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TOLL-LIKE RECEPTOR and AUTOIMMUNITY (Graves's disease): Literature Review

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Abstract

Graves's disease is an autoimmune condition that affects thyroid. The primary mechanism of Graves' disease is the results of adipokines, specifically leptin, IL-6, TNF, PAPMs molecular patterns, damage to DAMPs, and TLR molecules. In APC, homologous proteins known as Toll-like Receptors (TLR) serve as receptors or antigens. There are various types of TLRs depending on the type of antigen. There are currently 10 human TLRs named TLRs 1-10, TLR-2 and TLR-4 are equally significant in the emergence of autoimmune disorders. According to scholars based on latest research TLR-2, TLR-3, and TLR-9 are increased in Grave diseases. The purpose of this study is to identify the mechanism of TLR which is involved in the immune response in Graves' disease. The search for relevant scientific data was carried out by entering search queries based on keywords: TLR, autoimmunity, Graves's disease. The search was conducted through PubMed, Elsevier journals, and ScienceDirect as well as other highly cited publications.

Keywords: *TLR, grave's disease, autoimmune*

1. Introduction

Graves's disease is an autoimmune disease caused by excessive thyroid hormone production. Iodine is also known as a micronutrient for the formation of thyroid hormone [1]. Thyroid hormone functions to regulate all the work of the human body, plays a role in cell maturation, brain development and plays a role in the secretion of other hormones. Manifestations of Graves' disease are tremors, tachycardia (increased heart rate), increased appetite but drastic weight loss, and enlarged thyroid glands. Graves disease is stimulated by thyroid stimulating hormone (TSI) otherwise known as thyroid stimulating antibody (TSAb). The site of thyroid synthesis is in the

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thyroid cells, lymph nodes and even the bone marrow. The immune system that plays a role is B cells which play a role in the formation of immunoglobulins to stimulate thyroid formation [2].

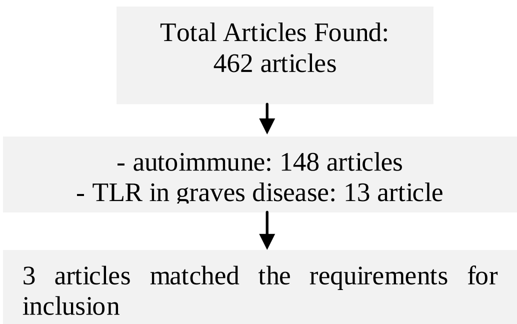
TLRs are proteins expressed by monocytes, dendritic cells and macrophages to recognize certain antigens. The *toll-like receptor* (TLR) is just one of several different classes of *Pattern Recognition Receptors* (PRRs) including *Nod-like receptors* (NLR), *C-type lectin receptors* (CLR), *AIM2-like receptors* (ALR), *RIG-I-like receptors* (RLR) and DNA sensors. intracellular including cyclic GMP-AMP synthase (cGAS) [3][4][5]. TLRs consist of a single membrane transmembrane helix that functions to connect extracellular ligand-binding domains to intracellular signaling domains [6]. TLRs contain leucine flanked by cysteine characteristically in their extracellular regions involved in ligand binding. Currently there are 10 types of functional TLRs in humans, namely TLR 1 to TLR 10 [7]. TLRs can recognize *pathogen-associated molecular patterns* (PAMPs) consisting of structures as diverse as flagellin, nucleic acids, saccharides (mainly mannose and lipopolysaccharide), peptidoglycans (such as lipoteichoic peptidoglycan), and lipoproteins. The adaptive immune response is triggered by recognition of these antigens, mediated by the production of proinflammatory cytokines together with stimulation of *antigen-presenting cells* (APCs).

2. Method

This research design is an identification of research journals within a period of 5 years, namely from 2018-2022. The research journals reviewed are those contain cytokines that play a role in Graves's Disease.

Article Selection Method

Several inclusion criteria in this study were a) articles reviewed in this study related TLR that play a role in autoimmune; b) Using TLR mechanism that plays a role in Autoimmune disease. The Exclusion criteria in this study were cytokines that play role in other than in TLR mechanism in autoimmune and journals published before 2018.



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Article Search Method

How to find articles in this study is examined methodically, starting with selecting research topics and generating English keywords for journal searches. The database used is PUBMED, SCIENCEDIRECT to search for articles throughout the year, from January 2021 to December 2022. The keywords are in English used are "Autoimunne", "TLR", and "TLR Mechanism". The next step is to identify the title of the article that best fits the research we want. Then, abstract identification and overall content analysis were completed to provide study findings that match the researcher's objectives.

Search results in Figure 1. Then the researchers filtered the relevant article titles and inclusion criteria, in order to obtain 3 appropriate article.

Analysis studies

According to the researcher's objectivities. Pertinent literature and data gathered utilizing the method of random controlled trial (RCT).

3. Result and Discussion

The involvement of TLRs in the early inflammatory immune response is responsible for their ability to develop autoreactive B and T cells. Such autoimmune responses are thought to result from molecular mimicry of pathogen-derived antigens to self-antigens or a form of nonspecific activation of the innate immune system that results in the production of T-cells and antibodies specific for self-antigens, thereby implicating TLRs in various autoimmune diseases. Graves disease increases the secretion of cytokines such as IL-1, IL-2, IL-6, IL-4, IL-10, IL-8, IL-13, IL-12, IL-14, TNF-α and IFN-γ (Polak et al, 2019; Grim et al, 2019). Thyrocytes in It has been found that thyrocytes in Graves's Disease patients do not undergo apoptosis, and around them there is an infiltrate consisting mostly of Th2 cells, which secrete small amounts of IL-2, TNF-α and IFN-γ. However, they are capable of producing large amounts of IL-4, IL-5 dan IL-10.

TLR and Graves's Disease

TLR signal transduction occurs through the involvement of MyD88 (myeloid differentiation factor 88), TAK1 kinase (TGF-beta-activated kinase), TAK1-binding protein kinase (TAK1-binding protein), IRAK kinase ((IL-1)-1R1 associated protein kinase) and tumor necrosis factor receptor-associated factor—TRAF6 (TNF receptor-associated factor 6) [9]. TLR ligation can cause abnormal activation and inflammatory reactions in autoimmune diseases. Most research has concerned with intra-cellular TLRs, such as TLR-3, TLR-7 and TLR-9, but recent studies have also shown that cell surface TLRs, especially TLR-2 and TLR-4, play an equally important role in disease development. autoimmune [10].

The basic mechanism in Graves' disease is the result of adipokines in the form of leptin, IL-6, TNF-α, PAPMs, DAMPs and TLR. Adipokines in adipose tissue exhibit autocrine, endocrine and paracrine properties in tissues and organs. Peng et al's study (2016) reported TLR 1-10 expression in peripheral blood assessed by the RT-PCR method, an increase in TLR-2 was found in Graves's patients [11]. This is in accordance with the study of Polak et al (2019), in patients with Graves's disease, the percentage of CD4+, CD8+ and CD19+ cells on TLR-2 showed a significant increase and the percentage of CD4+, CD8+ and CD19+ B cells in TLR-4 also increased. Significant correlation in TLR-expressing lymphocytes as a clinical parameter and cytokine concentration in peripheral blood [8]. In Graves' patients, there is a relationship between TLR-2 antigen expression on CD4+ T lymphocytes and TLR-4 antigen expression on CD4+ T lymphocytes, a relationship between TLR-2 antigen expression on CD4+ T lymphocytes and FT3 concentration. Pre-treated patients also had a correlation between TLR-2 antigen expression on CD8+ T cells and TLR-4 antigen expression on CD8+ T cells and between TLR-2 antigen expression on CD19+ lymphocytes and TLR-4 antigen expression on CD19+ lymphocytes. Whereas after treatment, there was a significant correlation between TLR-2 antigen expression on CD19+ B lymphocytes and TLR-4 antigen expression on CD4+ T cells as well as TLR-2 antigen expression on CD19+ B lymphocytes and TLR-4 antigen expression on CD19+ B lymphocytes.

The expression of TLR-2, TLR-3, and TLR-9 on monocytes is increased in Graves' patients. In addition, after specific agonist stimulation, the percentage of CD14+ cells expressing TLR2 increased in Graves' Disease *peripheral blood mononuclear cells* (PBMC). Similarly, increased expression of TLR-3 and TLR-9 in Graves' patients was also found under TLR-3 and TLR-9 stimulation. Expression of *high mobility group box 1* (HMGB1) and RAGE was found to be upregulated in PBMCs from AITD patients at rest and under TLR9 stimulation. The HMGB1, a protein released from damaged or necrotic cells, is involved in many chronic inflammatory diseases. The HMGB1-DNA complex binds to RAGE and then activates a TLR-9-mediated inflammatory response, and previous studies have shown that extracellular HMGB1 can bind to CpG ODNs and stimulate their transfer to TLR-9 in inflammatory diseases. The findings of Peng et al (2016) demonstrated that HMGB1 and RAGE play an important role in the development of chronic inflammation in autoimmune thyroid disease through activation of the TLR9 pathwa [11].

