

# Assessing Individual Fitness for Research and Development Position using Fuzzy AHP and Pareto: Case Study in Manufacturing Industry

I Made Ronyastra<sup>a</sup>, Evy Herowati<sup>b</sup>, Rahman Dwi Wahyudi, Joniarto Parung<sup>c</sup>  
and Christanto Henadi

*Industrial Engineering Department, Universitas Surabaya, Surabaya, Indonesia*

**Keywords:** MCDM, Fuzzy AHP, Pareto, Research and Development, Assessment Model.

**Abstract:** Research and development function play significant role in the success of company's venture and this function has a strict set of recruitment criteria to ensure company can find a good candidate among applicants. The strict recruitment criteria can be time and money consuming while still prone to wrong recruitment which can lead to a high turnover for the company. To help companies in selecting competent candidates for the workforce, there is a potential workforce self-assessment model made for industrial engineering students or graduates. The assessment model is created in advance by identifying the criteria for research and development job positions required by the manufacturing industry. The criteria that have been identified are grouped based on categories and based on the same understanding. Furthermore, Pareto 80/20 method is used to find out the most influential criteria and Fuzzy Analytical Hierarchy Process (FAHP) method is using expert considerations whose consistency was tested using the Analytical Hierarchy Process (AHP) consistency test. The expert used in this research is a professional from a manufacturing company in Indonesia. The research identified 5 objective criteria where analytical capabilities has the most weight and 4 subjective criteria where problem solving skill has the most weight, to be considered. The model provides fitness in terms of suitability percentage for the R&D job.

## 1 INTRODUCTION

Research and development (R&D) function in a business organization plays significant role in the success of the company's venture especially due to the radical changes that happened since 1990s in terms of competitive environment (Chiesa et al., 2009). Rapid advancement in technology, shortened product life cycle, and intensified competition have led R&D to another challenge so that they could come up with products or services innovations that will satisfy the always changing customer needs. Hence, R&D job is a suitable role for creative persons with purpose of crafting solutions to problems in the market and offered it better than the competitors do. To be a good R&D person, one must have sound knowledge regarding market trends and the technical area.

Based on the Industrial Engineering Body of Knowledge, Industrial Engineers (IE) are also taught with knowledge that match with the R&D job role. The engineers must take ergonomic and human factors courses, and product design and development courses which covers the topic of developing new product or service. Aside from the technical aspect, IE also equipped with knowledge regarding the economic aspects of projects in engineering economic courses. IE are also taught to become a problem solver where they should be able to find solution for problems. Thus, IE graduates can be potential candidates to take the R&D jobs. However, the scope of IE is quite wide which implies that not every IE can become a successful R&D person.

It is necessary to construct a model to assess IE fitness with the R&D role so that the IE can check whether they are suitable for the role. If they are not suitable, then they should be encouraged to apply for

<sup>a</sup> <https://orcid.org/0000-0002-6118-6094>

<sup>b</sup> <https://orcid.org/0000-0002-9653-604X>

<sup>c</sup> <https://orcid.org/0000-0002-3866-8132>

other function or role and vice versa, so it would improve the probability of being hired by companies. From the company's point of view, employee recruitment is often a time consuming and costly process that they must conduct to find the best candidates so it would help companies when the candidates can pre-screen themselves prior to applying. The competition among companies in finding the best talent are getting fiercer for it may lead to operational excellence (Oshri & Ravishankar, 2014). There are multiple criteria used by companies or human resources department to select the best candidates among applicants. Thus, the selection process can be considered as a multiple criteria decision problem. This research aimed to construct an assessment model to measure candidates' fitness for R&D job by considering the multiple criteria decision problem. The criteria were derived from secondary data analysis where selection criteria were collected from various R&D job advertisements. To assign the weight for each criterion, an expert in the field was asked to give judgement using Fuzzy AHP method. The result can be used to develop a talent pool management especially for companies focusing on R&D function.

## 2 LITERATURE REVIEW

Talent pool management is part of talent management which in its application can have a positive impact on individuals and organizations. Talent pool is a collection of individuals with high potential and performance that an organization can take advantage of in filling important positions (Collings & Mellahi, 2009). Talent pool is a group of individuals with broad abilities at a certain level who are considered eligible to fill positions at a higher level. It can be concluded that talent pool management is the process of identifying a group of talented individuals who have superior performance and quality than other individuals. The process of putting an employee into the talent pool usually involving multiple criteria. Thus, the techniques of multi criteria decision making are often used in the process.

Multi Criteria Decision Making (MCDM) is used in solving a problem that has both objective and subjective criteria that are contradictory and not commensurate. Multi Criteria Decision Making (MCDM) is a set of methods that deals with evaluating a series of alternatives that are many, often contradictory, and have various criteria (Mulliner et al., 2016). In its use, MCDM is divided into Multi Objective Decision Making (MODM) and Multi

Attribute Decision Making (MADM). MODM is a decision-making method by designing a decision alternative by taking many criteria as a basis, while MADM is a decision-making method by selecting the best alternative which uses many criteria as a basis. Some popular techniques in MADM includes Analytical Hierarchy Process (AHP), Weighted Product Model (WPM) / Weighted Product Method (WP), Fuzzy Analytical Hierarchy Process (FAHP).

