT-3), angiopoietin-1, glial cell line derived neurotrophic factor (GDNF), and brain-derived neurotrophic factor (BDNF) [10]. After injection, the PRP releases neurotrophic neural growth factor (NGF) cell molecules, BDNF, insulin growth factor 1 (IGF-1), platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), hepatocyte growth factor, (HGF) and neurotropic factors (fibrin, fibronectin, and vitronectin) [11]. In vitro and in vivo nerve tissue shows that platelet rich plasma (PRP) and fibrin obtained

from this technology hold important therapeutic potential, not only as neuroprotective, neurogenic, but also as an amplifier of motor and sensory unit recovery [10,11]. The release of growth factors and other biomolecules in PRP occurs gradually and continuously. This biomolecule has been shown to stimulate stem cell-like myelinating Schwann cell activation, angiogenesis, macrophage polarization, as well as active repair of inflammatory processes, angiogenesis, and fibrogenesis, so that it acts as the main driver in full recovery of nerve function [3,11]. Sanchez dkk. case report of a young man suffering from peroneal nerve disorder with a drop foot [12]. Patients have been undergoing conservative care for 11 months without improvement. Then, using ultrasound guidance, it is treated with intraneural injection of PRP. Then the patient was followed up for 21 months, the patient was declared to have a partial recovery, so he could walk without orthosis [12]. Research conducted by Anjayani et al. showed that PRP injection could improve peripheral neuropathy repair in 2 weeks in patients with leprosy. In that study, patients were randomly divided into two comparable groups and treated either with perineural injection of PRP or injection of platelet poor plasma (PPP) as a control. PRP perineural injection has been shown to be significantly effective in nerve regeneration [13]. Cases 2 and 3 show a sensory improvement that occurs within 4 weeks of the posterior tibial nerve characterized by a discriminatory examination showing normal results in the lateral area of the D / S foot and in the right palm. Compared to case 1 using conventional therapy for which there was no sensory improvement after week 4. EMG results can also be evaluated after 4 weeks, where in case 3 there is improvement to mild axonal demyelinating motoric sensoric polyneuropathy.

A good PRP injection technique is to use perineural targeted methods. Ultrasound is an effective modality for use in peripheral nerve injection of upper and lower extremities. With the right technique, peripheral nerve injection can be done safely and is useful for diagnostic evaluation and treatment of peripheral neuropathy. In recent years, the use of injection with ultrasound-guided methods has evolved. Jarum dapat dekat dengan epineurium nervus sehingga meningkatkan efek injeksi dan menghindari cedera saraf atau tendon. In cases

2 and 3, ultrasound-guided autologous platelet rich plasma injection therapy can maximize the area of injection and prevent side effects. In the post-injection monitoring, there were no side effects such as anesthesia, swelling, or redness in the injection area.

CONCLUSION

Any 3 cases have been reported with a diagnosis of multibacillary hansen morbus with polyneuropathy established anamnesis, physical examination and investigations. In case 1 amitriptyline therapy was administered 1x12.5 mg, vitamin B6 1x25 mg where after being evaluated 4 weeks did not show sensory improvement, whereas in cases 2 and 3 given perineural autologous platelet rich plasma injection therapy with ultrasound-guided method on the right median nerve and nerves tibialis dextra and sinistra. There is improvement within 4 weeks of the right posterior tibial nerve and the right nerve and median nerve. No side effects were observed during the observation period. It was concluded that autologous platelet rich plasma perineural injection therapy with ultrasonography-guided method in multibacillary Morbus Hansen patients can improve sensory peripheral neuropathy.

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Histoid-Type Leprosy Polyneuropathy : A Case Report

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ABSTRACT

Introduction: Leprosy (Hansen Disease) is a chronic granulomatous disease in the peripheral nerve and cutaneous caused by the bacterium *Mycobacterium leprae* and *Mycobacterium lepromatosis*. Histoid-type leprosy is a clinical expression of multibacillary leprosy (MB) characterized by the occurrence of cutaneous and subcutaneous nodules and plaques with distinctive histopathological features. Histoid-type is estimated to be 2.79-3.60% among all of leprosy patients. The prevalence of leprosy in East Java in 2015 was 1.02 per 10,000 population, and there was still limited data to describe histoid-type. **Case Report:** A male, 55 years old, with complaints of numbness of both feet and presence of multiple nodules on whole body. Regarding physical examination, we found thickening of left Tibial nerve. Electrophysiologic examination described sensory and motor demyelination of right and left Tibial and Peroneus nerve. The patient was diagnosed with Histoid-type Leprosy (Hansen Disease) polyneuropathy. She had been treated by Rifampicin, Ofloxacin, and Minocycline for causative treatment of Leprosy, and also Amitriptyline for neuropathy. **Conclusion:** The proper diagnostic and prompt treatment had been performed, but the outcome after 1 year of treatment still had not shown significant neurologic improvement yet.

Keywords: Polyneuropathy; Leprosy; Hansen Disease; Histoid-type.

INTRODUCTION

Leprosy (*Morbus Hansen*) is chronic granulomatous disease of peripheral nerves and skin due to the bacteria *Mycobacterium leprae* and *Mycobacterium lepromatosis*. Histoid type leprosy is a clinical expression of multibacillary leprosy (MB), characterized by cutaneous and subcutaneous nodules and with distinctive histopathological features [1]. The prevalence of histoid type leprosy among all of leprosy patients is estimated to be 2.79-3.60% [2-4]. Leprosy prevalence in East Java on 2015 was 1.02 per 10,000 population, while data for histoid type was still limited in Indonesia [5].

Leprosy is one of the most common infectious diseases associated with the peripheral nervous system and cause disability while the early and prompt treatment was delayed. Thus, it is the important way to perform early recognition

and immediate treatment of nerve involvement. Reviews of patients referred to the Tropical Disease Hospital in London, England, showed the average of time ranging since early onset symptom until the disease diagnosed was 1.8 years (0.2-15.2). Prior to their arrival, patients had come to Dermatologists, neurologists, orthopedic surgeons, and rheumatologists. Delayed diagnosis occurs in 82% of cases, and misdiagnosed, as well as other neurological conditions, is an important cause of delays. As a result, 68% of patients have permanent nerve damage. In countries which are more familiar with leprosy, delay of diagnosis tends to be less case, so there is still a possibility of improvement. Increased migration number from high rates leprosy area into low rate areas will increase the leprosy clinical features problem. So that, most patients with leprosy (eg, in Brazil ~ 1.5 per 100,000 population) have a degree of chronic 2-degree disability (visible impairment and disability) on their initial arrival [6].

Diagnosis of leprosy is established by anamnesis of clinical symptoms, physical

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examination, and investigation. The signs and symptoms of leprosy are various, depending on the type. Sensory neuropathy is much more common than motor neuropathy, but pure motor neuropathy may occur. Mononeuropathy and multiplex mononeuritis may occur, whereas common ulnar and peroneal nerves most commonly involved. Symmetrical peripheral neuropathy may also occur. Patients with skin lesions above the peripheral nerve tract are potentially develop sensory or motor disturbances [7].

Inflammatory reactions in the nerves can be suppressed by corticosteroid and antileprosy treatment. Corticosteroids are used for patients with severe nerve involvement, nerve abscess, symptoms that almost lead to paralysis, or extensive and acute skin injuries. High-risk patients may require corticosteroids for 6 months with MDT as a profilactic therapy. Nerve damage can occur even after clinical cure and finishing treatment [8].

This paper report the histoid-type of leprosy (Morbus Hansen) case on a male, 55 years old, was diagnosed of leprosy with a sign of polyneuropathy, whereas the symptoms had been getting severe and persist for 1 year.

METHOD

Patient suffered from numbness of his feet and multiple nodules on his arm that gradually spread to the face, back, chest, and legs (soft solid consistency, painless) since 2 years ago. Patient came to dermatologist of Saiful Anwar Malang Hospital 6 months after that complaint. He was diagnosed of leprosy, and given rifampicin and ofloxacin therapy for 1 year.

After 1 year of therapy, the skin nodules were still present (decreased) and the numbness of both legs was still persist. Patient was performed slit skin smears and rifampicin resistance tests, and the results showed that he already sensitive to rifampicin yet. Therefore, the treatment was continued with MDT MB (multidrug therapy multibacillar). Then the patient was referred to neurologist for management of neuropathy.

From physical examination, the blood pressure was 130/80, pulse rate was 84 bpm, respiration rate was 16 tpm, axillar temperature 36,5°C, and internal status of patient was within normal limit. Dermatological status showed

multiple nodules with varying diameters, macules and patches with irregular shapes and varying sizes are spreading throughout the body. Based on neurological examination, we found GCS 456, and there was protopathic sensory disturbance with hypesthesia on both plantar till dorsum pedis area symmetrically. Pain sensation and proprioceptive perception of vibration and positions were within normal limits. There was an enlargement of his left tibial nerve.

Slit skin smear of auricula region and biopsy of the lesion found Bacterial Index +5, while histo PA image showed grenz zone area and the presence of rounded or spindle histiocytes. Accordingly, the patient was diagnosed with histoid type of leprosy (MH).

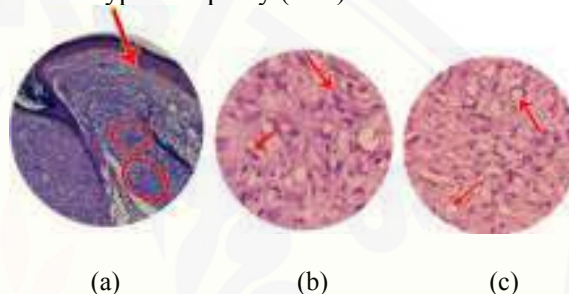


Figure 1. Tissue biopsy of nodular lesions. The arrows show grenz zone area (a), rounded or spindle histiocyte (b), and foam cell (c). The circles showed multiple group of granulomatous cell (a).

The results of electrodiagnostic test show low amplitude of motoric at right (5,86 mV) and left (1,07 mV) Peroneal nerve, prolonged distal latency of motoric at right (10,9 ms) and left (2,65 ms) peroneal nerve, low amplitude of motoric at right (1,49 mV) and left (4,97 mV) tibial nerve, prolonged distal latency of motoric at right (4,65 ms) and left (5,15 ms) tibial nerve, prolonged latency of F-wave at right (41 ms) and left (55 ms) Tibial nerve, slight prolonged distal latency of sensoric at right (2,82 ms) and left (3,24 ms) sural nerve, low amplitude of motoric at right (14,9 uV) and left (14,6 uV) Sural nerve. The conclusion was moderate axonal more than demyelinating of motoric than sensoric polyneuropathy.

Patients had taken Rifampicin 600 mg + Ofloxacin 400 mg + Minocycline 200 mg for 1 year then doing rifampicin resistance test, it is indicated that the patient had already rifampicin-sensitive. Therapy followed with MDT MB for 2 years or negative smear results, and monitoring

regularly of skin smear test every 3 months.

RESULTS AND DISCUSSION

Based on history taking and physical examination, there was stocking type hypesthesia on bilateral plantar till dorsal pedis, with enlargement of left Tibial nerve and dermatological status present of multiple nodules and multiple hypopigmented and skin-colored plaques throughout the patient's body, and the erythematous macula of the abdomen. In his first visit in February 2016, the patient was initially diagnosed by dermatologist with a histoid type of MH because of many cutaneous nodules and plaques especially in the back, buttocks, face, and protruding bones. Further investigation was microscopic tissue biopsy examination, which show histiocyte groups (a type of cell involved in the inflammatory response) and the grenz zone (collagen area separating abnormal and normal tissue). Slit Skin Smear examination showed the large number of acid-resistant bacillus (BI +5). Such histoid reaction was shown in histopathologic examination result of this patient.

Neuropathy in MH patient can show mono or polyneuropathy pattern, extent sensory loss with consistent patterns of symmetric polyneuropathy. This pattern is compatible to lepromatous leprosy, as well as the patient's sensory symptoms of plantar and left and right (symmetrical) dorsum pedis hypesthesia, involving cutaneous nerve of Tibial, Sural, and distal branches of Peroneal, and there was also enlarging left Tibialis nerve.