Receptor activation has been shown to have the ability to regulate the production of pro-inflammatory cytokines. Increased IL-6 and decreased IL-10 production in PBMCs from Graves's patients in response to specific ligands for TLR-2, TLR-3, or TLR-9 and increased TNF-α expression in response to TLR-3 and TLR-9 ligands. In contrast, TNF-α secretion after TLR-2 agonist stimulation in PBMCs from Graves' Disease patients and controls, suggests that TNF-α production is not associated with TLR-2 activation in PBMCs. PBMCs from patients with AITD are more sensitive to responses induced by TLR agonists, resulting in the secretion of pro-inflammatory cytokines [11][12].

4. Conclusion

TLR that play role in Graves's disease are TLR-2, TLR-3, TLR-4, TLR-9. Other component like SOCS and TRAF proteins are considered to be major regulators of the TLR pathway. Studies remain limited to relatively small articles. Deeper knowledge of TLR families could help the development of more targeted therapies for Graves's diseases.

5. References

[1] R. A. Wibowo, S. N. Wahyuningrum, I. Kusrini, S. Kumorowulan, E. B. Prihatmi, Sudarinah., C. Wijayanti, N. Nuraini, N. A Janah,I. Setianingsih, P. D. Ayuni, C. Harfana, & M. Samsudin. "Autoimmune as Risk Factor of Hyperthyroidism at Childbearing Age Women in Replete Iodine Deficiency Disorder (IDD) Area", Media Gizi Mikro Indonesia. Vol. 9(2), p. 139-148, 2018. DOI: https://doi.org/10.22435/mgmi.v9i2.600.

[2] B. Pokhrel, & K. Bhusal. "Graves Disease". StatpPearls Publishing. Louisiana State University HSC, 2022

[3] S. Akira, S. Uematsu, O. Takeuchi. "Pathogen recognition and innate immunity". Cell. Vol. 124(4), p. 783–801, 2006, doi: 10.1016/j.cell.2006.02.015

[4] X. Cai, Y. H. Chiu, Z. J. Chen. "The cGAS-cGAMP-STING pathway of cytosolic DNA sensing and signaling". Molecular Cell. 54(2):289–296, 2014, doi: 10.1016/j.molcel.2014.03.040.

[5] M. Farrugia & B. Baron, "The Role of Toll-Like Receptors in Autoimmune Diseases through Failure of the Self-Recognition Mechanism." International journal of inflammation. 2017:

8391230. doi:10.1155/2017/8391230

[6] N. J. Gay N. J, M. Gangloff, "Structure and function of toll receptors and their ligands", Annual Review of Biochemistry. Vol. 76, p. 141–145, 2007. doi: 10.1146/annurev.biochem.76.060305.151318.

[7] A. K. Abbas, A. H. Lichtman, & S. Pillai. Cellular and Molecular Immunology. Elsivier. Philladelphia, 2021.

[8] A. Polak, E. Grywalska, J. Klatka, J. Roliński, B. Matyjaszek-Matuszek, & M. Klatka.. "Toll-Like Receptors-2 and -4 in Graves' Disease-Key Players or Bystanders". International journal of molecular sciences, vol. 20(19), 4732, 2019, DOI:: https://doi.org/10.3390/ijms20194732

[9] D. Grimm. "Cell and Molecular Biology of Thyroid Disorders". Int. J. Mol. Sci. 20:2895, 2019, doi: 10.3390/ijms20122895

[10] C. Qian, & X. Cao. "Regulation of Toll-like receptor signalling pathways in innate immune responses". Ann. N.Y. Acad. Sci. 1283:67–74, 2013, doi: 10.1111/j.1749-6632.2012.06786.x

[11] S. Peng, C. Li, X. Wang, X. Liu, C. Han, T. Jin, S. Liu, X. Zhang, H. Zhang, X. He, et al. "Increased Toll-Like Receptors Activity and TLR Ligands in Patients with Autoimmune Thyroid Diseases". Front. Immunol. Vol. 7:578, 2016, doi: 10.3389/fimmu. 00578

[12] Y. Zhang, J. Liu., C. Wang., J. Liu., W. Lu. Toll-Loke Receptors Gene Polymorphisms in Autoimmune Disease. Frontiers in Immunology. 12; 672346; 2021. DOI: 10.3389/fimmu.2021.672346

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The Effectiveness of Account Receivable Work on the Smooth Handling of Receivables at Grand Hap Hotel Solo

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Abstract

This study aims to determine how the mechanism carried out by Account Receivable staff on the smooth handling of receivables so that it can make a good contribution to hotel operational governance, especially in increasing hotel revenue. The research method used in this research is a qualitative method of literature study and field study by collecting relevant literature sources and conducting research in the field. While the data collection techniques used are conducting interviews with the company, observing the company, and documenting data obtained from internal companies. The results of the study found that the implementation of handling and management of accounts receivable has been carried out in accordance with the job description and standard operation procedure and in accordance with company objectives. Although there is still something that is not optimal regarding the making of reminders to Guest Ledger that has exceeded the credit limit limit, it cannot be implemented properly and further studies are still needed regarding the application of the accounts receivable loss reserve method as an anticipation of losses incurred by uncollectible accounts.

Key words: *effectiveness, account receivable, receivables, hotel.*

1. Introduction

The era of rapid growth of the hotel market share with various facilities and amenities offered to guests, making hotels the right choice for all groups to organise various events or events. Likewise, the hotel tries to make it easy to establish good relations with guests, both individual and group guests. One of the strategies implemented by providing credit facilities in payment. This strategy is able to make a good contribution to hotel operational governance, especially in increasing hotel revenue / revenue. In addition, to increase customer interest so that it can increase the volume of revenue and company profits. However, the greater the proportion of credit sales in a hotel, the greater the investment in receivables. Credit sales can increase sales turnover, but have the risk of delayed cash receipts. Delays in cash receipts can lead to receivables [1].

Receivables as a form of income in the form of bills for income received by the company, both in the form of goods and services on credit to other parties [2]. Receivables management is needed to overcome this impact. Impacts or risks that often occur such as the risk of delays in settlement of receivables either in part or in whole, even uncollectible receivables. This will have an impact on hampering the smooth operation of the company, especially if the receivables are in large amounts. Problems that often arise include the settlement process on the Electronic Data Capture (EDC) machine by the front office which causes differences in the date of entry of payments into the hotel account, the delay in sending a stay agreement letter with a partner (List of Statement), and negligence in signing the bill by the guest on the Guarantee Letter.

Therefore, the accounting management of a hotel plays a very important role in collecting receivables. Account Receivable in the Accounting Department of Grand HAP Hotel Solo itself is responsible for controlling hotel operations both in terms of hotel income and expenses which ultimately rests on the financial reporting process. Dimana jika pengumpulan hasil pembayaran piutang lebih besar maka akan dapat membantu dalam proses kelancaran operasional pada saat itu, namun jika sebaliknya nilai pemgumpulan hasil pembayaran piutang tertunda maka akan mempengaruhi tertundanya proses pembayaran operasional [3]. As a result, a research study is needed on the effectiveness of Account Receivable work at Grand HAP Hotel Solo in facilitating the handling of receivables. This is very important to analyse, because the smooth handling of receivables affects the operational cash flow (cash flow) which is the foundation in the implementation of daily operations at the hotel. Based on this understanding, effective receivables management is needed to manage receivables to avoid losses so that hotel profits can continue to increase and hotel operations and cash flow can always be maintained properly.

2. Method

This research uses qualitative methods of literature study and field study by collecting relevant literature sources and conducting research in the field. In this part of the literature study, data processing is carried out from reference sources that support research data, while the field study is carried out directly in the field through observation, structured interviews and documentation [4]. Data processing in the field is carried out systematically to respondents who are directly related to the research data source, so that the data obtained in the field can really be accounted for.

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3. Result and Discussion

3.1. Results

The recording of receivables in the finance department is carried out by the Account Receivable section by managing and controlling credit sales policies against company receivables generated to finance company operations.

One of the risks that can occur is the risk of uncollectible receivables, which will hinder the smooth operation of the company itself. In terms of the role of Account Receivable is very important to the smooth flow of financial operations, as is the case in operations at Grand Hap Hotel Solo. Where an Account Receivable must be able to manage receivables properly and on time, and be able to establish good cooperation with company partners. Guided by the existing jod description and standard operating procedures, namely by conditioning the detailed receivables report (break down city ledger) reported by night audit and examining the complete accompanying documents, to make confirmation of the detailed bills / city ledger. Including newly entered receivables and those already in reminder letters. Accounts receivable that are due in the range of 30 to 60 days are conditioned for timely collection and recorded in the daily collection report which is included in the company's balance sheet as a current asset [5].