In dealing with too many criteria, it is necessary to reduce the number of criteria for further analysis. The Pareto principles can be applied in the reduction process. The Pareto diagram is a bar chart combined with a line diagram to show the causes or dominant factors of several causes of a problem. The use of the Pareto diagram aims to evaluate the things that are the dominant factors in the occurrence of a specific problem based on the impact or frequency of occurrence (Hashemi et al., 2021).

Analytical Hierarchy Process (AHP) is a decision-making technique in MCDM developed by Thomas L. Saaty. The AHP decision-making model describes a complex multi-factor or multi-criteria problem into a hierarchy (Chen & Dai, 2021). In the AHP hierarchy there is a multi-level structure where the first level is the goal, the next level is the criteria, and the last level is the alternative. With a hierarchy, complex and multifactorial problems can be divided into groups arranged in a hierarchical form so that problems become structured and systematic. The AHP are then further developed into Fuzzy Analytical Hierarchy Process (Fuzzy AHP) to solve fuzzy uncertainty problems in AHP (Coffey & Claudio, 2021). The main task of the AHP fuzzy method is to decide the relative importance of each pair of factors in the same hierarchy. In its use, fuzzy has a scale of importance conversion as follows (Büyükoçkan et al., 2008):

Table 1: Fuzzy conversion scale.

Linguistic Scale for Importance Level	<i>Triangular fuzzy scale</i>	<i>Triangular fuzzy reciprocal scale</i>
Equally Important	(1/2, 1, 3/2)	(2/3, 1, 2)
Slightly more important	(1, 3/2, 2)	(1/2, 2/3, 1)
More Important	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
Highly more important	(2, 5/2, 3)	(1/3, 2/5, 1/2)
Extremely more important	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)

There are several steps in using *fuzzy* AHP as followings:

1. Calculating fuzzy synthetic values, define as:

$$S_i = \sum_{j=1}^m M_{gi}^j \left[ \sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1}$$

To get the value of  $\sum_{j=1}^m M_{gi}^j$ , conduct the fuzzy summation for the value of area analysis  $m$  for a certain matrix as:

$$\sum_{j=1}^m M_{gi}^j = \left( \sum_{j=1}^m l_j, \sum_{j=1}^m m_j, \sum_{j=1}^m u_j \right)$$

To find  $\left[ \sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1}$ , conduct the fuzzy summation from the values of  $M_{gi}^j$  ( $j = 1, 2, \dots, m$ ) so then

$$\sum_{i=1}^n \sum_{j=1}^m M_{gi}^j = \left( \sum_{i=1}^n l_i, \sum_{i=1}^n m_i, \sum_{i=1}^n u_i \right)$$

And then conduct the vector inverse which will results:

$$\left[ \sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1} = \left( \frac{1}{\sum_{i=1}^n u_i}, \frac{1}{\sum_{i=1}^n m_i}, \frac{1}{\sum_{i=1}^n l_i} \right)$$

2. Calculating the *degree of possibility* of  $M_2 \geq M_1$ :

$$V(M_2 \geq M_1) = \sup_{y \geq x} [\min(\mu_{M_1}(x), \mu_{M_2}(y))]$$

Since  $M_1 = (l_1, m_1, u_1)$  and  $M_2 = (l_2, m_2, u_2)$  are convex fuzzy numbers, then:

$$V(M_2 \geq M_1) = \begin{cases} 1, & m_2 \geq m_1 \\ 0, & l_1 \geq u_2 \\ \frac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)}, & \text{otherwise} \end{cases}$$

3. *Degree of possibility* for a convex fuzzy number greater than  $k$  convex fuzzy numbers  $M_i$  ( $i = 1, 2, \dots, k$ ) can be defined as:

$$\begin{aligned} V(M \geq M_1, M_2, \dots, M_k) \\ = V[(M \geq M_1) \text{ dan } M \geq M_2 \text{ dan } \dots \text{ dan } (M \geq M_k)] \\ = \min V(M \geq M_i), i = 1, 2, 3, \dots, k \end{aligned}$$

To assign weight vector mentioned as:

$$W' = (d'(A_1), d(A_2), \dots, d'(A_n))^T$$

Where  $A_i$  ( $i = 1, 2, \dots, n$ ) are elements of  $n$

4. Normalize the vector weights

$$W = (d(A_1), d(A_2), \dots, d(A_n))^T$$

With  $W$  is not a fuzzy number.