Performing electrodiagnostic examination, we obtained the conclusion of Moderate axonal > demyelinating motoric > sensoric polyneuropathy. Clinically, however, no motor deficits found in the patient, so it is important to monitor and educate the patients about progressive effect of neuropathy to be motor deficits. Motor manifestations are common in leprosy patients and occur late than sensory symptoms.

Treatment for histoid type of MH is different from multibacillary MH. Histoid type can be given 600 mg Rifampicin, Ofloksasin 400 mg, and Minocycline 200 mg followed by MDT MB for 2 years. MDT therapy may also be continued until the results of negative skin smear result [7].

Based on WHO recommendations, all relaps of MB patients should be re-treated with standard MDT MB without waiting for result of drug resistance test. If the results are sensitive to rifampicin then treatment should be continued. If the patient is resistant to dapsone only then MDT MB can still be used safely. But if the patient's condition is resistant to rifampicin or rifampicin and dapsone then another regimen will be required [6].

Patient had treated with rifampicin 1x600 mg, ofloxacin 1x400 mg, and minocycline 1x200 mg for a year, then Slit Skin Smear result at the 12 month later showed that BI was still high enough, ie +5 at left ear lobe, +4 at right ear lobe, and +5 at perinodule. Although it could not already be categorized as relapsed case because completely treatment hadn't be perform, but the presence of high remain BI at the end of therapy and tends to increase compared to smear test 3 months before and finding of solid bacillus, it can be considered to perform drug resistance test. From direct DNA sequencing, it was found that *M. leprae* obtained from this patient's specimens was still sensitive to rifampicin, so we continued treatment of MDT MB therapy for 2 years or until the results show negative BI.

Medical therapy for neuropathy in patients was performed symptomatically with amitriptiline. The main therapy for leprosy-related neuropathy is more causative with MDT treatment. Supportive therapy is also required with education in patients to prevent injury caused by sensory loss of the feet, by reducing friction and pressure to the feet.

It has been reported a male, 55-years-old, with chief complaints of numbness of both feet felt since 2 years ago with the presence of multiple noduls generalized over the body. Based on anamnesis and physical examination, we found chronic hypesthesia with stocking type on bilateral symmetrically plantar until dorsum pedis, presence of multiple nodules throughout the body, with macular hyperpigmentation in the trunk area, and thickening of left Tibial nerve. Patients were diagnosed with histoid type of Leprosy (Morbus Hansen) polineuropathy.

Electrophysiologic examination indicated moderate axonal demyelinating motor > sensory polineuropathy. However, patients had no motor symptoms, so it is important to educate him to anticipate the possible of motor deficit later.

Skin Smear Slit examination was performed,

with the high number of acid fast bacillus (BI +5). Histopathologic examination indicates a histoid reaction. Histoid MH is a rare variant of leprosy categorized as lepromatous type.

Patients did not have a history of taking MDT before so that Histoid type was suspected due to Dapsone resistance. Then the therapy chosen for this patient was rifampicin 1x600 mg and ofloksasin 1x400 mg which was planned for 12 months. At the end of therapy period (month 12), repeated BTA evaluation was obtained and BI was still high, therefore it was planned to examine drug resistance in patients, showing that *M. leprae* bacteria in case this is sensitive to rifampicin.

For Histoid type of MH we can perform treatment with 600 mg Rifampicin, 400 mg Ofloksasin, and 200 mg Minocycline followed by MDT MB for 2 years. MDT therapy can also be continued until the results of the negative Skin Smear of the patient's evaluation test. This patients had been taken rifampicin 1x600 mg, ofloksasin 1x400 mg, and minocycline 1x200 mg for a year and examination of Skin Smear Slit after 12 month therapy indicated that BI still high enough. While based on the results of resistance testing, patients are still sensitive to rifampicin, therefore patient was planned to treat with MDT MB regiment for 2 years or until BI show negative result.

CONCLUSION

Based on this case, we can conclude that neuropathy associated Leprosy (Morbus Hansen) can be various type and sequele to different prognostic. Sometimes the proper diagnostic and prompt treatment had been performed, but still had not shown significant neurologic improvement yet. Further research is necessary to develop better treatment of polineuropathy associated Histoid type of Leprosy.

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Effectiveness mHealth Improves Adolescent Health: A Systematic Review

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ABSTRACT

In several countries in the world, mHealth has become a means to provide information, control disease and used for prevention. Adolescents are specialized because they are the most mobile phone users of all ages and the need for media as an effort to control and prevent the disease they suffer or prevent future diseases. This study is a systematic review through a journal review based on the PRISMA protocol to assess the effectiveness of using mHealth in adolescents. The process of searching articles is accessed from an internet database search namely Ebsco and Proquest with keywords: adolescents, mHealth and effectiveness. Initial screening is based on the year of publication (2014-2019), full text, English, reading the title and abstract, then conducting a feasibility assessment, finding 5 journals that are relevant to the inclusion and exclusion criteria. Inclusion criteria were school-age adolescents who received mHealth interventions and the study design used the Randomized Control Trial (RCT) method. Exclusion is a journal under the year 2014 and teenagers are not in school. The analysis was conducted based on the characteristics of the respondents, sample size, control type. Mobile applications, text messages, and cell phones as mHealth interventions are considered easily accessible and effective as information providers, control and prevention of diseases in adolescents. The advantages and disadvantages of mHealth based on the journal are examined so that later these results can become recommendations in making mHealth target adolescents in Indonesia.

Keywords: adolescent; mHealth; effectiveness.

INTRODUCTION

mHealth or mobile health is a health communication innovation as a form of service and promotion of technology based health [1]. The World Health Organization's global survey reveals a range of uses of mobile technologies in health communications. Such technologies are being used to improve communication from patient to health service providers (e.g., health hotlines or call centers); communication from health service providers to patients (e.g., SMS reminders for appointments, compliance with treatments, or information to raise awareness);

health consultations over the mobile phone; communication among health services in emergencies; monitoring and surveillance of patient's health; and the accessibility of databases of patient records [2]. For example the application of mHealth is done for diabetes management, obesity prevention and reference to health services [3]. mHealth allows access to services and health care by electronic means by utilizing the use of mobile phones [4]. Research conducted by Madhavan in 2011 revealed that mHealth was able to contribute in improving the quality of services, especially long distance services [5]. As predicted, cellphone use worldwide will exceed five billion by 2019 and currently, almost (67%) of the population worldwide already have cellphones with the largest users being teenagers [6]. In response to this, the use of mHealth can be maximized for

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adolescents, bearing in mind that they are a group that must begin to identify and prevent early to protect themselves from future diseases. Adolescent categories are those aged 10-19 years [7] with a total of 1.8 billion in the world [8]. Teenagers are susceptible factors for contracting the disease, the factors can be in the form of thoughts, environmental factors, lifestyle and genes [9]. Mentioning the diseases that most attack adolescents is a health problem of sexuality and reproduction, obesity and mental illness [10]. The importance of prevention and control as early as possible can reduce the amount of disease that will come. In Indonesia, health information systems continue to be developed in order to provide quality health services. The Association of Indonesian Internet Network Providers (APJII) revealed that more than half of Indonesia's population is now connected to the Internet [11], this makes it possible that mHealth can be used in Indonesia.

MATERIALS AND METHODS

A systematic review through article review to see the effectiveness of mHealth in adolescents. It is divided into several steps including; document search, selection, determination of inclusion and exclusion criteria.

1. Search Strategy

The process of determining the literature that qualifies using PRISMA as an instrument by determining articles that are relevant to the criteria of identification, screening and eligibility. The process of searching articles is accessed from an internet database search namely Ebsco and Proquest. Then obtained 5 articles relating to the use of mHealth in adolescents.

2. Document Selection

By using a search engine using the keywords adolescent, mHealth and effectiveness through the search engine Ebsco and Proquest obtained 952 documents. Full text article screening obtained 568, based on publication (2014-2019) amounting to 227 articles. The journal search is based on the relevance of the title, abstract and suitability of the criteria and selected documents, then screening based on eligibility according to the inclusion and

exclusion criteria so that 5 articles are obtained for further review.

3. Inclusion Criteria

Inclusion criteria were adolescents aged 10-19 years, student status, getting mHealth intervention and research design using the Randomized Control Trial (RCT) method.

4. Exclusion Criteria

Exclusion criteria are journals under 2014 and adolescents are not students.

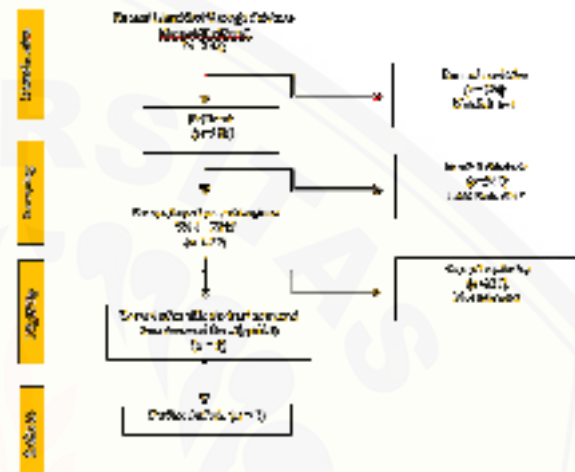


Figure 1. Flow Chart PRISMA

RESULTS AND DISCUSSION

Based on a review of 5 articles found that the study was conducted in several countries including; USA, Belgium, Sweden, Vietnam and Ghana. Design study 5 of this research article using the Randomized Control Trial. Studies from several countries have shown that the use of mHealth in adolescents is effective in providing information, controlling and preventing disease.

1. Intervention Characteristics

These 5 articles provide interventions for adolescent in schools using applications downloaded on their smartphones and also via SMS and cell phones. Analysis was carried out based on the intervention approach, weaknesses and strengths of each article (see Table 1.).

Table 1. Jurnal in Review

No	Location	Intervention approach	Result	Strenght
1.	USA	Mobile app : BodiMojo	The intervention successfully fostered a sense of self-acceptance thereby preventing the risk of depression in adolescents.	<ul style="list-style-type: none"> o Cost effective o Easy to disseminate o Increase engagement
2.	Belgium	Mobile app : The Snack Track School	This research is effective in increasing adolescent knowledge about good snacking patterns so that it helps prevent obesity.	<ul style="list-style-type: none"> - Using games to attract attention - Based on "gifts" - Provision of information on answers
3.	Sweden	Mobile app: Skyddslandet	In this study, adolescents became aware of and were willing to have safe sex to prevent STIs.	<ul style="list-style-type: none"> ▪ Can be used to get information immediately ▪ Save cost ▪ Guaranteed confidentiality
4.	Vietnam	Text massage and call phone	This intervention effectively improves disease management in adolescents with HIV by reminding therapy via SMS and telephone	<ul style="list-style-type: none"> - Quick response - There is a reminder
5.	Ghana	Text-messaging program	This study develops sexual behavior education interventions in adolescents that successfully reduce pregnancy rates for sexually active teenage girls.	<ul style="list-style-type: none"> ▪ Can be used for an audience of both cultural and individual characteristics, ▪ Costs that tend to be cheap (no need internet fees)

2. Methodological Quality

The quality of the methodology of the study to assess mHealth interventions in adolescents was analyzed based on several criteria such as; sample characteristics), sample power (reporting strength analysis), ITT (intention-to-treat), control (confounding control in data analysis), assess point (time assessment), blind assess, drop out, lost to follow up, exlude (participants who received other treatments). In table 2. the signs (+) Yes, (-) No. Of the 5 studies providing sociodemographic information to characterize students, 3 studies reported strength analyzes to determine sample size, and intention-to-treat analysis was mentioned in 2 studies. 5 of these studies involved control as a potential confounder in the study. In addition, all studies conducted assessment points and blind assessments. 2 out of 5 studies describe participants who dropped out, 3 who lost to follow up and 2 studies reported exclusion in this study.