As for the smooth handling of receivables, both receivables in relatively small and large amounts affect the smooth flow of company cash.Where cash flow is an indicator of the smooth running of daily financial operations in the hotel operation itself. This can be proven by the results of data processing from the performance results of Grand Hap Hotel Solo Account Receivable in the period from 2020 to 2022, which refers to the percentage of collection results per accounting period.

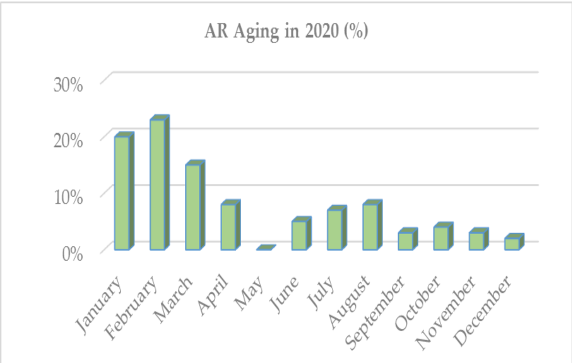

Figure 1. Percentage of AR Aging 2020

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From the graph presented in the AR Aging report in 2020, there was a drastic decline due to the covid 19 pandemic, which at the end of the year closed less than 5% of the total collection of existing receivables.

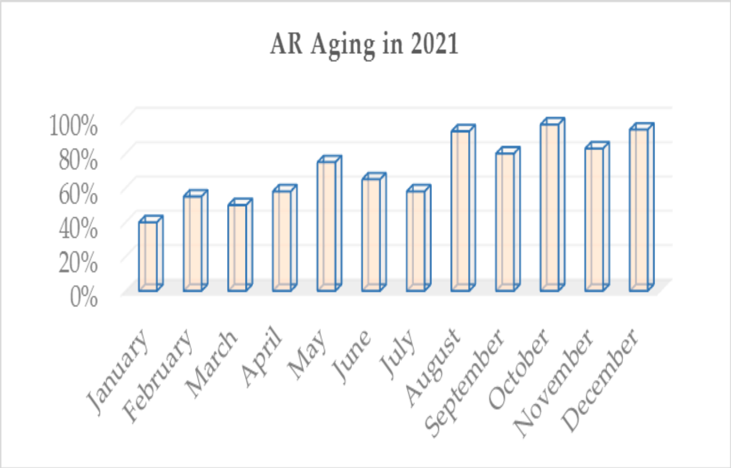

Figure 2. Percentage of AR Aging 2021

From the percentage graph of the total reports presented in the 2021 AR Aging report, there was a significant increase which started at the beginning of the year in the range of 40% and closed at the end of the year at 94%.

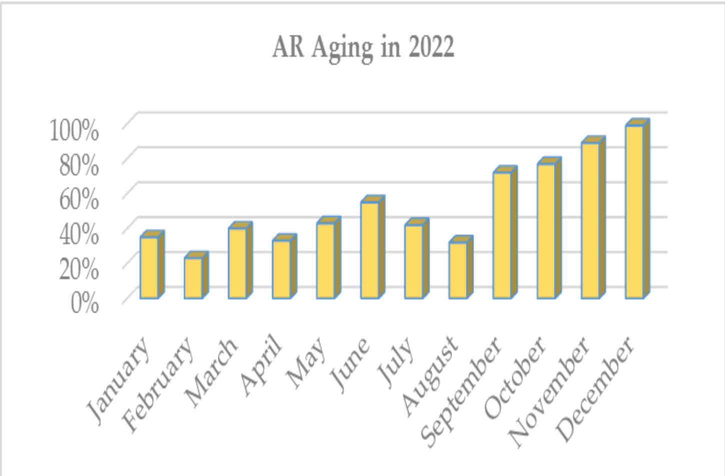

Figure 3. Percentage of AR Aging 2022

In the results of the AR Aging report in 2022, the graph shows that accounts receivable income at the beginning of the year is around 34% and at the end of the year there is a significant increase, almost reaching the highest point of 99%. This is the result of good cooperation between existing departments, as well as the application of receivable governance by the work of Account Receivable in facilitating good relations between the hotel and all companies that are given credit facilities. Before providing credit to guests and company relations, management needs to make a policy determination of credit facilities to customers / company relations as a form of agreement between management and customers / relations. In determining the provision of this credit facility, 4 elements that need to be considered by management include :

(1) age of credit facilities;

(2) standardisation of credit provisions;

(3) credit settlement policy

(4) special pricing [6]

Apart from that, the results of this receivables processing are also inseparable from the processing of daily receivables to monthly and annual reports by Account Receivable, both new receivables (curent) and receivables that have been more than a month.

The following are the results of processing the age of receivables contained in the report between 2020 and 2022.

Table 1. Age of receivables for the period 2020

Aging	Total AR 2020
1-30 days	192
31-60 days	36
61-90 days	10
91-120 days	0
over 120 days	0

Table 2. Age of receivables for the period 2021

Aging	Total AR 2021
1-30 days	878
31-60 days	49
61-90 days	15
91-120 days	1
over 120 days	0

Table 3. Age of receivables for the period 2022

Aging	Total AR 2022
1-30 days	639
31-60 days	32
61-90 days	5
91-120 days	0
over 120 days	0

From the results of the comparison between 2020 and 2022, it is found that the age of receivables between 1 - 30 days can be well conditioned, compared to the age of receivables above 30 days. It can even be taken that the average age of receivables that exceed 30 days is only around 0.1%. This shows that the performance and effectiveness shown by Account Receivable is good and as expected. Where effectiveness is the ability of a person who is able to realise the results of his work in accordance with the company's objectives that have been set [7]. By referring to the suitability of the application of job descriptions and standard operating procedures in each operational implementation in the field, the effectiveness of credit sales is also improved can run well. And this is always followed up by prioritising the recording of cash expenditure in a regular and structured manner, checking back on the cashier outlet section accompanied by in-depth information related to the company's partners / relations who become customers [8].

3.2. Discussion

Basically, sales on credit if managed properly can provide considerable benefits for the hotel's own financial operations. However, if it is only limited to management without regular planning or control, it will make a loss for the hotel itself. Therefore, in order to obtain maximum profit, the size of trade receivables must be managed properly. The receivable itself arises from the policy of granting credit and selling on credit. Where cash receipts from credit sales can be realised if the receivables that arise can be collected [9]. The Account Receivable section at Grand HAP Hotel Solo itself has four main tasks, namely making bills in the form of invoices, completing payments using credit cards, making daily collection reports, and inputting system data related to payment locations. The application of this division of duties and responsibilities policy aims to make it easier for employees to carry out their duties which are of course adjusted to the job description and standard operating procedures. As a first step, namely:

1. Break down the city ledger master report created by the night audit and scrutinise the accompanying documents before posting each bill according to its respective classification in the city ledger.
2. Furthermore, invoicing is carried out every time making bills to customers accompanied by complete documents either by mail or telephone to ensure payment.
3. Make daily reports on collections obtained into the Daily Collection Report and post each collection result on the city ledger card/report and the necessary corrections or

adjustments in accordance with applicable regulations. This receivables turnover shows an attempt to measure how often receivables become cash in a certain period. The high and low receivable turnover that occurs is due to the level of credit sales payments in one year increasing or decreasing depending on the management of receivables applied [10]. By knowing the level of accounts receivable turnover, it can be seen the level of accounts receivable turnover in each period. In general, it can be concluded that the company's cash flow turnover can be achieved well if it is balanced with a higher ratio of accounts receivable turnover in its operations [11].

4. Carrying out control, the Account Receivable always books account receivable transactions based on D'cards in the city ledger control book/list. This is done as a form of control on each age of receivables to be precise in the billing process towards payment settlement. And this is a step in effective receivables management to manage receivables to avoid losses, so that it is expected to increase daily operational profits for hotel management.
5. Make Reminders to guest bills that have exceeded the credit limit in accordance with the applicable credit facility provision policy. This is done as a form of control of uncollectible receivables. This control must be further improved by controlling costs on the sales results of each main product in daily operations and coordinating with customers or company relations who are given credit facilities before the specified payment due date. It is also necessary to increase the percentage of collection of existing receivables [12]. Because if internal control over receivables is not running properly, it will result in ineffective collection of receivables which results in an increase in the risk of bad debts [13]. In controlling the amount of receivables, a careful planning stage and in-depth analysis are needed, so that during the process of collecting receivables from guests / company relations it can be done as effectively and efficiently as possible [14].
6. Administrative order, the Account Receivable section conducts a re-check regarding the detailed accounts receivable report (out standing balance) which must be followed up immediately, closing the Aged Trial Balance Account Receivable based on the city ledger, guest ledger and city ledger control list. This is also accompanied by its complementary documents. In addition, make a list of customer / partner receivables that have been long

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and uncollected (city ledger uncollected) to immediately get certainty of elimination and submit to the board of directors / owner. Because the increase in uncollectible receivables can interfere with financial performance. In addition, if there is a relatively low percentage of accounts receivable turnover, this indicates a lack of efficiency of collection work during that period due to the length of collection carried out. So that this will worsen the condition of the company's cash flow.