### 3 METHODS

The first step in the research is to collect the criteria for research and development job positions obtained

from the job vacancy website. The criteria obtained are grouped into three categories of criteria, namely objective criteria, subjective criteria, and absolute criteria. To determine the most influential criteria from each category of criteria, the criteria were reduced using the Pareto 80/20 method. The criteria that have been determined are then assessed for the level of importance by professionals in the field of research and development and the data for the level of importance was also tested for consistency using the Analytical Hierarchy Process (AHP) consistency test before calculating the weight using the Fuzzy Analytical Hierarchy Process (FAHP). The weights that have been obtained for each criterion will be used as the basis for the suitability assessment system. The scoring system was created using the spreadsheet application in which there are questions that must be answered by the respondent to calculate the percentage of fitness for the R&D position.

## 4 RESULTS AND DISCUSSION

### Criteria Grouping.

The criteria obtained are 64 criteria, then the criteria are grouped into 3 categories, namely objective, subjective, and absolute criteria. The results of grouping obtained the objective criteria group consisting of 21 criteria, the subjective criteria group 19 criteria. In each group, the criteria are re-grouped based on the similarity of the understanding they have so that the objective and subjective criteria groups each become 8 criteria.

### Pareto Chart.

The criteria data have been grouped and will be reduced using the Pareto 80/20 diagram to determine the most influential criteria. The number of objective criteria is reduced to 5 criteria, namely education level, work experience, ability to analyse, ability to do research, and ability to plan as shown in Figure 1. The left y-axis is the frequency while the right side of y-axis is indicating the percentage.

The subjective criteria were reduced to 4 criteria namely interpersonal skills, mastery of software, ability to solve problems, the ability to speak spoken and written English as shown in Figure 2.

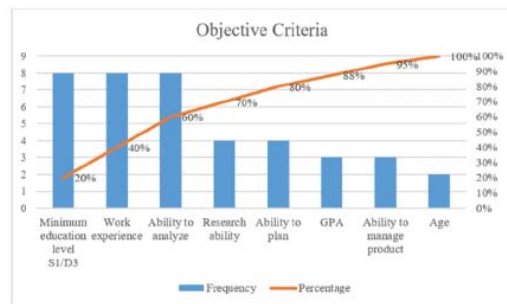


Figure 1: Pareto diagram for objective criteria.

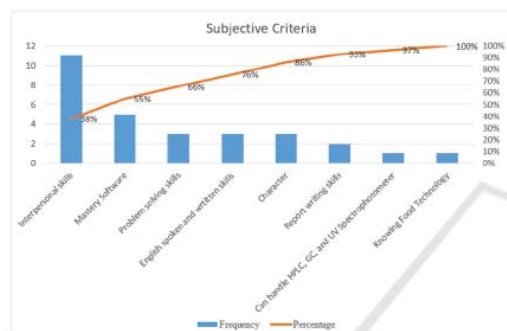


Figure 2: Pareto diagram for subjective criteria.

### Analytical Hierarchy Process (AHP) Consistency Test.

The reduced criteria are assessed in advance for the level of importance by an expert who is a professional research and development practitioner in PT. Mandom Indonesia. The data on the level of importance of the criteria obtained through the questionnaire was subjected to a consistency test before being used in calculating the weight of the criteria. The results of the consistency test showed that the level of importance of the data was consistent with the consistency ratio value of the objective criteria was 0.07 and the consistency ratio value for subjective criteria was 0.07 which still below the 0.1 threshold value.

### Fuzzy Analytical Hierarchy Process (FAHP).

To determine the weight of the criteria based on the level of importance of the criteria, the FAHP method is used. The criterion level of importance data will be converted using the previous Fuzzy conversion scale before the calculation is carried out. Calculations using the FAHP are carried out to assign weight of each criterion. Table 2 and Table 3 summarize the weights for objective and subjective criteria respectively.

Table 2: Objective criteria weights.

Objective Criteria	Weight
Education level	0,07
Experience length	0,12
Analytical capabilities	0,32
Research capabilities	0,27
Planning capabilities	0,22

Table 3: Subjective criteria weights.

Subj ective Criteria	Weight
Interpersonal skill	0,32
Software mastery	0,03
Problem solving skill	0,47
Eng lish language skill	0,18

### Scoring System.

The known weights become the basis of the system for calculating the value of conformity. Each group of criteria has sub criteria, in the scoring system each sub criterion is represented by one question that must be answered according to the answer choices given. Each answer has its own value, which later the scores of each sub-criterion question will be averaged and become the value of the criteria group. The value of each group of criteria are then multiplied by the weight that has been determined and then the total value for the categories of objective and subjective criteria is sought. The total values of the objective and subjective criteria categories are averaged to find the percentage value of the respondent's fitness with the R&D job position for PT. Mandom Indonesia. The scoring system details are listed in Table 4 (objective criteria) and Table 5 (subjective criteria).

The scoring system was created using the Microsoft Excel application and contains an initial section containing personal data, a content section containing questions, and the final section containing the percentage value of matches. Questions in the content section are answered by selecting the answers provided in the dropdown list. An example of filled application is shown in Figure 3.

## 5 CONCLUSIONS

In this study, the criteria were obtained from the website for job vacancies from 8 manufacturing industry companies with a total of 64 criteria. The criteria that have been collected are grouped based on categories and understanding, so that the objective and subjective criteria groups each amount to 8 groups of criteria. After grouping, the criteria were reduced so that the objective criteria became 5 criteria

Table 4: Objective criteria scoring system.