Table 2. Methodological Quality

No	Study	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	USA	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2	Belgium	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	Sweden	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4	Vietnam	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5	Ghana	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

3. Intervention Outcomes

Study conducted in the USA with a sample of 47 adolescents from 2 junior high schools and 2 high schools to improve body image and self-compassion to prevent depression in adolescents. Intervention using an application called BodiMojo which is downloaded free through the Appstore. This research lasted for 12 weeks. Participants who get the intervention must write their feelings in the application during the study, answer quizzes and get motivated every day. while the controls in this study were active as usual. The results obtained from this study were a significant increase in self-acceptance (p = 0.023) [12]. Another study was conducted in Belgium with a sample of adolescents aged 14 to 16 years in 3 schools in one city in Filander, Belgium. The intervention was carried out for 4 weeks, while the controls carried out activities as usual. Using the smartphone application "The Snack Track School" teenagers who become interventions must record the daily snacks they eat through the application, listed the number of calories they eat

and their daily calorie needs. If they consume snacks less than their daily calorie needs, there will be a "REWARD" in the form of vouchers. Proven effective seen from the enthusiasm of adolescents in following this challenge and an increase in knowledge about nutrition in adolescents [13]. Another study conducted in Sweden, a sample of 446 adolescents was separated into an intervention group and a control group. Using an application called "Skyddslaget" which aims to improve sexual health in adolescents. The intervention group in this study will get information about 'safe-sex' and STI in a fun format. While the control group was active as usual. Conducted for 6 months, this study produced effective results in increasing students' knowledge about 'safe-sex' and STI assessed by the increase in adolescents who reported using condoms during sexual intercourse [14]. Other research conducted in Vietnam; the aim is to provide support to adolescents with HIV in Vietnam. Using text and telephone messages, teens will get information about care and ask complaints that they feel through text or telephone messages. Teenagers will also get a reminder to do Antiretroviral Therapy (ATR). The result of this intervention is an increase in adolescents with HIV who carry out ATR in an effort to manage their disease [15]. Another study conducted in Ghana, aims to improve reproductive health in adolescent girls in countries with low to medium incomes. The sample in this study were 756 adolescent school-age girls in 38 schools in Ghana. The intervention group will get text messages in the form of information and quizzes about reproductive health for 15 weeks. The result is an increase in adolescent knowledge and effective in reducing the risk of pregnancy in adolescent girls who are sexually active [16].

4. Discussion

The application of mHealth in improving adolescent health is considered effective. Its use is easy, cheap and fast response, it is suitable for teenagers. However, this intervention cannot be done in all countries, especially countries with low incomes because not all teenagers have their own mobile phones. Another disadvantage of mHealth is that adolescents do not continue interventions if there is no monitoring, feeling bored and not needed anymore is the reason for the unsustainable use of mHealth. Therefore, the

need for supervision and monitoring to ensure adolescents always use the application, especially for applications with the aim of disease management and compliance (taking medication or therapy). mHealth in its role as a provider of long-distance health services has been very helpful between patients or users with health workers. Forms of mHealth such as providing health information, help control disease and prevent future disease. As technology develops, mHealth is now able to help with the purchase of medicines according to the doctor's prescription through the application, payment of health insurance and also provides guidance on a healthy lifestyle, such as; exercise guidelines and eat healthy according to balanced nutrition. The use of smartphones in Indonesia has expanded for various purposes, so the mHealth application to improve adolescent health is very possible and easy to implement. The need for special attention from all groups to start taking initiatives in recognizing application programs, conducting research and collaboration across sectors in order to produce improvements in health services in the future.

CONCLUSION

mHealth helps adolescents to improve their health status. Both through mobile applications and text messages and cell phones. This study provides recommendations that can be applied to adolescents in Indonesia, namely the availability of health services through mobile applications to improve adolescent health in Indonesia with a modern and relevant concept to the problems most faced by adolescents in Indonesia.

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Tumefactive Multiple Sclerosis Mimicking Brain Tumors: Case Report

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ABSTRACT

Introduction: Multiple sclerosis (MS) is an immune mediated disease that attacks the myelinated axons in the central nervous system in the form of myelin and axon damage in degrees which varies. Tumefactive multiple sclerosis is a rare variant of multiple sclerosis. Patients with multiple sclerosis can experience various clinical findings, and these findings can change from one examination to the next. **Case Report:** Women, 36 years old, present with the main complaint of right-sided headache since 2 weeks and getting worse since 5 days of before admission, such as being stabbed, appearing mainly in morning. The patient also complained of a weak left half body also obtained dysarthria, facial weakness and double vision. A similar history has occurred in 2011, 2014 and 2016, including complaints completely gone. A history of missing seizures arose since 2014 and patients received depakote therapy 3x250 mg. Physical examination revealed edema papillary in both eyes, right N. VI paresis, left N. VII and XII paresis central type, left inferior extremity weakness, and positive left Babinski pathological reflex. Magnetic resonance imaging (MRI) of the head with and without contrast shows multiple intraaxial lesions suggesting multiple sclerosis. Brain biopsy showed no tumor cells and suggests an inflammatory process. Tumor markers with results within normal limits. In the case of high-dose intravenous methylprednisolone therapy followed by oral prednisone tapering showed significant clinical improvement. **Conclusion:** This case shows tumefactive multiple sclerosis which can mimic brain tumors. Efforts in establishing diagnostics in the form of findings and clinical history as well as supporting examinations play an important role, so that proper management and a better prognosis can be given.

Keywords: Multiple sclerosis; brain tumors; methylprednisolone.

INTRODUCTION

Multiple sclerosis is an inflammatory disease mediated by the immune system, which attacks the myelinated axons in the central nervous system in the form of damage to myelin and axons in varying degrees. Multiple Sclerosis affects about 400,000 people in the United States and about 2.1 million people worldwide. 85% of patients experience a phase of relapse and remission. Tumefactive multiple sclerosis is a rare variant of multiple sclerosis. Patients with

multiple sclerosis can experience varied clinical findings, and these findings can change from one examination to the next [1,2]. In Indonesia, this disease is relatively rare when compared with other neurological diseases. MS more often attacks women than men with a ratio of 2: 1.

Generally this disease affects those aged 20-50 years. MS is progressive and can cause disability. About 50% of people with MS will need help walking within 15 years of the onset of the disease. The cause of MS is not known. The involvement of genetic and non-genetic factors such as viral infections, metabolism and environmental factors is thought to play a role in triggering the immune response that damages this central nervous system [1,2]. Another form

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of multiple sclerosis is tumefactive multiple sclerosis. This term is used for multiple sclerosis patients who have a single aggressive demyelinating lesion, measuring > 2cm, causing mass effects, edema and / or there is an increase in ring-shaped intensity on the MRI picture [1,3].

CASE

Female, 36 years old, presents with a chief complaint of headache. Right head pain and radiating to the neck since 2 weeks of SMRS and getting more and more heavy since 5 days of SMRS, such as being stabbed, appear mainly in the morning and temporarily relieve by anti-pain. The patient also complained of a weak left half body since 2 weeks of before admission, progressively getting heavier until 5 days the patient's before admission cannot stand up. Also obtained pelo, rot and double view. A similar history has occurred in 2011, 2014 and 2016, including complaints completely gone. A history of missing seizures has arisen since September 2014 and the patient received 3x250 mg depakote therapy. Physical examination showed edema papil in both eyes, right N. VI paresis, right N. VI paresis, left N.VII and XII paresis central type, left inferior limb weakness, and positive left Babinski pathological reflex.

1. Supporting investigation

1.1 Imaging

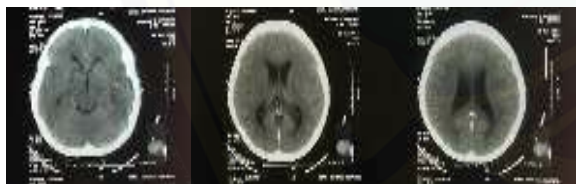


Figure 1. CT scan of the head with and without contrast (2014). Overview of SOL (space occupying lesion), multiple in the right-left parietal region and toxoplasma, tuberculosis (TB), HIV, no visible intraparenkim infarct bleeding



Figure 2. MRI of the head with and without contrast (2016). Multiple intraaxial lesions in the

left temporal lobe, left frontal lobe, left periventricular lateral posterior cornu, right internal anterior limb capsula, right lentiform nucleus, right semiovale centrum, enhancement in left frontal lobe and right semiovale centrum, suggesting multiple sclerosis



Figure 3. CT scan of the head with and without contrast (before biopsy) (2017). Intraaxial mass of right frontotemporal lobe suggestive Tumefactive Demyelinating Lesion. Cerebri edema accompanied by left subfalcine herniation as far as 6 mm

1.2 Biopsy

On examination with the vries coupe and paraffin block method of 3 preparations, with no results obtained tumor cells. Biopsy specimens suggest an inflammatory process.

1.3 Electroencephalography

EEG examination (2016) with the results of the recording found no epileptogenic waves or abnormal slowing. Does not get rid of an epilepsy.

1.4 Other Support Examinations

Tumor markers (2017) showed an increase in NSE values (59.93), while AFP (7.30), CEA (4.07), CA 125 (12.21), CA 19-9 (<0.60) , CA 15-3 (6.66) within normal limits. Abdomen ultrasound (2014), thyroid ultrasound (2016), and Mammae ultrasound (2016) with results within normal limits.

DISCUSSION

Multiple sclerosis is a disease mainly occurs in young individuals between the ages of 20-50 years and is more common in women than men is 1.4: 1 to 1.8: 1. In this case accordingly, which occurs in women aged 36 years, the initial symptoms appear 6 years ago which means the patient's age at that time was 30 years [1,2]. Multiple sclerosis diagnosis is established based on the 2010 McDonald criteria where there are more than 2 attacks with more than 2 lesions and the MRI shows different lesions [1]. Tumefactive

demyelinating lesions are acute, large (> 2cm) demyelination lesions and resemble tumors in the central nervous system that can be accompanied by edema around the lesion, mass effects and an increase in ring-like intensity. Tumefactive multiple sclerosis in this case resembles a brain tumor where appropriate clinical and MRI findings are obtained but on the results of a biopsy there are no tumor cells [3,4]. Until now, the cause of changes in nerve cells in the central nervous system is not yet certain in multiple sclerosis patients turning into tumor cells. But several things that might play a role in this case include hereditary factors, neurotropic growth factors, development of gene expression. MRI examination can be used to help make a diagnosis. Based on the MRI examination, gliomas in multiple sclerosis patients occur mostly in the frontal and temporal lobes. On contrast MRI of the head on 2017 intraaxial period with central necrosis and bleeding component in the right temporofrontal lobe, suspected high grade glioma with cerebral edema. Although MRI is a reliable test to distinguish between multiple sclerosis lesions and brain tumors, multiple sclerosis lesions can mimic brain tumors. This is because multiple sclerosis lesions can be colored by gadolinium contrast so that the intensity of these lesions can increase and mimic tumors in the brain. In addition, large demyelinating plaques can cause edema resulting in mass effects such as brain tumors [2,5,6]. Characteristics of MRI that support tumefactive demyelinating lesions in cases including ring enhancement incomplete, T2-weighted iso and hyperintensity of the warmed area, and absence of cortical involvement. Biopsy examination with neuronavigation is a very important examination to distinguish between multiple sclerosis lesions and brain tumors. Gliomas that occur in patients with multiple sclerosis can be single / unicentric or multiple / multiple gliomata. Histologically, the glioma consists of demylastic astrocyte cells that form anaplastic astrocytoma or glioblastoma patterns [7]. Periventricular glioblastosis can be found in the transition area of the acute demyelinating lesion (the area between the demyelinating lesion and normal cells). In addition, through histological examination, it was found that the presence of astrocytomas located in the demyelinating lesion. So from the two histopathological findings, the tumor

originated from the process of transforming glia cells in the demyelinating area. In addition, recent studies have found cellular activity in chronic multiple sclerosis lesions with lymphocytic activity in small blood vessels. This is considered to be a process of gliosis or cellular cycle that indicates the transformation of cells into malignancy. In this patient biopsy with vries coupe has not been obtained tumor cells and the paraffin block suggests an inflammatory process. Biopsy examination is a very important examination to distinguish between multiple sclerosis lesions with brain tumors, in which case there are no tumor cells found with biopsy specimens showing inflammatory cells [2,5,6]. In the case of high-dose intravenous methylprednisolone therapy followed by oral prednisone tapering showed significant clinical improvement.