It can be concluded that the more the acquisition of receivables from credit sales, both goods and services that are not on time as agreed, then this will certainly slow down the level of receivables turnover itself or vice versa, so it is necessary to minimise problematic / uncollectible receivables. In order to overcome this uncollectible accounts receivable problem, it should be necessary to make an allowance for receivable losses. Where the method of applying the allowance for receivable losses is as an indirect write-off policy using a calculation based on a percentage of sales. The losses incurred by uncollectible receivables are reported on the income statement / profit and loss which will reduce sales profit. While on the balance sheet report it is conditioned as a receivable loss reserve which will reduce the amount of the receivable itself so that the value of the company's assets is reduced by itself. Furthermore, the amount of loss of receivables is calculated by multiplying a certain percentage by the amount of sales for that period, then a journal is made and will be included in the profit and loss statement as other expense [15]. With the application of this receivable loss reserve, the amount of receivable loss costs will appear so that the income statement / profit and loss will present the actual profit and by deducting the cost of receivable losses, it will affect the company's own taxes.

4. Conclusion

The effectiveness of receivables management carried out by Account Receivable Grand HAP Hotel Solo can run well by referring to job descrition and operational standards starting from making detailed city ledger reports, posting each bill according to its respective classification on the city ledger, collecting both by letter and telephone by ensuring payment, making a report on bills that have been paid (daily collection report) and depositing in detail to the general cashier. In addition, make reminders letters to company relations / partners for receivables that have exceeded the credit limit in accordance with applicable regulations and post each collection result on the city ledger card / report and correction or adjustment in accordance with the provisions and policies determined by the company. For monthly tasks, it starts from cross-checking the out standing balance that must be followed up immediately, closing the Aged trial balance of receivable accounts based on the city ledger, guest ledger, city ledger control list and conducting credit meetings. For annual tasks, it starts from making a detailed list of uncollected bills (city ledger un-collected) to be written off and submitted to the board of directors / owner. Through these stages of work, the effectiveness of Account Receivable work is able to manage the turnover of receivables in a timely manner and facilitate the turnover of existing cash flow.

The implementation of receivables management by Account Receivable is in accordance with the applicable procedures, but related to the implementation of reminders to customers who have exceeded the credit limit in accordance with applicable regulations has not been implemented properly, so with this it should be improved so that the role of Account Receivable in collecting receivables can be carried out faster and smoother. In addition, it is also necessary to apply a reserve for receivable losses to anticipate losses incurred by uncollectible receivables.

5. Acknowledgement

At the end of this research activity, the researcher would like to thank the management of Grand Hap Hotel Solo and its staff as well as the academics of Indonusa Polytechnic Surakarta, so that this research can be completed as expected and provide benefits to the effectiveness of accounts receivable management in hotel operations and be able to contribute to smooth operations at Grand Hap Hotel Solo, especially related to account receivable performance and hospitality associations in general on the implementation of effective accounts receivable management and being able to create profits.

6. References

[1] P. Widyantari, I. K. Sugiarta, and P. D. Hudiananingsih, "Analysis of the Effectiveness of Accounts Receivable Management on the Risk of Uncollectible Accounts at Four Seasons Resort Bali at Jimbaran Bay," *J. Appl. Sci. Accounting, Financ. Tax*, vol. 2, no. 2, pp. 149–154, 2019, [Online]. Available: https://garuda.kemdikbud.go.id/documents/detail/1861407

[2] Y. Kiay Demak, J. J. Tinangon, and L. Mawikere, "Analisis Piutang Tak Tertagih Berdasarkan Umur Piutang Pada Pt. Air Manado," *Going Concern J. Ris. Akunt.*, vol. 14, no. 1, pp. 347–355, 2018, doi: 10.32400/gc.13.04.21151.2018.

[3] Lexi Pranata Budidharmanto and D. L. Deviyanti Lunardi, "Fungsi Account Receivable Terhadap Kelancaran Arus Kas Di Fairfield By Marriot Surabaya," *Ekon. J. Ilm. Manajemen, Ekon. Bisnis, Kewirausahaan*, vol. 7, no. 2, pp. 146–152, 2020, doi:

10.30640/ekonomika45.v7i2.136.

[4] W. Darmalaksana, "Metode Penelitian Kualitatif Studi Pustaka dan Studi Lapangan," *Pre-print Digit. Libr. UIN Sunan Gunung Djati Bandung*, pp. 1–6, 2020.

[5] A. Agustin, "Analisis Pengendalian Piutang Terhadap Penagihan Piutang Arus Kas Pt.Cowell Development Tbk," *J. Bina Akunt.*, vol. 6, no. 2, pp. 42–65, 2019, doi: 10.52859/jba.v6i2.61.

[6] S. E. Baguna and R. Lambey, "Ipteks Kebijakan Pemberian Fasilitas Kredit Di Hotel Four Points By Sheraton Manado," *J. Ipteks Akunt. Bagi Masy.*, vol. 2, no. 02, pp. 43–47, 2018, doi: 10.32400/jiam.2.02.2018.21638.

[7] H. Gunawan, "Analisis Manfaat Seleksi Karyawan Terhadap Produktivitas Dan Efektivitas Kerja Karyawan Pada Bidang Perhotelan Di Kota Makassar," *Movere J.*, vol. 3, no. 2, pp. 221–232, 2021.

[8] F. Alviolita and M. Yunus, "Analisis atas Efisiensi dan Efektivitas Penerapan Sistem Informasi Akuntansi Penjualan Kredit dalam Pengendalian Intern (Surabaya Suites Hotel di Plaza Boulevard, Surabaya)," *UAJ UBHARA Account. J.*, vol. 1, no. 1, pp. 28–38, 2021.

[9] I. P. A. 12Politeknik Ni Komang Riska Fildayanti1, "Analisis Kebijakan Kredit dalam upaya Penagihan Piutang Travel Agent di Fairmont Sanur Beach Bali," *J. Ilm. Hosp. Manag.*, vol. 12, no. 02, pp. 168–182, 2022.

[10] D. Minar and N. W. Purnamasari, "Peranan Perputaran Piutang Usaha Terhadap ROI Perusahaan (Studi Kasus Pada Kota Bukit Indah Plaza Hotel Purwakarta).," *Efisiensi - Kaji. Ilmu Adm.*, vol. 16, no. 1, pp. 59–68, 2019, doi: 10.21831/efisiensi.v16i1.24477.

[11] T. Irmawati Ishak and A. Tomu, "Analisis Efektivitas Dan Efisiensi Pengelolaan Piutang Pada Emerald Hotel Timika," *J. ULET*, vol. VI, no. 2, pp. 90–109, 2022.

[12] N. L. P. P. Dewi and N. L. P. S. P. Pradnyani, "Analisis Pengendalian Internal Piutang Usaha Untuk Meminimalkan Piutang Tak Tertagih Pada Pandawa All Suites Hotel Umalas," *Pros. SINTESA*, vol. 5, pp. 117–124, 2022.

[13] and M. S. K E Rahayu*, C Ardina, "Analysis of Uncollectible Receivables and Their Impact on Profitability at The Legian Bali," *J. Appl. Sci. Accounting, Financ. Tax*, vol. 3, no. 2, pp. 152–157, 2020, doi: 10.31940/jasafint.v3i2.2144.

[14] H. Wicaksono, A. Swantari, and F. Festivalia, "Analisis Pengendalian Piutang Hotel Z Di Jakarta Pusat," *At-Tadbir J. Ilm. Manaj.*, vol. 6, no. 2, p. 155, 2022, doi: 10.31602/atd.v6i2.6533.

[15] E. V. Mantiri and R. T. Poluan, "Evaluasi Penerapan Metode Cadangan Kerugian Piutang dan Pengaruhnya terhadap Laporan Keuangan Hotel Sahid Kawanua Manado," *J. Educ.*, vol. 5, no. 3, pp. 9339–9345, 2023, doi: 10.31004/joe.v5i3.1740.

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Design and Implementation of Nusa Medis for Cloud Computing-Based Electronic Medical Record Systems

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Abstract

The background of this research is the importance of using information technology in health services to increase the efficiency and effectiveness of health services. However, there are still many challenges in implementing electronic medical record systems, such as difficulties in integrating data from various sources, data security issues, and limitations in data accessibility.

The purpose of this research is to design and implement a cloud computing-based electronic medical record system that can meet the special needs of various health care providers and improve the accessibility of patient data safely and efficiently. The method used in this study is a system development approach based on the software development life cycle by combining user-based design principles and feedback from health care providers.