Criteria Group	Criteria	Score	Weight
Education Level	Bachelor of Industrial Engineering	100	0,07
	Bachelor of Chemical Engineering	100	
	Bachelor of Mechanical Engineering	100	
	Other Bachelor of Engineering	100	
	Bachelor of Food Technology	100	
	Bachelor of Management	100	
	Bachelor of Statistics	100	
	Bachelor of Bio Technology	100	
	Bachelor of Pharmaceuticals	100	
	Other Bachelor Degree	100	
	Diploma in Industrial Engineering	0	
	Diploma in Design	0	
Work Experience	Fresh Graduate	25	0,12
	Experience 1 year	50	
	Experience 2 years	75	
	Experience $\geq 3$ years	100	
Analytical Capabilities	Data Analytics: Grade in Operational Research Course	A= 100, AB= 80, B = 60, BC = 40, C = 20, D-E = 0	0,32
	Market and trend analysis: grade in Marketing Management Course		
	Numerical Interpretation: grade in Optimization Mathematics		
Research Capabilities	Research and experiment: grade in Physical Practicum	A= 100, AB= 80, B = 60, BC = 40, C = 20, D-E = 0	0,27
	Creating research budget: grade in Cost Analysis		
	Research Methods: Grade in Industrial Statistics 2		
Planning Capabilities	Priorities setting: Grade in Production Planning and Control Course	A= 100, AB= 80, B = 60, BC = 40, C = 20, D-E = 0	0,22
	Effective planning : Grade in Production Planning and Control Course		
	Project Management: Grade in Industrial Planning Course		

Table 5: Subjective criteria scoring system.

Criteria Group	Criteria	Score	Weight
Interpersonal Skill	Ability to work with target and under pressure	1 = 0, 2 = 25, 3 = 50, 4 = 75, 5 = 100	0,32
	Ability to cooperate in teamwork		
	Innovative and Creative		
	Logical thinking		
	Energetic		
	Meticulous		
	Initiative		
Software mastery	SPSS	1 = 0, 2 = 25, 3 = 50, 4 = 75, 5 = 100	0,03
	Ms. Project		
	Ms. Office		
Problem Solving Skill	Brainstorming	1 = 0, 2 = 25, 3 = 50, 4 = 75, 5 = 100	0,47
	Working problems with target		
	Ability to create solution		
Language skill	Verbal and Written English Language Skill	1 = 0, 2 = 25, 3 = 50, 4 = 75, 5 = 100	0,18

Assessment of the Conformity Level of Industrial Engineering Students at the University of Surabaya with Research and Development Criteria for PT. Mandom Indonesia Tbk.		
Name	(unknown)	
Gender	Woman	
Place/Date of birth	Pala / 25 December 1999	
Age	21	
Address	(unknown)	
Education Level	Bachelor of Industrial Engineering	
GPA	3.3	
Work Experience	0	
		Year
<b>Knowledge of Fast Moving Consumer Goods (FMCG)</b>		
Do you know about FMCG?	Yes	
Description: Fast Moving Consumer Goods (FMCG) is a type of consumer goods that moves very quickly		
<b>Analysing Ability</b>		
The grade of your <i>Penelitian Operasional 2</i> subjects	C	
The grade of your <i>Manajemen Pemasaran</i> subjects	AB	
The grade of your <i>Matematika Operasional</i> subjects	C	
<b>Ability to Do Research</b>		
The grade of your <i>Praktikum Fisika</i> subjects	AB	
The grade of your <i>Analisa Biaya</i> subjects	C	
The grade of your <i>Statistika Industri II</i> subjects	B	
<b>Planning Ability</b>		
The grade of your <i>Perencanaan dan Pengendalian Produksi (PPC)</i> subjects	A	
The grade of your <i>Perencanaan Industri</i> subjects	A	
<b>Interpersonal Skill</b>		
Are you able to work under pressure and targets	(3) Quite Competent	
Are you able to work together in groups	(4) Competent	
How Innovative and Creative you are	(2) Little Creative	
How good the logic of thinking you have	(4) Competent	
How energetic you are	(5) Very Energetic	
How detailed you are	(3) Quite Detailed	
How self-initiated you are	(3) Quite Initiated	
<b>Operation of Software</b>		
How good do you operate the SPSS software	(2) Little Competent	
How well do you operate the Microsoft Project software	(2) Little Competent	
How well do you operate the Microsoft Office software	(4) Competent	
<b>Problem Solving Ability</b>		
How capable you are in brainstorm	(3) Quite Competent	
How capable you are to solve the problem with the target	(4) Competent	
How capable you solve the problem	(4) Competent	
<b>English ability</b>		
How good you are in spoken and written English	(3) Quite Competent	
The value of your suitability between your potential and the criteria for the research and development job position at P.T. Mandom Indonesia Tbk:		
60%		

Figure 3: Scoring system interface.



groups and the subjective criteria became 4 criteria groups. Each criterion is weighted using the FAHP based on the level of importance data obtained from professionals of PT. Mandom Indonesia which has been tested for consistency. The weights of the criteria are used as the basis for making the scoring system. The assessment system was built in the form of a questionnaire using the Microsoft Excel application. When fully filled, the system can compute the fitness percentage for a candidate with R&D Job position.