CONCLUSION

This case shows tumefactive multiple sclerosis which can mimic brain tumors. Efforts in establishing diagnostics in the form of findings and clinical history as well as supporting examinations play an important role, so that proper management and a better prognosis can be given.

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Employee's Based Program To Support Breastfeeding at Workplace: Systematic Review

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ABSTRACT

Background: Maintaining exclusive breastfeeding up to six months and continuing until two years along with other supplementary food is challenging for working mothers. Working mother faced multiple barrier such as a lack of flexibility in the work schedule to allow for milk expression; lack of accommodations to express and/or store human milk; and concerns about support from supervisors and colleagues and it's factors consequently terminated breastfeeding earlier. The aim of this review to examine literature about effectiveness of employee's based lactation programs to support mother achieve breastfeeding success at workplace. **Method:** Searching relevant articles used three databases; PubMed, Cochrane and Ebscohost. Inclusion criteria are articles must have measured at least one outcome, such as breastfeeding duration and/or breastfeeding exclusivity as an impact of breastfeeding program that implemented at workplace. **Result:** Seven articles were selected from five countries; Indonesia, Malaysia, Thailand, Taiwan and the rest from United States. The institutions where breastfeeding programs are implemented include government offices and clinics, factories, and electronics, entertainment and manufacturing industries. The breastfeeding programs provided include breastfeeding class, counseling, lactation space with equipment for pressing milk, and lactation break. All literature shows positive results in increasing duration and exclusivity breastfeeding coverage at workplace. The average duration of breastfeeding are 6-8 months after postpartum leave. Mothers who received breastfeeding class intervention were six times more likely to be successful at breastfeeding exclusively (OR, 5.93; 95% CI, 1.78-19.79) ($p < 0.05$). **Conclusion:** It is possible to maintain breastfeeding for working mothers until recommended time,. Workplace has a significant role to support mother during breastfeeding process. In addition, the breastfeeding program provided can be adjusted to the budget of each company.

Keywords: breastfeeding program; working mother; duration; exclusive breastfeeding; workplace.

INTRODUCTION

Many studies have proven that breast milk is the best food for babies, because it contains a variety of important nutrients that can protect babies from the risk of infectious diseases and degenerative diseases. In order to achieve optimal health conditions, WHO and UNICEF recommend infants breastfeeding exclusively for 6 months and continuing it for up to two years along with other additional nutrients [6]. In its implementation, this becomes a challenge for working mothers who may encounter several obstacles in their working environment.

In a study that was conducted in Malaysia in 2015 at several government hospitals and private clinics. It was found that 73% of working mothers stopped to breastfeed their babies before the recommended time and 21.9% of them stopped to breastfeed in the first 3 months of postpartum (Muda, Siti Mariam et al; 2016). Likewise, studies in South Jordan shows that 71.2% of mothers who breastfeed their babies, only 20.9% succeeded in exclusive breastfeeding for 6 months and as many as 30% of mothers stopped to breastfeed at less than 3 months [1].

When returning to the world at work, many challenges faced by mothers to continue breastfeeding their babies such as limited time

and energy, lack of knowledge related to breastfeeding, and no facilities that support breastfeeding. In addition, the phenomenon of the dual role that is carried by mothers related to work and taking care of the household has the potential to increase stress and conflict at home and at work (Triaryati, 2003). This causes the process of breastfeeding is not optimal both in terms of frequency and duration so there is a risk of too early in breastfeeding termination [5].

Working outside home is closely related to the shorter duration of breastfeeding and the intensity of working full time is significantly related to the low rate of initiation of breastfeeding and shorter duration. This was seen to be more significant in women with low incomes compared with those with high incomes (CDC, 2018).

Compared with a number of studies that identify the benefits of breastfeeding, the obstacles and challenges of initiating breastfeeding and exclusive breastfeeding, studies regarding the effectiveness of comprehensive breastfeeding promotion programs at work are relatively few. In fact, in the 2019 of Cochrane review, only one study was found regarding the effectiveness of workplace interventions to support breastfeeding among returning mothers to work. The purpose of this review is to identify literature related to the effectiveness of breastfeeding programs for employee to support breastfeeding in working women.

MATERIALS AND METHODS

This study uses The Systematic Review Design, which is a review of the existing literature to evaluate the impact of Employee’s based programs at workplace towards breastfeeding success. Criteria for inclusion of articles or journals that will be reviewed in this study are programs that are conducted in the workplace targeting lactating mothers or have been breastfeeding while working there. Then the resulting output is related to the success of breastfeeding which is shown by at least the duration of breastfeeding more than 3 months or exclusive breastfeeding for 6 months. In September - October 2019, articles were searched from three databases, namely PubMed, Ebscohost, and Conchrane. These are related

articles that were relevant to the purpose of the review of this article. The search strategy uses several keywords such as "Breastfeeding Program OR Lactation Program AND Working Mother OR Employee OR Workplace. From this database, 2703 articles were obtained with details of 833 articles from PubMed, 1870 from Ebscohost, and 1 article from Conchrane. Then the articles that were found were screened again based on language (articles that were used were only in English), access to full-text articles and duplication. From the first screening, results 633 articles remain. Then review articles that are eligible or relevant to the objectives of this study and get as many as 46 articles that discuss the relationship of breastfeeding programs with breastfeeding outcomes that have been previously presented. Furthermore, from the available articles, a re-election was made based on criteria that had been established as an inclusion criteria and it was obtained the seven most relevant articles for a more in-depth study. Furthermore, data from the article or journal is extracted into a summary table 1.

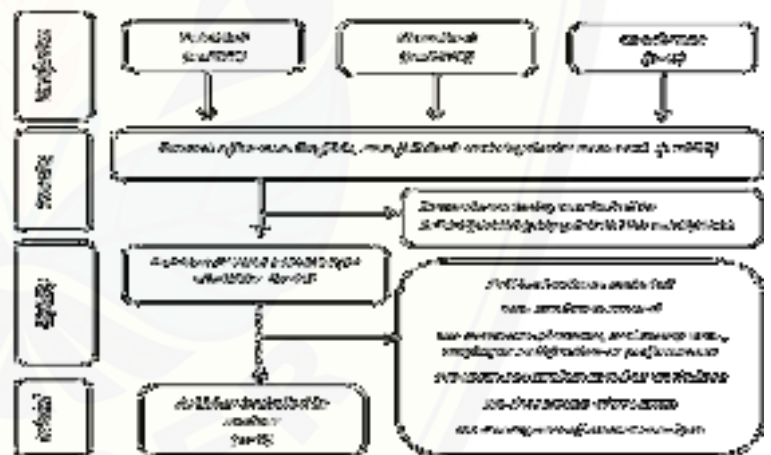


Figure 1. Figure PRISMA flow chart study selection

Table 1. Summary of Results from Articles Included in Review

Author	Year	Country	Sample Size	Intervention	Outcome
Cohen and Mrtek	1994	USA	715	Workplace breastfeeding program	Increased breastfeeding duration
Ortiz	2004	USA	57-715	Workplace breastfeeding program	Increased breastfeeding duration
Amin et al.	2011	USA	57-715	Workplace breastfeeding program	Increased breastfeeding duration
Basrowi, Sulistomo, Adi, & Vandenplas	2015	Indonesia	57-715	Workplace breastfeeding program	Increased breastfeeding duration
Balkam and Cadwell	2011	USA	57-715	Workplace breastfeeding program	Increased breastfeeding duration
Basrowi et al.	1994	Indonesia	57-715	Workplace breastfeeding program	Increased breastfeeding duration

RESULTS AND DISCUSSION

1. Sampel Characteristics

From the seven articles carried out in the review, most of them (3 articles) came from the United States, and the other articles are from Malaysia, Taiwan, Thailand, and Indonesia. The number of samples measured also varied from one article to another with a range of 57-715 samples. Institutions that implement breastfeeding programs for employees in this study are 47% (7 institutions) belong to the government including those that in the fields of energy and water resources, health clinics, and other government institutions that are not specifically mentioned and 53% (8 institutions) are privately owned companies including aeronautics, entertainment, services, electronics, and oth factories that are not specifically described. Based on the average age, the sample participating in this study has an age range of 20-46 years, which is the productive age for work. ((Cohen and Mrtek, 1994); (Ortiz, 2004); (Amin et al., 2011) (Basrowi, Sulistomo, Adi, & Vandenplas, 2015); (Balkam and Cadwell., 2011); (Basrowi et al. , 1994) [10] [9].

2. Effectiveness Employee's Based Lactation Program

Breastfeeding programs that are implemented in the workplace quite varied, including the provision of breastfeeding space, counseling with professionals, breastfeeding classes, the availability of equipment for pumping, breastfeeding break, and campaigns

from companies to support mothers maintaining breastfeeding at worplace after maternity leave. The availability of breastfeeding rooms and counseling with professionals is a program that is always in the breastfeeding program in each country [2]; [3]; [4]; [7]; [9]; [10].

In a study conducted by Balkam and Cadwell in 2011, the workplace breastfeeding program has been implemented since 1998 in the United States, and in 2005 this study was conducted with purpose to see the impact of implementing breastfeeding programs at work on maternal breastfeeding behavior. The results showed that the percentage of respondents who exclusively breastfeeding increased in accordance with each program received (prenatal education, telephone support, consultation, and nursing rooms). Respondents who received three or more services had a longer duration of breastfeeding at 11 months. The results of the regression analysis also showed a positive relationship between the number of services received with exclusive success for 6 months ($R^2 = 0.12$) (Balkam and Cadwell, 2011). Then a study conducted in Malaysia showed that 51% of working mothers stopped breastfeeding their babies before 6 months, and 54% of them stopped breastfeeding of less than 3 months of the infant age. This is in conjunction with the completion of maternal leave, in Malaysia there is a 3-month maternity leave. The low flexibility factor for milking during working hours is a statistically significant factor that hinders the success of exclusive breastfeeding. (Amin et al., 2011). Research conducted in Indonesia showed that support for breastfeeding programs at work increasing the practice of exclusive breastfeeding nearly six times (OR, 5.93; 95% CI, 1.78-19.79; $p < 0.05$) [3].

The intervention in the review of this article is divided into three stages, namely the prenatal, perinatal, and postntal phase when mother returning to work after maternity leave until the weaning phase. Interventions that is given in the prenatal phase are breastfeeding classes. This service is not only aimed at pregnant workers but also families, and husbands, or male workers who have a pregnant wife. Then the services that are provided in the perinatal phase are breastfeeding counseling either by telephone or in person with professional counselors. Then the phase when returning to

work until weaning time, the institution continues to provide consulting services and provide accommodation in the form of lactation room and equipment for milking, as well as ensuring that working mothers still get special breaks to milk. After the implementation of the breastfeeding program at work, around 75% of mothers who return to work can at least continue to breastfeed their babies for up to 6 months, with an average duration of breastfeeding for 8.1 months. (Cohen and Mrtek, 1994). In a study conducted by Ortiz in 2004 in the United States, it was found that after the implementation of the breastfeeding program in the prenatal phase the rate of initiation of breastfeeding in working mothers was 97.5% and around 57.8% of mothers succeeded in giving exclusive breastfeeding up to 6 months. The success criteria for milking in this study are the ability to pump at least 2 weeks after returning to work. Based on the experience of CLC (Certified Lactation Consultants), this is sufficient time for mothers to adjust milking time to be more comfortably into their daily work schedule. From the 435 who returned to work, 79% attempted to milk at work and 98% were successful and the average duration of breastfeeding was around 9.1 months. Medical reasons for not breastfeeding or for early weaning were reported by 14 women. The causes of which included abnormal pap smears, lupus drugs, mastitis, cimetidine for severe vomiting after childbirth, carpal tunnel syndrome, thrush, other infections, kidney failure, decreased baby's weight is greater than 10% and asthma. A mother experiences 3 times of breast infections before deciding to wean. Two subjects stopped breastfeeding at work because they were pregnant again [7]. A mother has a retained placenta which can cause premature lactation failure In a study conducted by Yimyan in 2014, a slightly different intervention was carried out by establishing a model of breastfeeding program at work, then analyzing the impact of the model on changes in maternal behavior. The first phase is to form a committee to support breastfeeding programs at work, then to analyze the situation related to breastfeeding practices, and then to plan the program. The program is divided into 2, namely direct intervention through education and professional support and indirectly through campaigns. The results of the statistical analysis show that the implementation of a breastfeeding program

model at work is significantly related to the success of exclusive breastfeeding for up to 6 months. The contribution of the Employee Breastfeeding Program was also shown in a retrospective study conducted in Taiwan, namely knowledge about breastfeeding, access to breastfeeding space and environmental care about breastfeeding mothers in the workplace significantly related to breastfeeding behavior ($P_v = 0.0001$) [9].