The result of this research is a web-based electronic medical record system that can be accessed from anywhere with an internet connection, with features such as medical history tracking, appointment scheduling, prescription management, and billing management. This system also has a high level of security to protect patient privacy and prevent unauthorized access.

Keywords*: cloud computing, electronic medical records, medical nusa medis.*

1. Introduction

On August 31, 2022, the Government through the Minister of Health of the Republic of Indonesia issued Regulation of the Minister of Health Number 24 of 2022 concerning Electronic Medical Records. This regulation itself legally revokes the Regulation of the Minister of Health of the Republic of Indonesia No. 269/MENKES/PER/III/2008 of 2008 concerning Medical Records which of course is no longer relevant to the development of science and technology that is developing. very rapidly, especially in terms of the development of digital technology which enables the transformation of the digitalization of health services, including in the case of electronic medical records which must prioritize the principles of security and confidentiality of data and information. With the issuance of this new regulation, health facilities are immediately burdened with the obligation to be able to organize RME in accordance with these regulations, based on these regulations, health facilities including independent practice are given until December 31, 2023 to be able to implement it. If the health facility or health service cannot implement it, an administrative sanction will be imposed (written warning and/or recommendation for revocation or revocation of accreditation status) against the health service facility that commits a violation. Of course this is done to be able to realize legal certainty. However, it cannot be denied that there are many challenges that must be overcome by health services to be able to implement this, especially for health services in remote areas of Indonesia which do not have access to adequate internet and computer networks. In a study conducted by several researcher previously found several obstacles in the implementation of Electronic Medical Records including human resources (HR), policies and regulations, infrastructure and costs, and most importantly how Electronic Medical Records (RME) can support every need for service activities in health facilities [1]–[7]. The role of information systems in health facility management activities is very helpful and plays a very effective role in the process of health services, with an information system a leader of a health facility can make a policy quickly, precisely and accurately based on information obtained from health services in the health facility led [1], [2], [4], [6]–[10].

The solution offered to overcome the above problems is a free and reliable Cloud Computing-based RME information system according to the criteria of government regulations regarding PMK No. 24 of 2022 and regulations related to decisions related to Guidelines for Variables and Meta Data in the Implementation of Electronic Medical Records which are attached to the Decree of the Minister of Health (Kepmenkes) Number HK.01.07/MENKES/1423/2022. Updating and developing the Nusa Medis application will always be carried out to comply with applicable regulations, this application can even be customized according to user needs, this application can be run as a local client server or on cloud computing for easy access using either a Laptop/PC/Android.

2. Materials and methods

The type of research used in this research is qualitative research with action research methods. Whereas method development system using waterfall, where method This Lots interested developer system Because for convenience [11]–[13], [13], [14], the action research method has 4 stages, including problem identification, action planning, action implementation and action evaluation.

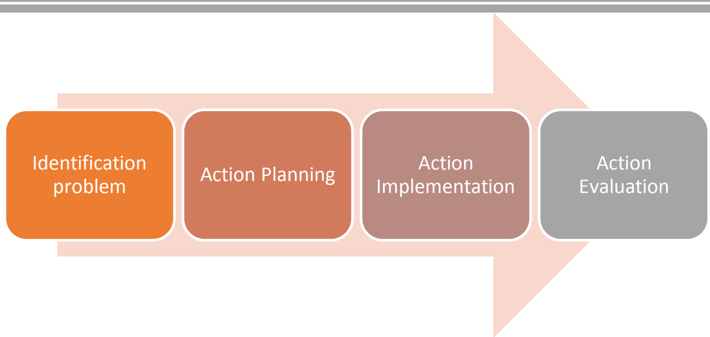

Figure 1. Action Research Methods

From Figure 1 above, in outline to fulfill the research stages by:

1. Identify user needs analysis.
2. Define users using electronic medical records.
3. Designing cloud computing-based electronic medical records.
4. Electronic medical record test using Blackbox Testing [13], [13]–[20].

The inclusion criteria for research subjects in this study were subjects who understood electronic medical records. While the exclusion criteria for research subjects in this study were subjects who did not understand electronic medical records.

Based on the consideration of these inclusion criteria, table 1 shows that the research subjects in this study were lecturers at the Indonusa Surakarta Polytechnic, system development partners and health information management students.

Table 1. Number of Research Subjects

NO.	Research Subjects	Total
1.	Teacher	7
2.	System development partner	6
3.	Student	14
	Total	27

3. Results and Discussion

a. Identify user needs analysis.

Table 2. Needs Analysis

NO	Module	Information
1.	Registration	Patient ID like • Name • Place of birth • Date of birth • Gender • Religion • Allergy medicine • Blood type

NO	Module	Information
		• Rhesus • KTP / Identity No • Ward • Address • Phone number • Education • Work • Nationality • Marital status
2.	Treatment Road	Subjective: Anamnesis Objective : • General condition of the patient • Systolic Blood Pressure • Diastolic Blood Pressure • pulse • Breathing • Temperature • Weight • Height Assessment: Diagnosis Planning : • Action • executor • BHP • Therapy • Mixed Therapy Transfer Lab Results Radiology Results Sale
3.	Drugstore	• General Sales • Guarantee Sales • Free Sales • Sales Returns • Reprint Sales Records • Reprint E-Tickets • Reprint Return Notes • Drug Preparation Process • LCD Pharmacy
4.	Medical records	• Patient Data • ICD 9 Teacher • ICD 10 Teacher • Input Diagnostics
5.	BPJS	Pcare logs
6.	Cashier	• Patient Payments • Guarantee Patient Payments • Receipt Reprint
7.	Management	Configuration • Configuration • Tariff Configuration

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NO	Module	Information
		• Service Configuration User • Employee Management • Organizational structure • Position • User Login • Change Password Rates • Registration fee • Inspection fees • Action Rates Medical • Set Poly • Doctor's Schedule • Education Teacher • Job Teacher • ICD category • Main Diagnostics • Master Procedure Import • Import Officer • Patient Import
8.	Admin	• User Login • Change Password

b. Define users using electronic medical records.

Table 3. User Context

NO.	User	Information
1.	Officer Registration	Perform patient registration and confirm the number of patients (visit)
2.	Nurse	Assists in filling subjective and objective (Vital Sign)
3.	Doctor	Conducting examinations (Assessmen) and prescribing drugs (Planning)
4.	Pharmacist	acquisition of drugs and monitoring of drug sales reports
5.	Cashier Officer	Completing payment/bills for patient examinations

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c. Designing cloud computing-based electronic medical records.