Since R&D is only one of many functions in a company, this research can be further improved by exploring the other functions as well such as marketing, finance, production, and others. Furthermore, once the models for the other functions are developed, a complex talent pool selection can be developed as well to group the employees based on their suitability for each function.

## ACKNOWLEDGEMENT

This research is fully funded by the Directorate of Higher Education in Ministry of Education, Culture, Research, and Technology Republic of Indonesia under contract number: 005/SP-Lit/LPPM-01/RistekBRIN/Multi/FT/III/2021.

## REFERENCES

- Büyüközkan, G., Feyzioğlu, O., & Nebol, E. (2008). Selection of the strategic alliance partner in logistics value chain. *International Journal of Production Economics*, 113(1), 148–158. <https://doi.org/10.1016/j.ijpe.2007.01.016>
- Chen, Z. Y., & Dai, Z. H. (2021). Application of group decision-making AHP of confidence index and cloud model for rock slope stability evaluation. *Computers and Geosciences*, 155. <https://doi.org/10.1016/j.cageo.2021.104836>
- Chiesa, V., Frattini, F., Lazzarotti, V., & Manzini, R. (2009). Performance measurement of research and development activities. *European Journal of Innovation Management*, 12(1), 25–61. <https://doi.org/10.1108/14601060910928166>
- Coffey, L., & Claudio, D. (2021). In defense of group fuzzy AHP: A comparison of group fuzzy AHP and group AHP with confidence intervals. *Expert Systems with Applications*, 178. <https://doi.org/10.1016/j.eswa.2021.114970>
- Collings, D. G., & Mellahi, K. (2009). Strategic talent management: A review and research agenda. *Human Resource Management Review*, 19(4), 304–313. <https://doi.org/10.1016/j.hrmr.2009.04.001>
- Hashemi, A., Bagher Dowlatshahi, M., & Nezamabadi-pour, H. (2021). A pareto-based ensemble of feature selection algorithms. *Expert Systems with Applications*, 180. <https://doi.org/10.1016/j.eswa.2021.115130>
- Mulliner, E., Malys, N., & Maliene, V. (2016). Comparative analysis of MCDM methods for the assessment of sustainable housing affordability. *Omega (United Kingdom)*, 59, 146–156. <https://doi.org/10.1016/j.omega.2015.05.013>
- Oshri, I., & Ravishankar, M. N. (2014). Industry insight: On the attractiveness of the UK for outsourcing services. *Strategic Outsourcing*, 7(1), 18–46. <https://doi.org/10.1108/SO-11-2013-0022>



Samarinda, Indonesia October 23-24, 2021

# The 4th

International Conference on Applied Science and  
Technology on Engineering Science 2021  
(ICAST-ES 2021)

Developing innovation and  
green technology to  
sustain the economic and  
social life in new normal.

## Virtual Conference

Due to covid-19 outbreak,  
all activities related to  
this conference are going to be  
conducted virtually



### Keynote Speakers

Prof. Dr. Arshad Ahmad

Director of Education and  
Training Engineering  
University Technology Malaysia

Prof. Peter Sheehan

Murdoch University  
MURDOCH AUSTRALIA

### Speakers

Tobias Hadi Rustandi

Director of CDD  
PT BUKA LUKU

Muhammad Yamin

President Director  
Buku Kufambara

Website : <https://icast.isas.or.id/2021/>  
Contact Person : Ratna Wulaningrum (icast2021@polinesia.id)

Organized by Indonesian Polytechnics Consortium





Research.Publish.Connect.

Search by any title, abstract, authors...



[Proceedings](#)
[Papers](#)
[Authors](#)

[Advanced Search](#)

## Proceedings

### Proceedings of the 4th International Conference on Applied Science and Technology on Engineering Science

October 23-24, 2021, in Samarinda, Indonesia



**Editor:** M. Udin Harun Al Rasyid

**Affiliation:** Politeknik Elektronika Negeri Surabaya (PENS), Indonesia

**ISBN:** 978-989-758-615-6

**ISSN:** 2975-8246

**DOI:** 10.5220/0000151100003260

**Conference Link:** <https://icast.isas.or.id/2021/>

**Foreword:** Welcome Message from Director of State Polytechnic of Samarinda Assalamualaikum Warahmatullahi Wabarakatuh It is my great pleasure and honor as Director of Polytechnic State of Samarinda (POLNES) to welcome all of you to the International Conference on Applied Science and Technology (iCAST) 2021, which is held at Samarinda, Indonesia on October 23-24, 2021. Moreover, I would like to welcome all the keynote speakers and discussion panelists. I am sure you will find this conference developing innovation and green technology to sustain the economic and social life in the new normal era. This International conference first held in 2018 in Polytechnics State of Manado and the second 2019 in Polytechnics State of Bali. Because of the covid 19 in 2020 the conference held on Polytechnic state of Padang by online. This year is the 2th virtual conference in Polytechnics State of Samarinda. This conference iCAST 2021 contains two tracks: International conference of applied science on **(More)**