The success of exclusive breastfeeding or the longer duration of breastfeeding is also influenced by the flexibility of time from the place where the mother works. Mothers who work in office areas are more likely to have a longer duration of breastfeeding compared to women who work in factories because office workers tend to have flexible work targets compared to factory workers who are very strict on their targets and deadlines every day. In a study conducted by Basrowi (2015) in Indonesia and Tsai (2013) in Taiwan it was found that mothers who work in offices with flexible time 3 times more potential to have longer duration of breastfeeding and successful exclusive breastfeeding compared to factory workers or workers in sterile area (OR 2.66-3.33) [3]; [9].

3. Discussion

Each country has their respective policies related to maternity leave. From the seven articles that were reviewed, on average, the country gave birth leave between 2-3 months. This is in line with the high rate of breastfeeding discontinue in the first 3 months postpartum. Therefore workplace support is very important to motivating mother maintaining breastfeeding until the recommended time.

The company's support for breastfeeding mothers consists of several categories; first, no lactation support is a condition where the company does not have any concern for its employees who are breastfeeding. The second stage is lactation awareness, in this condition the company has begun to care about the importance of providing support to its employees to continue breastfeeding their babies through the availability of room that can be used for breastfeeding or pumping. Then the lactation support is the company not only providing a nursery room for breastfeeding or pumping, but also providing equipment for express milk both to be lent or given free of charge, as well as giving

breastfeeding break. This was reinforced by the policy. The last is the lactation program, at this stage the company also provides counseling services from the prenatal period until the mother returns to work after maternity leave, sometimes the company also provides day care at work to make it easier for mothers to give breastfeed directly to her baby. (Bar-Yam, 2015)

From the seven articles reviewed, all implemented two main elements in the breastfeeding program, namely breastfeeding counseling by competent personnel and the availability of lactation room. The recommended lactation room is good lighting, giving privacy and has a refrigerator for storing breast milk. Three of the seven articles also offer a breastfeeding class program to improve mother's knowledge and capacity to continue breastfeeding their babies when they return to work. Breastfeeding class programs are usually done at the pre-natal period. The information that is provided about the benefits of breastfeeding, expressing and storing breast milk techniques and problems commonly encountered during the breastfeeding process. From all the elements that is offered in the breastfeeding program. Counseling is the most influential element in increasing the duration of breastfeeding.

The systematic review of this article is also found that the success of a mother to maintain breastfeeding to her baby are also influenced by the flexibility of working time and support from supervisor. According to Synder (2017) study women within the professional/management industry were most likely to receive informal and direct support for breastfeeding upon return to work and women within the service industry and production/transportation industry reported receiving the lowest levels of informal and direct support and have not sufficient time for pumping breaks [8]. In its implementation, support from peers or supervisors is also needed to encourage mothers to use their breastfeeding breaks so that the ASI reserves for babies can be fulfilled.

Implementation of breastfeeding programs in the workplace can vary depending on the concern of the leader of the company for breastfeeding issues and the benefits that have an impact on the allocation of funds provided. The limitation in this study is that all the literature studied did not use the experimental

method so that it cannot show a causal relationship. Besides that the sample from this literature tends to be homogeneous and in some studies the sample.

CONCLUSION

Maintaining breastfeeding for working mothers is possible. Through the company breastfeeding program can help mothers to achieve breastfeeding success up to the WHO recommended time for exclusive breastfeeding which is 6 months and continued for up to 2 years with additional food. The support provided is not only in terms of facilities but also flexibility of time and motivation from counselors, colleagues and supervisors.

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The Development Concept on Ecology Citizenship on The Community of Gunung Sewu

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ABSTRACT

Issues on environmental damage has become one the biggest global concern. We have watch and hear about the impact on almost every country in the world. Indonesia has been one of the countries that have experienced environmental crisis on almost every year. Some of environmental problems we had, such as forest burning, pollution and waste hasn't even found any right solution yet. The damage are made worse along with the escalation of infrastructure development that did not considering the ecological awareness, whether its highway, airport or the expansion of urban area. We can say the environmental damage happens in almost every place, including the karst area at Gunung Sewu, which threatened by the mining and tourism activities. There are some factors causing environmental damage, some are the lack of ecological education by the government to people, the schooling role that hasn't been optimized on its function to teach the environment based learning, and also the low level of public awareness on sustainable development. Therefore, it is important to build ecological citizenship that responsible in protecting, managing and conservation the environment in a wise and fair way. From the point of view of Civic Education, this is a form of effort in developing civic virtue within the scope of Ecological citizenship. This study aims to determine the efforts made by the Yogyakarta Walhi in conducting guidance to the Gunung Sewu community on preserving the Gunung Sewu karst area. The qualitative method will be the research method that are going to use here, while the members of Walhi of Yogyakarta and Gunung Sewu Community will be the main research informants. The research will show some various efforts on ways to empowering people, that include community building, providing needed information and also socialization of conservation on Gunung Sewu Karst Area.

Keywords: Not Government Organization, Ecological Citizenship, Community Development.

INTRODUCTION

Ecological citizenship is a new ideathat is strivedto shape the consciousness of citizens in a fully human role in preserving the environment. Deane curtin [5] the appearance of the idea of ecological citizenship was a manifestation of a world condition in which a prolonged ecological crisis was facing. The term "ecological citizenship" was first used in 1990 by environmental institutions in Canada. Based on

the Canadian environmental institutions, it suggests that some citizens of the globalized world do not have a good history of trying to manage their environment properly [6].

Michael Bell (bell, 1998) wrote about 'ecological dialogue,' pointing out the fact that the materially ecological crisis comes from human ideals in society and to approach it and give a real chance to the environmental crisis, it needs to understand and look at the sociological landscape. From a sociological standpoint, the environmental crisis is a material problem with ideological roots [3].

Karst is a German term derived from a Slovenian meaning stony wasteland [10] The term actually describes conditions that are encountered in many areas of carbonate rock or other rocks that have an soluble nature. A more specific definition is expressed by Ford and Williams, who define karst as a terrain with hydrological characteristics and landforms resulting from soluble combinations of rock and having a highly developed secondary mortality [12]. Karst in the Gunung Kidul region was first introduced by Danes (1910) and Lehmann (1936) and world-famous with karst mt sewu. This karst is characterized by the development of the karst dome, one of the more positive forms of land known as the sinusoidal dome. [7] mount sewu may also be categorized as an outdoor karst (bare/nackter karst) of conical hills not found in other karst areas around the world. The karst mountain at sewu is also one of the most unique karst ecosystems in Indonesia and is shown by the appreciation of the Pacific ecosystem and world heritage as world natural heritage. One of the systems that require management of this unique region is its groundwater.

According to the director of the environmental forum Yogyakarta (Walhi Yogyakarta), Khahik Sandera in an interview on the part of the region of Gunung Kidul and part of wonogiri and Pati district is part of the karst mountains of sewu. This is of particular concern because the breakdown of the landscape of the sewu mountains continues to be, both from public ignorance and from government and private projects that are doing development without consideration of the ecological aspects of the region. As illustrated earlier in the broadcast on March 2, 2017, the exploitation of karst continues to be primarily for tourism development that has been the special concern of the local government in guide. In an interview with tempo, Khalik which is also as a network coordinator for sewu mountain (JMPPS) said it would be a great loss for landscape exploitation to be conducted without consideration of ecological sustainability. This is because the landscape of the sewu mountain range serves as a wasteful use of water that deviates millions of kilos of water for future mountain communities. [11].

In walhi's environmental studies, the three main threats shaded the stability of mount sewu karst, the first of which is the southern route

(JJLS), limestone mining and tourism - lending facilities: resort, hotels and other facilities [4].

Based on these considerations, in November 2018 at the Yogyakarta Walhi Work Meeting, Walhi began to include the conservation of the Gunung Sewu karst in the annual work program. In the work program that was built, Walhi Yogyakarta included two important things that Walhi Yogyakarta would do in the vulnerable period of 2018 until 2020. Namely advocacy and capacity building for community building in the preservation of the Gunung Sewu karst. The program is carried out in at least three districts namely Gunungkidul, Wonogiri, and Pacitan.

This community building capacity building program is the focus of this research. From the point of view of Civic Education (Civics) the effort is an effort to develop civic virtue within the scope of Ecological citizenship (Ecology citizenship).

PURPOSE OFF RESEARCH

This study aims to describe the program formulated by Walhi Yogyakarta in increasing the capacity of community building in the effort to preserve the karst of sewu mountain.

METHOD OF RESEARCH

The study using interview methods, documentary surgery, using a qualitative approach, which is a research method based on a postpositivism philosophy, used to investigate in the condition of natural objects in which researchers are key instruments, the extraction of data source samples is conducted categorically. The qualitative research emphasized more meaning than generalization [8] Collecting techniques with interviews were conducted with four sources, namely the Yogyakarta walhi director, the avocation division, the walhi program manager and the walhi media division assigned to establish visual communication with the Gunung Sewu community. Interviews were conducted from 5 November to 6 November 2019. Document review was an important part of this research. The document review in question is dissecting the Yogyakarta walhi program documents as primary data and online media reporting as secondary data.

RESULTS AND DISCUSSION

1. The Development of Ecological Citizenship

Damage of the environment is the issue that is attracting a lot of human attention right now. Some natural disasters are subject to serious discussion and are often associated with the deterioration of nature resulting from man's negligence in managing nature. Therefore, governments should be encouraged to form environmental institutions that are concerned about the environment. It is essentially the importance of creating an ecological citizen through personal commitment to learn more about the environment and then being able to take action to preserve, manage and preserve the responsible environment [9]. Citizens are said to be citizens to play a key role in the preservation of the environment. Ecological citizenship becomes essential, that citizens today must have multidimensional characteristics that have an identity; Freedom to exercise certain rights; Relative fulfillments of liabilities; Interest in and involvement in public affairs; And the possession of basic values of civil-society is here one of the concepts of establishing ecological citizens through the role of government, school as well as community [3].

The development of ecological citizenship is a solution, according to Walhi Yogyakarta, bearing in mind that the threat to the natural conservation of the Gunung Sewu karst in the coming years will be even greater. There are a number of factors revealed by the Yogyakarta walhi that pose a serious threat to the conservation of the sewu mountain karst, the first being the construction of JJLS, construction of tourism facilities and mining activities.

2. Programming Karst by Walhi Yogyakarta

Since 2017, Walhi Yogyakarta has been involved in several karst preservation advocates directly to the public. In fact, Walhi Yogyakarta involves several elements of society in an advocacy process. The JMPPS wants to be a source of the official agreement signed by the Jakarta stock exchange here on Wednesday. In 2018, Walhi Yogyakarta began to incorporate karst preservation programs into its annual program. The program is divided into two important parts of the work, the first is a

community advocacy program involving JMPPS and a community-building capacity building program carried out through the assistance of youth groups, farmer groups, and tourism awareness groups in Gunungkidul. The following is a Walhi Yogyakarta programming table that deals with the sewu mountain karst.