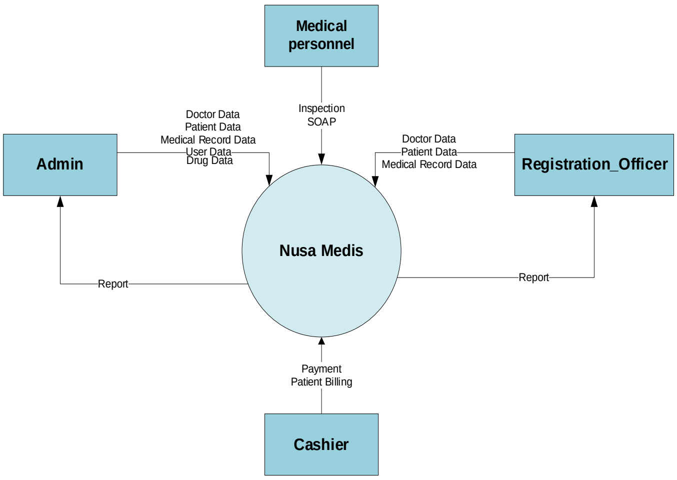

Figure 2. Context Diagram

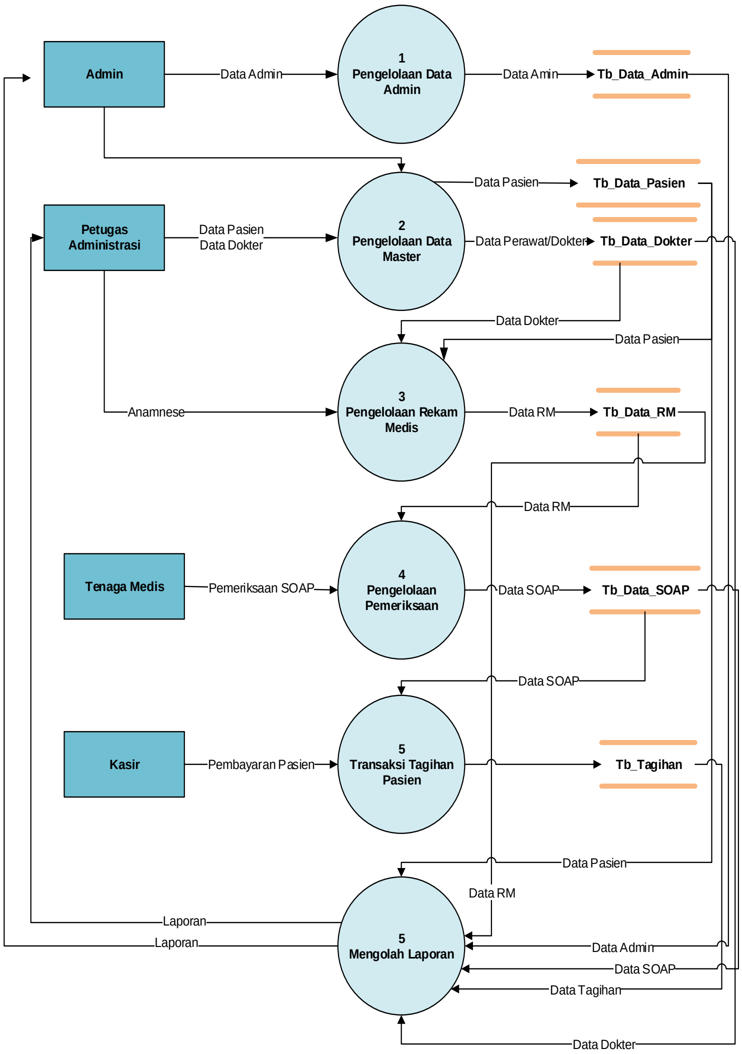

Figure 3. Data Flow Diagram

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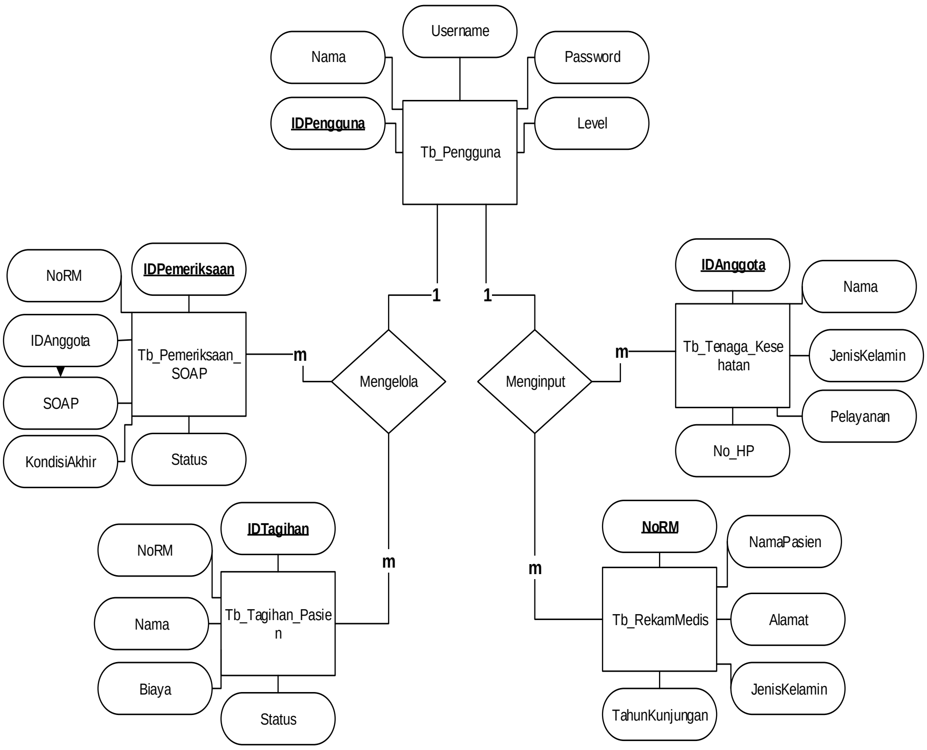

Figure 4. Entity Relationship Diagram

Figure 5 Login Display

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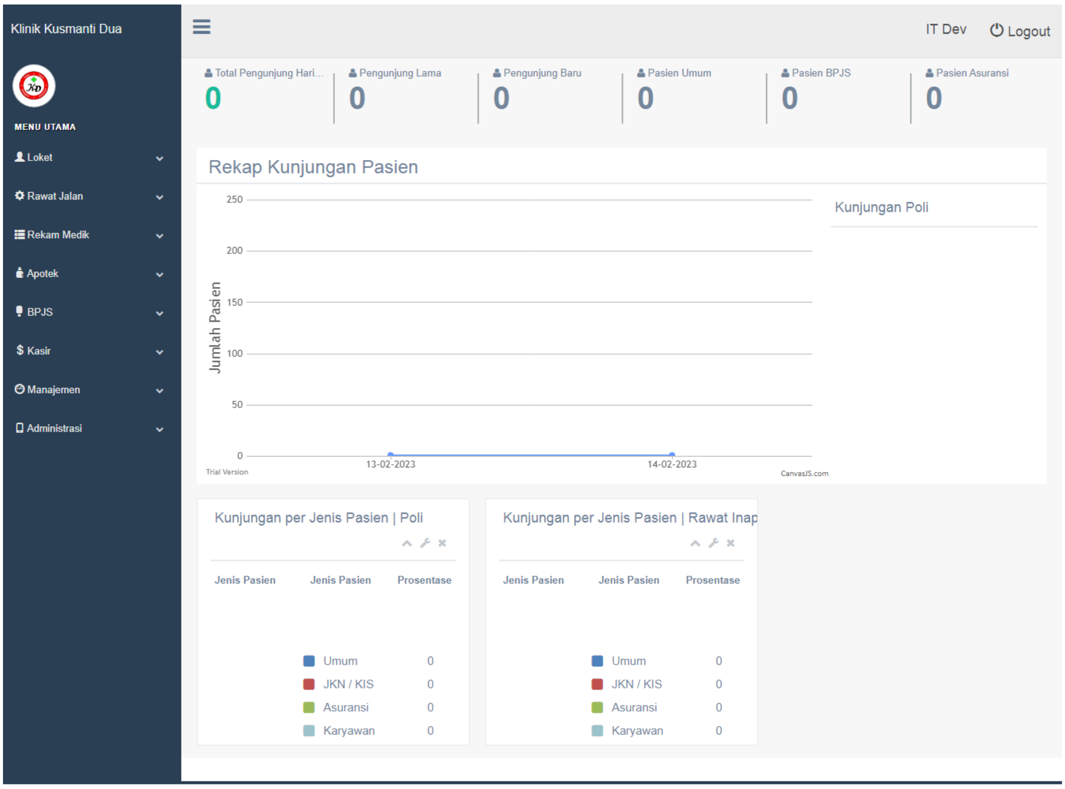