**Volumes:**

Vol. 1 - 978-989-758-615-6

Papers

Authors

Show 50 papers

#### Improvement of Traffic Performance at Intersections on Cak Doko Street, Kupang City, Indonesia

Mateus Sodanango , Amy Wadu , Obed Nenobais and Johan Lada

P. 321 - 328

DOI:10.5220/0010944800003260

#### Thermal Performance of Bio-Nano-PCM based Passive Cooling for Vaccine Carriers

I Nyoman Suamir , I Subagia , Luh Midiani , I Putra and I Rasta

P. 329 - 334

DOI:10.5220/0010944900003260

#### Comparative Analysis of the Energy Supply of Poly and Mono Crystalline Solar Panels in the Rooftop on Grid

I Sugiarta , I Suparta and I Teresna

P. 335 - 338

DOI:10.5220/0010945000003260

#### Numerical Study the Effect of Undulation to Mitigate Erosion Elbow

Sultana Mawaddah , Lohdy Diana and Hendrik Prasetya

P. 339 - 347

DOI:10.5220/0010945400003260

#### Twitter Sentiment Analysis on the Implementation of Online Learning during the Pandemic using Naive Bayes and Support Vector Machine

I. Wayan Suasnawa , I. Gusti Ngurah Bagus Caturbawa , I. Gede Suputra Widharma , Anak Agung Ngurah Gde Sapteka , I. Inrayana and I. Sunaya

P. 348 - 353

DOI:10.5220/0010945500003260

#### Thrust Force Analysis in Drilling Wood and Natural Fibre Reinforced Composite

Anggit Murdani , Rn Takwim and Muhammad Fakhruddin

P. 354 - 357

DOI:10.5220/0010945600003260

#### Mini Pile Foundation Construction Design on Soft Soil Due to Box Traffic Loads based on Standard Penetration Test

Liliwarti , Dwina Archenita and Sandra Faurina

P. 358 - 364

DOI:10.5220/0010945800003260

#### Study of Mechanical Properties of Palm Oil Pulp Sheet based Empty Fruit Bunches

Susiani , Evi Oktavia , Gema Suryadi , Purnomo Ananto and Handika Dany Rahmayanti

P. 365 - 367

DOI:10.5220/0010945900003260

#### Study of the Use of Drywall as the Wall Cover Material Reviewed from Cost and Time Aspects

Ni Yuni , I Sudiasa and I Suardika

P. 368 - 372

DOI:10.5220/0010946000003260

### Analysis Damage Cylinder Head Engine on QSK 50 MCRS

Hamka Munir , Ismail Ramli and Misdar Alamsyah

P. 373 - 378

DOI:10.5220/0010946100003260

### Application of OHS and Green Construction in Denpasar Markets

Anak Indrayanti , Ni Rani and I Budiadi

P. 379 - 384

DOI:10.5220/0010946200003260

### Real-time Hypertext Transfer Protocol Intrusion Detection System on Web Server using Firebase Cloud Messaging

Agus Tedyyana and Osman Ghazali

P. 385 - 392

DOI:10.5220/0010946300003260

### Effect of Stainless Steel Duplex Electrode Size on Hydrogen Production through Electrolysis Process

Yohandri Bow , Rusdianasari , Anerasari Meidinariasty and Muhammad Yori Pratama

P. 393 - 397

DOI:10.5220/0010946400003260

### Designing an Integrated Public Complaint System regarding Public Services using the Scrum Method

Fajar Ratnawati and M. Subandri

P. 398 - 405

DOI:10.5220/0010946500003260

### A Trial Study on Samarinda Identity Element Extraction for the Development of Cake Packaging Design

Andi Hidayanto , Basyarah Hamat and Mohd Dahuri

P. 406 - 411

DOI:10.5220/0010946600003260

### Effect of Different Type Catalyst on Biodiesel Production from Jatropha Curcas Oil via Transesterification using Ultrasonic Assisted

Muh. Irwan , Ramli , Mardhiyah Nadir , Marlinda and Arief Adhiksana

P. 412 - 415

DOI:10.5220/0010946700003260

### Google Earth Engine for Assessing Land Use and Land Cover Change in Banyuwangi Regency

Abdul Holik , Zulis Erwanto and Siska Hardiyanti

P. 416 - 422

DOI:10.5220/0010946800003260

### Effect of High Speed Machining on the Turning Aluminum Alloy 6061 of the Integrity Coated TiAlN/TiN Cutting Tool Carbide