Tabel 1. (Karst Preservation Program 2018-2020)

No	Program	Activities	Target	Responsible person
1	Community advocacy	1. The inventory regulation of karst protection in the Sewu mountains 2. The inventory of case 3. The reinforcement of JMPPS	1. Centralized data on environmental violations 2. The reinforcement of organization JMPPS 3. Environmental suit	1. Advocacy department of JMPPS
1	Increased community-building capacity	1. Establishment of an environmental consciousness community 2. Making karst infographics 3. Supporting farmer groups, youth, and youth organizations	1. The existence of a forum that facilitates community learning spaces 2. The existence of an information center that is affordable to the public 3. Intertwined the intensive communication with groups of community	1. Media Department 2. Advocacy Department 3. Anang Saptoto

According to table 1 shows, apart from advocacy, the three programs have become the priority of the country's walhi Yogyakarta in the development of ecological societal forms of sewu. The first is to establish an environmental conscious community, infographic creation karst and fellowshiping of community groups. Some

of the program's trips are explained by hands-on interviews at walhi Yogyakarta's office.

a) The Forming of Environmental Conscious Community

The environmental awareness community involves several elements previously involved in the JMPPS. Automatically more involved in the development of environmental awareness communities is the defense department of walhi Yogyakarta. Himawan Kurniadi as head of the advocacy department explains that organically aware environmental communities are formed in harmony with activities conducted by the previously gained Walhi in Gunungkidul before that. The JMPPS is a central part of the formation of this community, where the JMPPS also include student relations (img) and several student relations that currently help to establish an environmental awareness community in the mountains of sewu, particularly an established guneid region. Until now, only one recognized community was formed, and that was the Watu Kodok community in Gunungkidul.

b) Making Karts Infographics

These infographics are non-digital infographics. Which is a simple mass-produced poster in three districts that became part of karst Sewu mountain, namely, wonogiri and part of the district. Infographic handled directly by Anang Saptoto poster artist. There are some such constraints that infographic posters have not been carried out so far. Data shortages and research that are constantly delayed are key reasons so infographic materials have not been collected fully. Infographic provided by Anang Saptoto where infographics are the spearhead of public awareness development, as recent problems are solved by karst's ignorance and lack of knowledge about the karst itself.

c) Community Group Assistance

The activities of Walhi are directly related to the community, opening communication spaces between Walhi and community groups, namely farmer groups, tourism awareness groups, and cadets. Some community groups that directly networked with Walhi and began discussing karst preservation in the regular program were the Watu Kodok farmer group, the Bandarejo farmer group, Semanu's Karang Taruna and several tourism-aware groups around

the Indrayanti Beach. The group's intervention is particularly effective, because membership material has been established for a long time, though it is, but still has a lot to lose because the focus of the group is divided into another focus that has become the focus of their community.

CONCLUSIONS AND SUGGESTIONS

Ecological citizenship is getting more popular in the world as the issue of global environmental destruction grows. There are several factors that make environmental issues acceptable to society, the first is an internal factor, which is a self-reflection that feels increasingly distant from nature, feels the difference in weather and subjective discomfort. The second one is an external one, which is the external thrust of the campaign by the environmentalists and the objective condition in which an injustice exists, that is, the environmental vandals in the capitalist economy, never get the appropriate punishment for the environmental pathos.

The development of ecological citizenship made by Walhi Yogyakarta is a powerful force that enables people to maintain karst for the viability of the sewu mountain communities in three districts namely Gunungkidul, Wonogiri and part of Bantul. This attempt is all that Walhi does is create a bulwark against an imminent threat. So eventually some of the development efforts were hampered, as the focus of walhi was drained into an advocacy program in keeping with ongoing karst destruction. For encouraging authors by walhi Yogyakarta, other environmental workers in mt. Sewu, to address economic and drought problems with environmentally friendly technology. Scientific findings of the karst as a water reservoir must be borne out by the uplift of enlightened water to be used by the community. He said the country's economic growth target for 2008 was expected to be less than expected.

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Simulation of Integrated Water Resources Management Scenarios in Unda Watershed Using Water Evaluation and Planning (WEAP)

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ABSTRACT

Unda watershed is the second largest watershed in Bali Province which is planned to fulfill water demand in Karangasem and Klungkung regency which are experiencing water crisis. However, there are still various problems in the management of water resources in the Unda watershed. To optimize the use of the water potential in the Unda watershed, it is necessary an integrated water resources management so that the potential of the available water can be sustainable. Integrated water resources management planning is very complex in its implementation because it is multisectoral in nature. To facilitate water resources management planning, it can be done by making a model, one of the models that can be used is Water Evaluation and Planning (WEAP). WEAP is an integrated water resources management model that allows for analysis of various scenarios for changing the supply and demand conditions of a water source. Data needed in this study are primary data in the form of an existing state survey to take assumptions in making models and secondary data in the form of population, irrigated land area, climatology data, discharge data, and Unda GIS maps obtained from relevant agencies. Based on the simulation results from several integrated water resources management scenarios, it can be seen that changes in irrigation efficiency in the Unda watershed can reduce the value of unmet demand which is quite significant, especially in the lack of water in the demand site in the form of irrigation areas, while the scenarios for changing the period of planting for irrigation areas in the watershed Unda does not have a significant effect and the demand site management scenario of 10% on non-agricultural water demand is very significant in reducing water shortages that occur in the Unda watershed. Therefore in the future, it is very necessary to save water which can be done in various ways such as reducing water use, reuse and so forth.

Keywords: Water Balance; Integrated Water Resource Management; Water Evaluation and Planning (WEAP).

INTRODUCTION

Bali Province is one of the provinces in Indonesia which has become a world tourism destination. The development of tourism in the Province of Bali led to an increase in the economic level in the Province of Bali, this also led to an increase in water demand in the Province of Bali for supporting facilities for increasing the economy. In addition to domestic water demand water demand, the use of water in Bali Province is widely used for irrigation purposes.

According to research from the Ministry of Environment [1], Bali Province has experienced a water deficit, during the dry season since 1995 of 1.5 billion m³/ year and continues to increase to 7.5 billion m³/ year in 2000 and is expected to reach 27.6 billion m³/ year in 2015. The water crisis in Bali mostly occurs, especially in areas with minimal rainfall conditions with uneven locations of water sources. One of the areas in Bali Province that is experiencing water crisis is Karangasem and Klungkung Regencies. To overcome the water shortages in the Karangasem and Klungkung areas, the

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provincial government of Bali has planned several water withdrawal facilities from the Unda River Basin.

Even though it has a lot of water sources, many Unda Irrigation Area agricultural land experiences a water crisis, this happens because there are still many subaks that still use channels made of soil which causes water loss that cannot be avoided when water flows in the channel [2].

According to Toban's research [3], Unda watershed functions began to decline, due to various problems in watershed management such as changes in forest conversion, siltation of streams, landslides, erosion and the presence of excavation C give impact to changes in critical land. Unda watershed is one of the critical watersheds that is considered as an urgent target for an integrated watershed management plan.

Based on the use of water and the problems that occur in the Unda watershed, it is deemed necessary to carry out an integrated management of water resources in the Unda watershed so that the potential of available water can be used optimally and sustainably and there is no conflict in water access due to competition in access to water use both for drinking water, domestic water supply, irrigation as well as the tourism industry and other sectors that utilize water from the Unda watershed.

Integrated and sustainable water resources management planning is very complex in its implementation because it is multisectoral in nature. Due to the complexity of water resource planning, it can be helped by the model to facilitate it. One of the software that has been developed with the integrated water resources management approach is WEAP. Water Evaluation and Planning (WEAP) is an Integrated Water Resources Management (IWRM) model that seeks to overcome the gap between water allocation management and watershed hydrological processes. WEAP can also be used as a forecasting tool to simulate scenarios of changes in water demand, water availability, flow rate, water quality, alternative management of water resources and so on that might occur in the future to obtain an optimal management strategy.

This research will examine the effect of integrated water resources management strategies that can be implemented in the Unda watershed through scenario simulations using WEAP on the availability of water in the Unda watershed. The results of the scenario simulation will produce a water balance in the coming year (simulation year) which will show the impact of integrated water resources management strategies carried out on the availability of available water in the future, so that the potential contained in the Unda watershed can be used optimally and sustainably.

MATERIALS AND METHODS

1. Research Location

The Unda River Basin covers 3 regencies with total area of 230.91 km² in Karangasem Regency about 208,092 km², in the Klungkung Regency 11.701 km² and Bangli Regency 11.122 km² [4]. The water potential from the Unda River is mainly used for raw water and fulfilling the irrigation water demand with an area of 4542.3 hectares of agricultural land, which is mostly found in the Karangasem Regency.



Figure 1. Research Location

2. Research Tool and Material

The tool used in data processing in this study is Ms. Excel 2013 and WEAP version 2019.1. While the research material is primary data and secondary data. Primary data in the form of a survey of the existing condition of Unda watershed for assumptions in making models, while secondary data in the form of population, irrigated land area, number of

livestock, climatology data, discharge data, and GIS Unda map obtained from relevant agencies as well as literature studies in determine the factors used in scenario analysis.

3. Model Calibration and Validation

Model calibration is the value for the model parameter selected after the model that is suitable for a particular watershed has been determined. The process of selecting parameters is called a calibration model [5]. Calibration is a repetitive exercise used to establish the parameters that are most suitable in modeling studies. This process is very important because reliable values for some parameters can only be found by calibration [6]. This involves identifying the main model parameters and changing the parameter set. Model validation is the process of showing that a specific site-specific model is able to make accurate predictions. This is done by applying a calibrated model using different data sets without changing parameter values. This model is said to be validated if the accuracy and predictive ability within the validation period have been proven to be within acceptable limits [7].

4. Interpretation of Model Reliability

Model calibration is the value for the model parameter selected after the model that is suitable for a particular watershed has been determined. In determining whether the model is feasible or acceptable, the following table can be used.

Table 1. Nash-Sutcliffe Efficiency (NSE)

Nash-Sutcliffe Efficiency (NSE) Value	Interpretation
NSE > 0.75	Good
0.36 < NSE < 0.75	Satisfactory
NSE < 0.36	Less satisfactory

Sources: Motovilov, et al [8]

5. Scenario

Scenarios are self-consistent story lines about how future systems can develop over time in certain socio- economic environments and under certain sets of policies and technological conditions. Scenarios are developed and then compared to assess water needs, costs, and

environmental impacts. All scenarios inherit data from the current account year. This scenario can answer a variety of questions "what if" a change occurs in the water system.

Table 2. Scenario Variables for Analysis

Scenario	Urban	Rural	Forest	Water
Scenario 1	10%	10%	10%	10%
Scenario 2	20%	20%	20%	20%
Scenario 3	30%	30%	30%	30%

RESULTS AND DISCUSSION

1. General Overview of the Research Location

The Unda River Basin covers 3 regencies, namely Karangasem Regency (208,092 km²), and partly in the Klungkung Regency (11.701 km²) and Bangli Regency (11.122 km²) with a total area of 230.91 km² watershed. Unda watershed is a small watershed because the area is less than 5,000 km². Unda watershed has a type of Perennial river flow, which is a river that has a year-round flow.



Figure 2. Existing Condition of Unda River Basin

2. Water Allocation Model with WEAP

Water allocation model in this research divide the demand sites into two types that is agriculture and non-agriculture. Where for the

agricultural demand site is modeled in accordance with the location of irrigation areas and for non-agriculture is modeled with the location of the sub-district area.



Figure 3. Unda Watershed Water Allocation Scheme

3. Current Account

The initial year of modeling or in WEAP called the current account was chosen in 2012. This is based on the availability of debit data only from 2006-2017. In addition, the trend of increasing population from 2006-2011 is different from 2012-2017 making it difficult for forecasting in the future. The calibration will be carried out in three years, 2012-2014 and one year validation in 2015. The catchment hydrological process is carried out using the rainfall runoff method (soil moisture). This method represents the catchment process with two layers of soil. This method allows the characteristics of land use (land use) to have an impact on the catchment hydrological process which can be used as a calibration parameter of the model.

4. Catchment Data

In this model the Unda watershed will be divided into eight catchments with pour points/outlets at the Unda-Cegeng debit station.

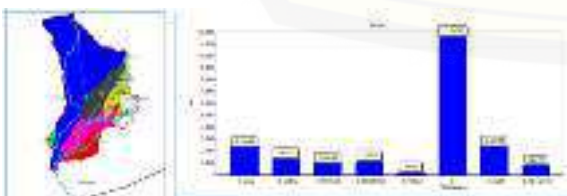


Figure 4. Catchment Area

Because WEAP is a model that combines hydrological processes with water allocation management, it is necessary to input data in the

form of rain data and climate data used in the catchment hydrology process.