Figure 6. Display Dashboard

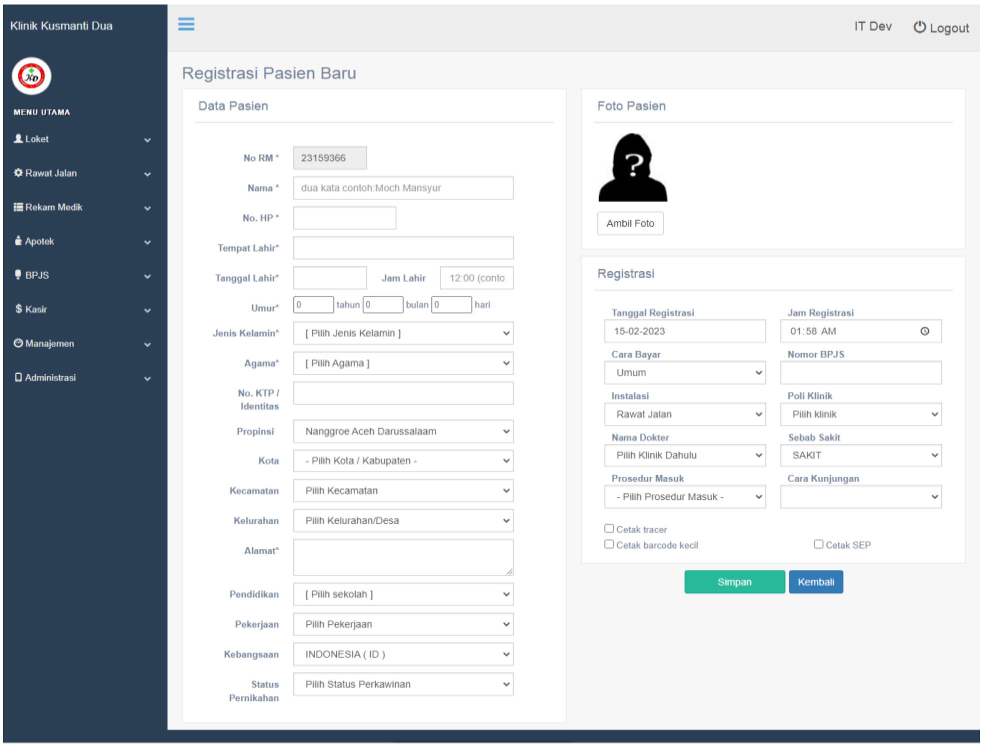

Figure 7. Display of Patient Registration

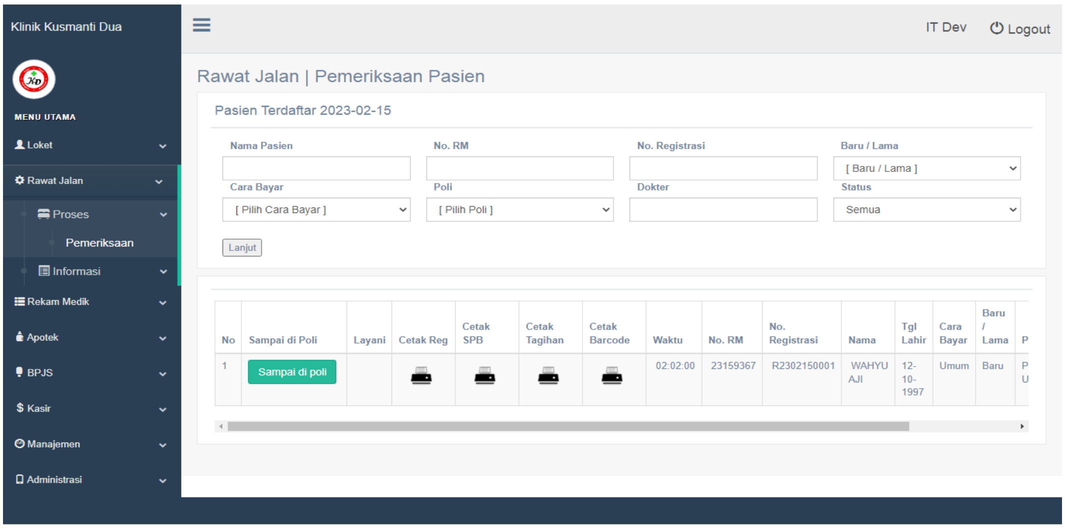

Figure 8. Outpatient view

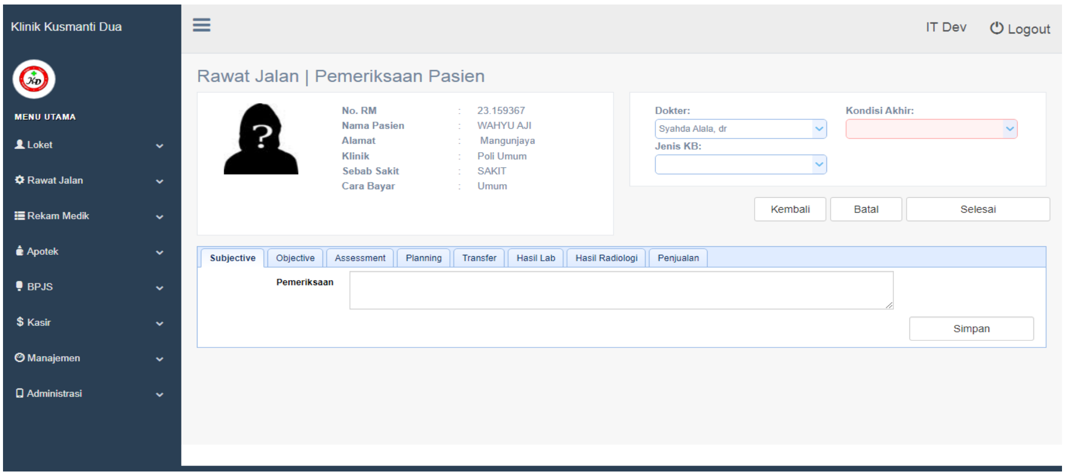

Figure 9. Display of General Poly Electronic Forms

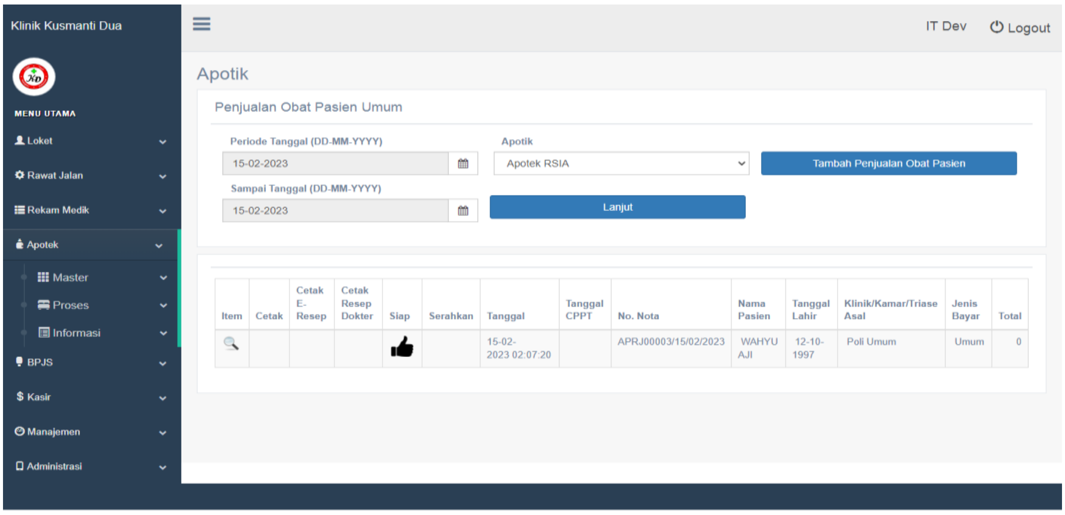

Figure 10. Display Pharmacy

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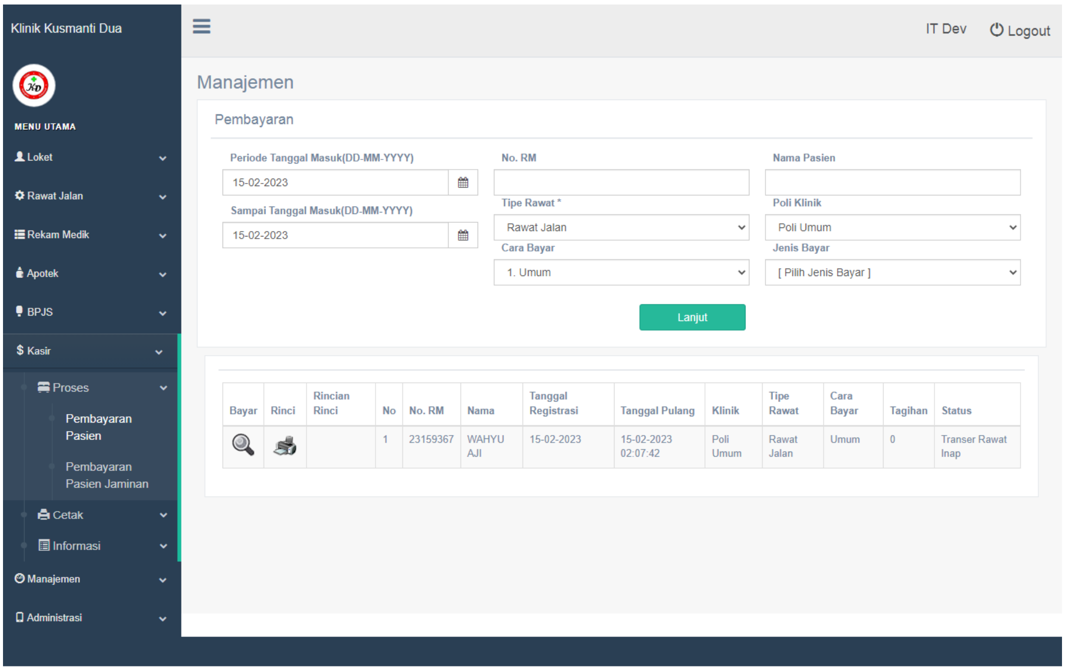