Sunarto and Razali

P. 423 - 428

DOI:10.5220/0010946900003260

### Preliminary Study of Solar PV Characteristics Cooled by Water Spray

Putu Wijaya Sunu , Daud Simon Anakottapary , I Dewa Made Susila , I Dewa Gede Agus Triputra , I Nyoman Edi Indrayana , Asrori , Andoko , Ketut Suarsana and C. Bambang Dwi Kuncoro

P. 429 - 433

DOI:10.5220/0010947000003260

### Thermal Performance of Hot Water System Produced by Air Conditioning Coupled with Heat Recovery

Putu Wijaya Sunu , I Made Suarta , Daud Simon Anakottapary , C. Bambang Dwi Kuncoro , I Dewa Gede Agus Triputra , I Dewa Made Cipta Santosa , I Made Ari Dwi Suta Atmaja , Ketut Suarsana and I Wayan Edi Arsawan

P. 434 - 439

DOI:10.5220/0010947100003260

### Preliminary Study for Development of Hydro Energy Harvesting in an Open Channel Irrigation System

Ketut Bangse , I D. G. Agustriputra , Sudirman , Made Ery Arsana , I Made Sugina and I Nym Gede Baliarta

P. 440 - 445

DOI:10.5220/0010947200003260

### A Design of a Tool of Car Brake Piston Caliper Remover with Pneumatic Power

I M. Suarta , I Rahtika , P. W. Sunu , Santosa Gede and K. Bangse

P. 446 - 450

DOI:10.5220/0010947300003260

### The Performance of Electric Vehicles Converted from Combustion Motorcycles

I Wayan Jondra , I Sunaya , I Arka , I Ketut Parti , I Sudiartha and I Gede Suputra Widharma

P. 451 - 457

DOI:10.5220/0010947400003260

### Tofu Industrial Wastewater Treatment using Local Microorganisms Bio Activator from Banana Weevil

Yuli Patmawati

P. 458 - 461

DOI:10.5220/0010947500003260

### Influence of Carbon-activated Foam to Gain Fresh Water Production on Ultrasonic Vibration Assisted Water Purification System

I Agustriputra , P. W. Sunu , I Nyoman Suamir , Wayan Septiadi , I Santosa , I M. Suarta , I Temaja and I Nym Sugiarta

P. 462 - 469

DOI:10.5220/0010947600003260

### Transaction Application Management through Wireless LAN for Small and Medium Enterprises

I Atmaja , I Astawa , Ni Wisswani , I Nugroho and Putu Wijaya Sunu

P. 470 - 476

DOI:10.5220/0010947700003260

### Simulation of Water Supply Pump System with PLC based Control

Sudirman , I Nyoman Gede Baliarta , Putu Darmawa and D. Agustriputra

P. 477 - 483

DOI:10.5220/0010947800003260

### Identification of Land Criticism for Land Conservation Actions in the Badeng Watershed with Regulation of Watershed and Protection Forest Management

Zulis Erwanto , Abdul Holik , Dadang Pranowo and Shinta Afifa

P. 484 - 491

DOI:10.5220/0010947900003260

### Analysis of Project Time Performance during Covid-19 Pandemic on the Construction of Service Building at RSUD Gianyar by using the Earned Value Method

Made Sudiarsa , Wayan Sudiasa and Gede Wibawa

P. 492 - 498

DOI:10.5220/0010948000003260

### The Application of Fluttering Thin-flat Plates for Wind Harvesting using Electromagnetic Converter

I Rahtika , I M. Suarta and I Rusmariadi

P. 499 - 502

DOI:10.5220/0010948100003260

### Experimental Study on the Effect of Intercooler on a Compressor Performance on Multistage Type Cold-storage Simulation