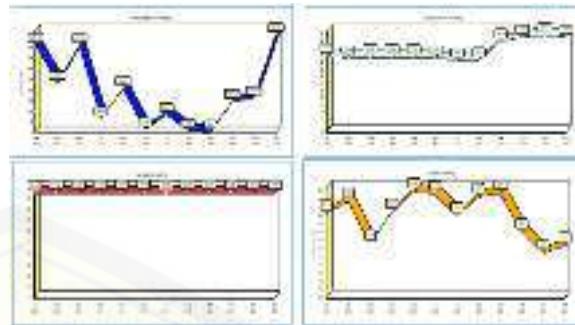


Figure 5. Climate Data of the Catchment

5. Demand Site

In this modeling, the demand site is an irrigation area, domestic, non-domestic and livestock. The demand site point for the irrigation area is assumed based on the location of the weir which is obtained from the map of the Bali-Penida River Basin Regional weir distribution map, then for the domestic, non-domestic demand site and livestock demand points are assumed based on the sub-district that uses the potential of Unda watershed water.

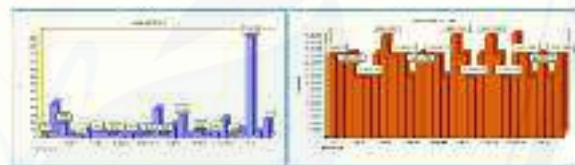


Figure 6. Data Input for Irrigation Areas

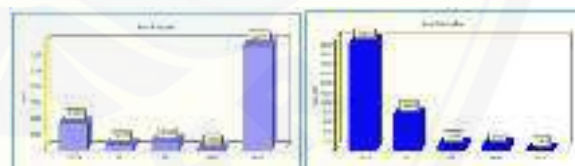


Figure 7. Sub district Demand Site Data Input

6. Calibration and Validation

After conducting trial and error then testing the reliability of the model with the value of R^2 , R, IoA, Nash, and RMSE. Once deemed feasible, the trial and error process is terminated, and the parameter values used are as follows.

Table 3. Parameters Used

PARAMETER	Using Value
Z1 [%]	25
Z2 [%]	65
DWC (Deep Water Capacity) [mm]	900
DC (Deep Conductivity) [mm/month]	75
RRF (Resistance Runoff Factor) [No Unit]	2
RZC (Root Zone Capacity) [mm/month]	75
SWC (Soil Water Capacity) [mm]	900
PFD (Preferred Flow Direction) [No Unit]	0.4 - 0.9

Sources: Analysis Result (2019)

Table 4. Comparison of Observation and Simulation Streamflow (in Cubic Meter per Second)

Year	1	2	3	4	5	6	7	8	9	10	11	12
Observation	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2
Simulation	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2

Sources: Analysis Result (2019)

From the simulation results the value of R at the time of calibration and validation ranged from 0.7-1 showing that the results of the model with the data in the field showed a high correlation. This means that the simulation flow model can approach the field discharge. Then the value of Nash Sutcliffe model Efficiency coefficient at the time of calibration and validation ranges from 0.36 to 0.75 which shows the model is satisfactory. Then from the Index of Agreement at the time of calibration and validation shows a value above 0.8 which indicates a high level of compatibility. From some model reliability tests, it can be concluded that the model is quite feasible and it can be assumed that the model results are close enough to the field conditions and can be continued to be used in scenario simulations.

In addition to the model reliability value, the Mean Bias Error value is also calculated where during the calibration and validation the mean bias error value is still below 0.2, and the negative value indicates that the simulation

model has an average discharge lower than the observation discharge.

Table 5. Model Reliability Value

Calibration	Validation	Application
Efficiency Coefficient (0.75)	Efficiency Coefficient (0.75)	Efficiency Coefficient (0.75)
Index of Agreement (0.85)	Index of Agreement (0.85)	Index of Agreement (0.85)
Mean Bias Error (0.1)	Mean Bias Error (0.1)	Mean Bias Error (0.1)
Nash-Sutcliffe Efficiency (0.75)	Nash-Sutcliffe Efficiency (0.75)	Nash-Sutcliffe Efficiency (0.75)
Root Mean Square Error (0.1)	Root Mean Square Error (0.1)	Root Mean Square Error (0.1)
Standard Error (0.1)	Standard Error (0.1)	Standard Error (0.1)

Sources: Analysis Result (2019)

7. Scenario Simulation

In this study four scenarios will be simulated, namely the reference scenario, which is a simulation in a situation where there is no change in the water system, scenario I is increasing irrigation efficiency, scenario II is changing the period of cropping pattern, assuming an increase in irrigation efficiency and Scenario III, namely the existence of site demand management. 10% assuming an increase in irrigation efficiency and a change in the period of cropping patterns.

a. Reference Scenario

Unmet demand shows the value of water shortages at each demand site (area of water demand). For water shortages in each district from year to year is increasing, where the average water shortage in 2012 was 0.41 million m³ per year and increased to 5.63 million m³ in 2032.

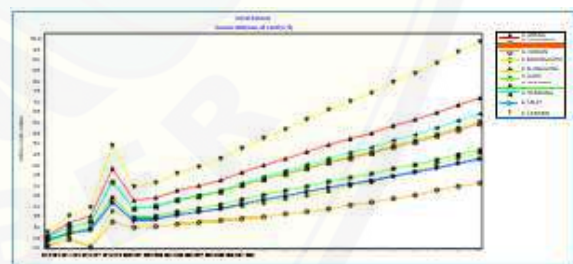


Figure 8. Unmet Demand for each District in 2012-2032

For water shortages per irrigation area tends to increase from year to year, where the average irrigation water shortage in 2012 was 0.19 million m³ per year and increased to 1.38 million m³ in 2032.

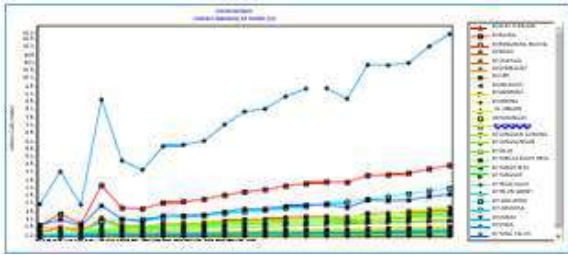


Figure 9. Unmet Demand for each Irrigation Area in 2012-2032

b. Scenario I

With the increase in irrigation efficiency, the average unmet demand value decreased for 20 years by 6.8%.



Figure 10. Comparison of Unmet Demand Reference with Scenario I in 2012-2032

c. Scenario II

With a change in the period of the cropping pattern with the assumption that there has been an increase in irrigation efficiency resulting in a reduction in unmet demand for an average of 20 years by 6.4%.



Figure 11. Comparison of Unmet Demand Reference, Scenario I and Scenario II in 2012-2032

d. Scenario III

With the existence of non-agricultural water savings of 10% with the assumption that there has been an increase in irrigation efficiency and changes in the period of cropping patterns resulting in a reduction in unmet demand for an average of 20 years by 36.2%.



Figure 12. Comparison of Unmet Demand Reference, Scenario I, Scenario II and Scenario III in 2012-2032

8. Effect of Water Resources Management Strategy on Unda Watershed Water Balance

Based on the simulation results of several integrated water resources management scenarios that might be applicable in the Unda River Basin, it can be seen that the changes in irrigation efficiency in the Unda watershed can reduce the value of water shortages (unmet demand) which is quite significant, especially in the water shortages at the demand site in the form irrigation area. This shows that it is very important in the maintenance of irrigation facilities because with the damage to irrigation channels that have an impact on irrigation efficiency, it causes large water losses and causes inadequate water in irrigation areas. For changes in the planting period of the Unda watershed irrigation area has a significant influence at the beginning of the change crop pattern period in 2013 but does not have a significant effect in the future. The existence of water savings of 10% in non-agricultural water needs is very significant in reducing water shortages that occur in the Unda watershed. Therefore in the future, it is very necessary to save water that can be done in various ways such as reducing water use, reuse and so forth.

CONCLUSION

Based on the simulation results of the scenario of water resource management in the Unda watershed can be concluded as follows.

1. The results of calibration and validation of the water allocation model using WEAP for the Unda watershed obtained the value of the Nash Sutcliffe model Efficiency coefficient at the time of calibration and validation in the range of 0.36 - 0.75 which shows the model is

satisfactory and can be concluded that it is feasible enough and it can be assumed that the model results are close enough field conditions and can be continued to be used in scenario simulations.

2. Based on the current account simulation, the result of unmet demand in each district increased from year to year, where the average water shortage in 2012 was 0.41 million m³ per year and increased to 5.63 million m³ in 2032. Whereas for irrigation areas the value of irrigation water shortages increased in 2012 by 0.19 million m³ per year and increased to 1.38 million m³ in 2032.
3. Based on the simulation results of several integrated water resources management scenarios that might be applicable in the Unda River Basin, it can be seen that the changes in irrigation efficiency in the Unda watershed can significantly reduce the value of water shortages (unmet demand), especially on water shortages in demand site in the form of irrigation area while the scenario of changing the planting period of the Unda watershed irrigation area does not have a significant influence in the future and with a water saving scenario of 10% on non-agricultural water needs is very significant in reducing water shortages that occur in the Unda watershed. Therefore in the future, it is very necessary to save water that can be done in various ways such as reducing water use, reuse and so forth.

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Learning Development Model Of Pandhalungan Community Empowerment Program Through Training In Summersari District, Jember City

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ABSTRACT

Researcher obtained a description of the community in Summersari Jember Village had various kinds of empowerment or strengthening. This can be the basis for researchers to develop a learning model which is a series of business training development activities in an urban area based on improving the quality of life of the Pandhalungan family. The objectives of this study are to know (1) the development model of community empowerment learning through training that is currently being implemented, and (2) the supporting and inhibiting factors for the development model of community empowerment learning through effective, valid, and practical training so that it has an impact on empowerment or strengthening the community. Research designed and analysis is use qualitative descriptive. Data collection uses interview, observation, and documentation techniques. documentation. While the stage of analyzing research data used in this study includes the stage before in the field, the phase while in the field, and the conclusion /verification stage of the data. The initial findings of the study show (1) learning development activities through training are carried out using ADDIE design starting from the analysis, design, development, implementation, and evaluation, and (2) supporting factors there is support from the role of government, community participation in implementation of training activities, the existence of good relations between communities, the need, trust, and open in the implementation of learning development models through training. While the inhibiting factor in the implementation of learning development through training in Summersari is the inadequate quantity of human resources.

Keywords: learning, community empowerment, training

INTRODUCTION

Based on the results of previous studies with the title Identification of Learning Needs Based on Socio-Economic and Cultural Conditions in Pandhalungan Community in Jember Regency in 2018, that the Pandhalungan community in Summersari village in economic, social and cultural conditions, especially those who are unable to need skills training programs that can

add experience with the hope that the results of the training can be used as an effort to supplement their income. This can be seen from their enthusiasm when participating in activities organized by the PKK (PESAT Keris Research Report, 2018).

Community empowerment activities are actually efforts to change the pattern of community behavior to improve their ability and independence through four aspects namely, social protection, capacity building, increased accessibility and utilization of local potential.

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Because the community empowerment policy that has been implemented so far is not limited to the concept of adoption of programs and activities, but the most important is to adapt the concept to the community.

Community empowerment, commonly known as community empowerment, is considered as an alternative strategy in development that has developed in a variety of literatures and thoughts, although in reality it has not been maximally implemented. Community development and empowerment is a matter that has been widely discussed by the community because it is related to the progress and change of this nation going forward especially when it is associated with community skills that still greatly inhibit economic growth itself.

At present, an empowerment policy has been developed in the fields of social and economic protection, capacity building, and utilization of local potential. In the field of social and economic protection, community empowerment policies must be directed at tackling natural disasters, people with social welfare problems and assistance to the poor, including the establishment of BUMDes and the development of rural areas.

While in the area of capacity building, community empowerment policies must address the problems of the resources of the village government apparatus and BPD, health, education, welfare and supporting infrastructure issues. For the area of increasing accessibility, it must be directed to provide access to resources, access to technology and access to finance. Furthermore, in the field of exploiting local potentials, community empowerment must be able to provide a set of appropriate technologies in line with local potentials, the provision of markets for the creation of community economic activities as well as the infrastructure management group facilities. Mardikanto (2014) explained that community empowerment activities are efforts to provide empowerment or strengthening to the community.

Community empowerment is also defined as the ability of individuals who are united with the community to build the empowerment of the community concerned so that it aims to find new alternatives in community development. So it can be formulated that the Pandhalunga community needs a training development program in community empowerment which is

one of the poverty reduction activities that is quite effective in accelerating community empowerment efforts through human resource capacity building and collective behavior change in government officials and community groups at the village level. To be able to improve the economic resilience of the Summersari village community, creating a empowered community that has superior quality and plays a role as the main actor in development, education and training is certainly the main key in it. The design of a model for developing community empowerment through this training is expected to be able to provide a high contribution to increasing the empowerment and welfare of the Pandhalungan community in the Summersari district Jember district

Based on the background that has been described, raised the problem as follows (a) What are the stages of the learning development model of community empowerment programs through training conducted in Summersari sub-district, Summersari sub-district, Jember district, and (b) What are the supporting and inhibiting factors in the learning development model of community empowerment programs through training conducted in Summersari sub-district, Summersari sub-district, Jember district?

MATERIALS AND METHODS

1. Matrials

1) Learning Development

Learning is a system that has integrated components. The components that compile a learning can be in the form of instructors, students, materials, learning activities, delivery systems, and learning environment and performance. Each component interacts with each other and works together to achieve the desired learning goals. Changes in one component can affect other components and certainly learning outcomes.

Development of learning as a common sense planning to identify learning problems and seek to solve these problems by using a plan for the implementation, evaluation, testing, feedback, and results. Learning development as a systematic way to identify, develop, and evaluate a set of learning materials and strategies with the aim of achieving certain goals.

Severa learning development models that have been known in the development of learning are (a) ASSURE Model, (b) ADDIE Model, (c) Jerold E. Camp Model, et al, (d) Dick & Carey Model, (e) IDI Model, (f) Gerlach & Ely model, and (g) Bela H. Banaty Model.

From these models, the ADDIE model was chosen and appropriate in answering the research problem. ADDIE model is an easy-to-apply model in which the process used is systematic with a clear framework producing effective, creative, and efficient products (Angel Learning in Siwardani, 2015). ADDIE model is a design / learning model that can facilitate students in developing scientific processes, is cooperative, flexible, adapts to structure and implementation. The ADDIE model can improve critical thinking skills because the learning steps / syntax that is owned by this model is in accordance with indicators of critical thinking skills that are formulating problems, conducting induction, evaluating, and deciding. The activity formulating the problem is carried out in the analyze step, where in this step students first analyze the problem through the identification of problems that are contextual in nature.

Then transform in the form of problem formulation and make a hypothesis as a temporary answer. Induction activity is carried out by students to design problem solving in the form of scientific activities in the form of experiments and discussions and develop the design based on relevant information obtained both in the selection of tools, materials, data collection techniques, and data analysis. Deciding activities are carried out when students implement a design that has been developed in the form of discussions and conclusions related to experiments that have been carried out as a form of lab inquiry. Evaluation activities are carried out at the end of the activity where students evaluate (evaluate) theories and facts based on the results of the activities.

This research belongs to the type of development research (R&D) with the ADDIE model (Analysis, Design, Development, Implementation and Evaluating) but is limited to the Implementation stage (Mulyatiningsih: 2012). Because in this research development only assesses the appropriateness of the product being developed, not to assess the effectiveness of the product.

2) Pandhalungan Community Empowerment

Community empowerment is a development process in which the community takes the initiative to start the process of social activities to improve the situation and condition of oneself [1]. Community empowerment can only occur if the community itself participates. An effort can only be successfully assessed as "community empowerment" if the community group or community becomes an agent of development or also known as the subject. Here the subject is a driving force, and not just beneficiaries or objects.

Community empowerment has been described by Payne (in Adi, 2012) that community empowerment is intended to help clients gain the power to make decisions and determine the actions that he will take related to themselves, including reducing the effects of personal and social barriers. In addition, the meaning of empowerment is seen as an effort to enable individuals or communities. Where the granting of authority or power aims to make the community become independent. In terms of language empowerment comes from the word "power" which means strength or ability to do business. Anwas (2013) states that empowerment is a concept related to power.

Theoretically, the East Java region can be divided into 10 cultural regions, namely Java Mataraman, Panaragan Java, Arek, Samin (Sedulur Sikep), Tengger, Osing (Using), Pandalungan, Madura Island, Madura Bawean, and Madura Kangean (Sutarto and Sudikan, 2004). Pandalungan communities are scattered in the areas of Pasuruan, Probolinggo, Lumajang, Jember, and Bondowoso, while the Madurese live in Madura Island and surrounding islands. Pandalungan is an identity that is likened to a 'big pot' where the gathering of various ethnicities and cultures. This understanding is the same as the concept of the United States-style melting pot which is used as a formula for regions with cultural diversity.

3) Training

Training is an effort to improve the quality of human resources. Training helps employees understand a practical knowledge and its application, in order to improve the skills, skills and attitudes needed by the organization in an

effort to achieve goals. Training is the process of systematically changing employee behavior to achieve organizational goals. Training deals with the expertise and ability of employees to carry out current work. Training has a current orientation and helps employees to achieve certain skills and abilities in order to succeed in carrying out their work (Rivai, 2013: 213).

According to Pu Pratama (2011: 753) The aim of the training is to improve the technical, theoretical, conceptual and moral abilities of employees so that later employees are able to achieve optimal work results so that employees are eager to work at the company. ability and skills in accordance with their area of duty. Training for employees is one of the most important investments made by an organization in smoothing the course of development activities. According to Kaswana (2011: 2), the purpose of the training is to provide adequate skills, knowledge, and attitudes in order to effectively run the wheel of life and the needs in developing human resources in the organization. Benefits and Impacts The training is intended to improve the mastery of various skills and specific work implementation techniques, in detail and routine. Each activity must have the intended direction, both short term and long term. The intended direction is a plan that is stated as the result achieved. The expected benefits and impacts of the training must be clearly formulated, not ignoring the ability and capability of the agency.

According to Hasibuan, (2010: 75), factors affecting training included participants, trainers / instructors, training facilities, curriculum, and training funds. Training indicators according to Melmambessy Moses (2011: 69), including (1) Type of Training, (2) training material, and (3) training time. Type of Training is the type of training provided to employees according to organizational needs, funds which is budgeted in the time available. The training material is always related to the type of training that is followed. And training time.

2. Methods

This research was designed with a qualitative descriptive research design. Data collection uses interview, observation, and documentation techniques. Data collected using descriptive qualitative analysis. documentation. While the

stage of analyzing research data used in this study includes the stage before in the field, the phase while in the field, and the conclusion / verification stage of the data.

RESULTS AND DISCUSSION

1. Preliminary Analysis of the Stages of Community Empowerment Learning Development Through Training conducted by Summersari Village, Summersari District, Jember Regency

The development model offered in community empowerment through training, is based on field findings and theoretical studies relating to the training process. Based on field studies, the main weakness in training is the absence of problem analysis methods and training needs, in preparing training plans and follow-up of training, there has been no involvement of business actors that functioned as technical informants from the planning, implementation, and evaluation stages of activities, so that the learning community unable to develop the skills possessed by entrepreneurship independently there is no real follow-up.

The development model used in the development of learning through this training is ADDIE. This model is one of the systematic learning design models. The selection of this model is based on the consideration that this model is developed systematically and rests on the theoretical foundation of training design. This model is programmed in a systematic sequence of activities in an effort to solve learning problems related to meeting the needs of life.



Figure 1. Model program in a systematic sequence of activities

The offer of this model is oriented towards perfecting the model that has been carried out so far as has been explained above, with modifications starting from analyzing, designing, developing, implementing and evaluating training activities from mentoring management, marketing, and extracting government assistance activities. It is possible for the mastery of life skills to be provided in accordance with the training participants' abilities and opportunities to be developed. Thus the independence of the training participants to develop life skills that have been mastered become a hope for the training organizers, because this is one of the markers of the success of life skills training conducted. Based on the diagram it can be stated that community empowerment through training with a variety of training such as making clutch bags and ornamental corn skin is directed at the stages that exist in the method so that the formation of entrepreneurial character of trainees is characterized by real activities in the form of business development and at the same time marketing business results. The formation of entrepreneurial character through training follows the main activity flow as follows:



Figure 2. ADDIE Model

a) Analysis.

The design phase of the analysis focuses on the target audience. At the analysis stage, defining instructional problems, instructional goals, learning objectives and identifying the

learning environment and knowledge possessed by learning citizens are adjusted to their learning needs.

b) Design

The design phase is related to goal setting, assessment instruments, exercises, content, and analysis related to learning material, learning plans and media selection. The design phase is carried out systematically and specifically.

c) Development

In developing the development, the creation and incorporation of content that has been designed at the design stage. In this phase, storyboarding, content writing and graphic design are required.

d) Implementation

In this phase, procedures are made for the training of the trainees and the instructor / facilitator. Training for facilitators includes curriculum materials, expected learning outcomes, delivery methods and testing procedures. Other activities that must be carried out in this phase include the duplication and distribution of other supporting materials and materials, as well as preparation for technical problems and discussing alternative plans with students.

e) Evaluation

Each stage of the ADDIE process involves formative evaluation. This is multidimensional and an important component of the ADDIE process. This assumes formative evaluation form in the development stage. Evaluation is carried out during the implementation phase with the help of instructors and students. After the learning process is completed, a summative evaluation is carried out to improve learning. The designer of all stages of evaluation must ascertain whether the problems relevant to the training program are resolved and whether the desired objectives are met.

2. Analysis of Supporting Factors and Obstacles to Development of Community Empowerment Learning Through Training conducted by Summersari Village, Summersari District, Jember Regency

Answering the second problem formulation are the supporting and inhibiting factors, while the factors that are supporting and inhibiting the learning development model of community empowerment activities through training programs in the village of Summersari, Jember Regency, as follows:

a) Supporting Factors

Supporting factors are the factors needed in an empowerment process, these supporting factors are needed to support the smooth and successful empowerment of women.

- (1) The Government, the Office of Education in particular as a facilitator for training participants in providing motivation.
- (2) The government provides training and counseling on capital, administration and bookkeeping through a training program participated by batik artisans.
- (3) Training by sending delegations for comparative studies to other regions, in order to improve the quality of human resources both to the craftsmen themselves and products.
- (4) The existence of promotional facilities by the Ministry of Industry and Trade, motive updates, and cooperation.
- (5) The active participation of craftsmen to participate in exhibition events to promote their products so that they can expand their market share.
- (6) There is a good relationship between members, a sense of togetherness, mutual need, trust, and openness.

b) Inhibiting factors

There are also several obstacles experienced in the development of learning models through this ministry, one of the efforts to empower the Summersari village community. This obstacle is especially in the inadequate quantity of human resources. Residents learning as trainees lack initial skills in training such as not understanding the importance of utilizing corn husk which turns out to have uses in improving quality of life. There are indeed some learning people who can use or have skills in processing utilizing corn husk well but cannot see the potential market using social media. In fact, social media has become one of the strategic media to promote the

results of skills and conduct online trading transactions.

The entrepreneurship spirit that is still low also impedes the development of the results of the training. Plus their position as parents or grandparents who every day take care of children and families, they do not have much time to practice operating social media. The promotion and marketing of products carried out so far is mostly spread by word of mouth and business cards, while the internet is actually done but not yet maximized. Another obstacle is the development of motifs in making crafts.

CONCLUSION

Conclusions from these results are as follows (1) learning development activities through training are carried out using ADDIE design starting from analysis, design, development, implementation, and evaluation, and (2) supporting factors for the development of learning through training are the support of the role of government, community participation in the implementation of training activities, the existence of good relations between communities, the need, trust, and openness in the implementation of learning development models through training. While the inhibiting factor in the implementation of learning development through training in Summersari is the inadequate quantity of human resources.

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