I Negara and I M. Arsawan

P. 503 - 509

DOI:10.5220/0010948200003260

<b>Processing of Browncoal from Kutai Kertanegara: East Kalimantan as Adsorbent Media</b>	P. 510 - 513
Alwathan and Dedi Irawan	<b>DOI:</b> 10.5220/0010948300003260
<b>Comparison of Comfort Level using Air Suspension with Electric Control 2.5 Bar and Factory Standard Hydraulic Suspension on a 2011 Vario 110 cc Motorbike Unit</b>	P. 514 - 517
Ruspita Sihombing , Hidayat , Samen Lolongan , Rizky Rinda , Rakhel Lia and Darwin	<b>DOI:</b> 10.5220/0010948400003260
<b>Characteristics of Sediment Material at Bengkalis River Bengkalis Regency, Riau</b>	P. 518 - 525
Dedi Enda , Zulkarnain and Oni Febriani	<b>DOI:</b> 10.5220/0010948500003260
<b>Impact of Land-use Change on Surface Runoff in Manikin Basin et Kupang Regency</b>	P. 526 - 533
Arnoldus Nama , Yacob Hayer and Fabianus Nope	<b>DOI:</b> 10.5220/0010948700003260
<b>Porous Concrete Paving Block: A Review of Clogging Mechanism and Durability</b>	P. 534 - 544
Yudi Pranoto , Nor Fazilah Hashim , Tumingan and Joko Suryono	<b>DOI:</b> 10.5220/0010948800003260
<b>Fulfillment of Quality of Service at Komodo Labuhan Bajo Airport to Increase Passenger Satisfaction</b>	P. 545 - 551
Anie Tuati , Deasi Daud and Amy Wadu	<b>DOI:</b> 10.5220/0010948900003260
<b>Analysis of Nusa Dua Estuary Dam Operations for Clean Water Supply South Badung Tourism Area</b>	P. 552 - 557
I Parwita , I Tapayasa , I Wiraga and I W.	<b>DOI:</b> 10.5220/0010949000003260
<b>Technical Review of Port Terminal Services Ferry Seba Sabu Raijua</b>	P. 558 - 564
Deasi Daud , Anie Tuati and Yacob Hayer	<b>DOI:</b> 10.5220/0010949100003260
<b>Implementation of Ultraviolet-type C and Ozone based on Android Home Smartphone for Room and Air Sterilization</b>	P. 565 - 571
Ade Manu Gah , Sumartini Dana and Indranata Panggalo	<b>DOI:</b> 10.5220/0010949200003260
<b>Effect of Material Type, Temperature, and Layer Thickness on PLA and PETG from 3D Printer Products by Tensile Test</b>	P. 572 - 580
Etik Puspitasari , Syamsul Hadi and Moh. Hartono	<b>DOI:</b> 10.5220/0010949300003260
<b>Development of Hydrogen Gas Generator Prototype Model for Vehicle Fuel with Electrolysis Method</b>	P. 581 - 586
I Darmawa , Ikeh Wiryanta and I Sutarna	<b>DOI:</b> 10.5220/0010949400003260
<b>Measurement of Problem Difficulty Level in User Interface Medical Management System (MMS) Application with Heuristic Evaluation Approach at Surabaya Medical Services Hospital</b>	P. 587 - 594
Amir Ali , Muhadi , M. Udin Harun Al Rasyid and Iwan Syarif	<b>DOI:</b> 10.5220/0010949500003260
<b>Experimental Study of the Effect of Reactor Temperature Reconstruction on Fuel Consumption and Distillate Quantity</b>	P. 595 - 599
Ida Bagus Puspa Indra , I Adiaksa and Gusti Ardana	<b>DOI:</b> 10.5220/0010949600003260
<b>Land Boundary Map and Land Contour Map for Tourism Accommodation Development using QGIS Software Application in Kalisada Village, Bali</b>	P. 600 - 603
Gede Yasada and Evin Setyono	<b>DOI:</b> 10.5220/0010949700003260
<b>Evaluation of Power Consumption in Moringa Leaves Dryer</b>	P. 604 - 612
Sumartini Dana , Yohanes Peli , Indranata Panggalo , Ade Manu Gah and Indah O. Laleb	<b>DOI:</b> 10.5220/0010949800003260
<b>Development of Population Data Cluster Application based on Real-time Expertise</b>	P. 613 - 618
Herry Lang , Dostenreyk Kantohe , Ottopianus Mellolo , Sonny Kasenda and Tracy Marcela	<b>DOI:</b> 10.5220/0010949900003260
<b>Assessing Individual Fitness for Research and Development Position using Fuzzy AHP and Pareto: Case Study in Manufacturing Industry</b>	P. 619 - 625
I Ronyastra , Evy Herowati , Rahman Wahyudi , Joniarto Parung and Christanto Henadi	<b>DOI:</b> 10.5220/0010950000003260
<b>The Development of Dance Movement in Humanoid Robot Dancing ERISA</b>	P. 626 - 632
Novian Satria , Eko Binugroho , Ridhan Chairussy , Dwi Basuki and Bianca Surya Nobelia	<b>DOI:</b> 10.5220/0010950100003260
<b>Effect of Type of Activator and Ultrasonic Waves on the Chemical Activation Process on the Characteristics of Activated Charcoal from the Rubber Fruit Shell (Hevea Brasiliensis)</b>	P. 633 - 637
Sirajuddin , Harjanto and Inzirah	<b>DOI:</b> 10.5220/0010950200003260

Other proceedings of same conference



International Conference on  
Applied Science and  
Technology on Engineering



**SCITEPRESS - SCIENCE AND TECHNOLOGY PUBLICATIONS, LDA.**

## RESOURCES

[Proceedings](#)

[Papers](#)

[Authors](#)

[Ontology](#)

## CONTACTS

Science and Technology Publications, Lda  
Avenida de S. Francisco Xavier, Lote 7 Cv. C,  
2900-616 Setúbal, Portugal.

Phone: +351 265 520 185 (National fixed network  
call)

Fax: +351 265 520 186

Email: [info@scitepress.org](mailto:info@scitepress.org)

## EXTERNAL LINKS

[PRIMORIS](#)

[INSTICC](#)

[SCITEVENTS](#)

[CROSSREF](#)

## PROCEEDINGS SUBMITTED FOR INDEXATION BY:

[dblp](#)

[Ei Compendex](#)

[SCOPUS](#)

[Semantic Scholar](#)

[Google Scholar](#)

[Microsoft Academic](#)