Figure 11. Display Cashier

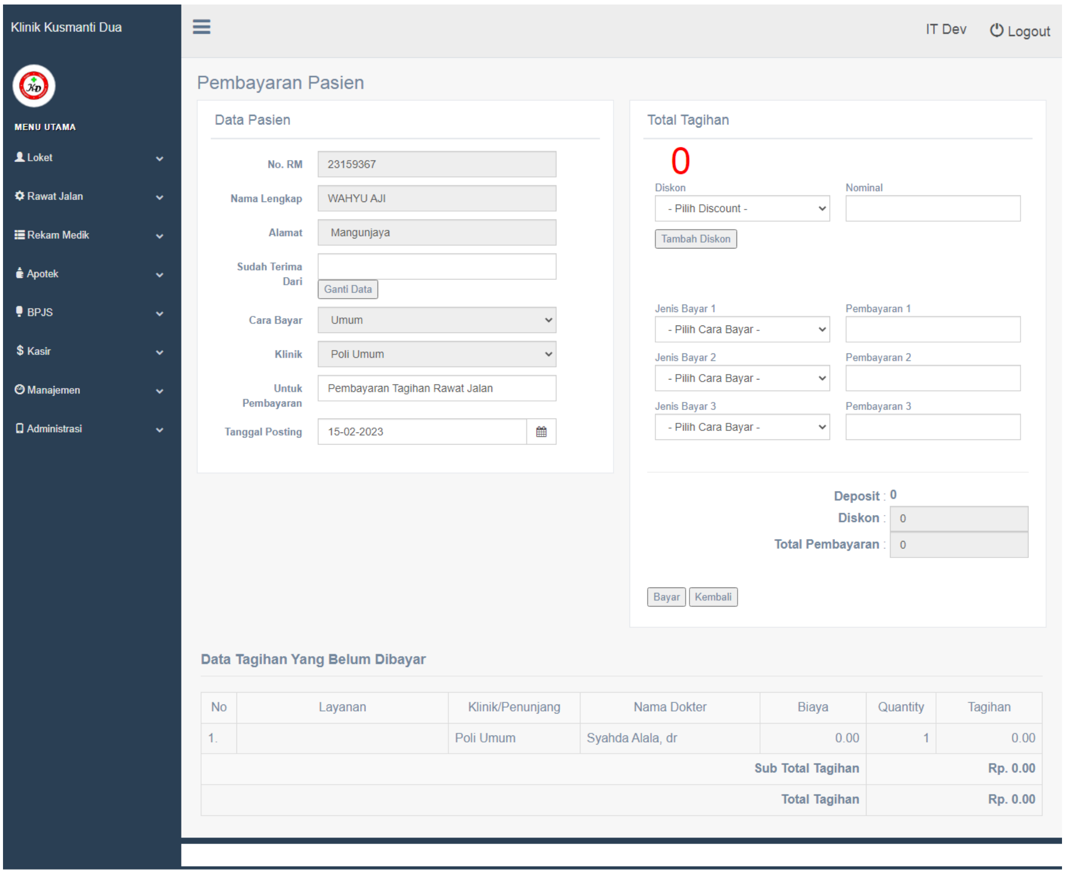

Figure 12. Patient Billing Form

d. Electronic medical record test using Blackbox Testing

Table 4. Testing Table on the User page Registration

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	The registrar can log in	Fill out the *login form* containing username and *password*	Nusa Medis Dashboard display	√
2.	Registration officers can add patient data	Click the counter menu, patient registration	Displays patient identification data	√
3.	Registration officers can display reports	Select the information menu, reports	The patient visit report page appears	√
4.	The registration officer can *logout*	Select the *logout menu*	*login* page appears	√

Table 5. Testing Table on the User page Nurse

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	Nurses can log in	Fill out the *login form* containing username and *password*	NusaMedis Dashboard display	√
2.	Nurses can fill out both subjective and objective forms	Click the outpatient menu, examination	Displays subjective and objective forms	√
3.	Nurse can *logout*	Select the *logout menu*	*login* page appears	√

Table 6. Testing Table on the User page Doctor

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	Doctors can log in	Fill out the *login form* containing username and *password*	NusaMedis Dashboard display	√
2.	I can fill in the doctor through the assessment and planning forms and the final condition of px.	Click the outpatient menu, examination	Displays assessment and planning forms	√
3.	Doctors can *logout*	Select the *logout menu*	*login* page appears	√

Table 7. Testing Table on the User page Pharmacist

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	Pharmacists can login	Fill out the *login form* containing username and *password*	NusaMedis Dashboard display	√
2.	Pharmacists are able to prepare medicine	Click the pharmacy menu, process	Shows the process of preparing and administering medication	√
3.	Pharmacists are able to monitor medication	Click the pharmacy menu, information	Displays the drug sales report form	√
4.	Pharmacists can *Logout*	Select the *logout menu*	*login* page appears	√

Table 8. Testing Table on the User page Cashier Officer

NO	Functionality	Test Scenario	Expected results	Conclusion
1.	The cashier can log in	Fill out the *login form* containing username and *password*	NusaMedis Dashboard display	√
2.	The cashier is able to settle patient bills	Click the cashier menu, process	Displays the patient payment form	√
3.	The cashier can *logout*	Select the *logout menu*	*login* page appears	√

4. Conclusion

From the method used using SDLC The results of this study are a cloud- based electronic medical record system that can be accessed from anywhere with an internet connection, with features such as tracking medical history, scheduling appointments, prescription management, and billing management. This system also has a high level of security to protect patient privacy and prevent unauthorized access. RME Nusa Medis tested its accuracy using the blackbox method from 24 respondents, consisting of lecturers, development partners, and students based on functionality and average success results in accordance function.

5. Reference

[1] R. J. Holden and B. T. Karsh, “The Technology Acceptance Model: Its past and its future in health care,” *J. Biomed. Inform.*, vol. 43, no. 1, pp. 159–172, 2010.

[2] Department of Health, "A policy on quality in health care for South Africa," *Dep. Heal. Repub. South Africa*, no. April, 2007.
[3] O. J. Anyango, "Investigating challenges to electronic medical record systems adoption : a case of coast province general hospital .," pp. 1–59, 2016.
[4] A. A. J, L. O. G, O. O. A, and O. T. A, "Electronic Health Records: Adoption and Challenges," *Adeleke Univ. J. Sci.*, vol. 1, no. 1, pp. 2814–0427, 2022.
[5] H. F. Al Otaybi, R. M. Al-Raddadi, and F. H. Bakhamees, "Performance, Barriers, and Satisfaction of Healthcare Workers Toward Electronic Medical Records in Saudi Arabia: A National Multicenter Study," *Cureus*, vol. 14, no. 2, 2022.
[6] N. A. bt N. Ariffin, A. bt Ismail, I. K. A. Kadir, and J. I. A. Kamal, "Implementation of Electronic Medical Records in Developing Countries: Challenges & Barriers," *Int. J. Acad. Res. Progress. Educ. Dev.*, vol. 7, no. 3, pp. 187–199, 2018.
[7] N. Wikansari and D. B. Santoso, "What Are the Barriers To the Implementation of Electronic Medical Records? a Review of Recent Studies," *J. Ris. Kesehat.*, vol. 11, no. 2, pp. 83–88, 2022.
[8] A. M. Shiferaw, D. T. Zegeye, S. Assefa, and M. K. Yenit, "Routine health information system utilization and factors associated thereof among health workers at government health institutions in East Gojjam Zone, Northwest Ethiopia," *BMC Med. Inform. Decis. Mak.*, vol. 17, no. 1, pp. 1–9, 2017.
[9] World Health Organization, "Strengthening health information systems," *Strength. Heal. Inf. Syst.*, pp. 1–4, 2017.
[10] Cholifah, R. Dijaya, A. S. Gracia, and U. K. Nisak, "Factors Influencing The Implementation of Electronic Medical Records (Remics) Based on Unified Theory of Acceptance and Use of Technology (UTAUT) in Sidoarjo Hospital," *Procedia Soc. Sci. Humanit.*, vol. 1, no. c, pp. 860–866, 2022.
[11] T. N. Sari, "Analisis Kualitas Dan Pengembangan Sistem Informasi Akademik Berbasis Web Menggunakan Standard Iso 9126," *JIKO (Jurnal Inform. dan Komputer)*, vol. 1, no. 1, pp. 1–7, 2016.
[12] K. Petersen, C. Wohlin, and D. Baca, "The waterfall model in large-scale development," *Lect. Notes Bus. Inf. Process.*, vol. 32 LNBIP, pp. 386–400, 2009.
[13] E. Pawan, R. H. . Thamrin, P. Hasan, S. H. Y. Bei, and P. Matu, "Using Waterfall Method to Design Information System of SPMI STIMIK Sepuluh Nopember Jayapura," *Int. J. Comput. Inf. Syst.*, vol. 2, no. 2, pp. 33–38, 2021.
[14] S. Herawati, Y. D. P. Negara, H. F. Febriansyah, and D. A. Fatah, "Application of the Waterfall Method on a Web-Based Job Training Management Information System at Trunojoyo University Madura," *E3S Web Conf.*, vol. 328, p. 04026, 2021.
[15] M. E. Khan, "D IFFERENT A PPROACHES T O B LACK B OX," vol. 2, no. 4, pp. 31–40, 2011.
[16] J. Purnama, D. Antoni, and M. Akbar, "Rapid Application Development Berdasarkan Iso 9126 Untuk Menciptakan Media Transparasi Informasi Pajak Bumi Dan Bangunan …," *Simetris J. Tek. Mesin …*, vol. 10, no. 2, pp. 639–650, 2019.
[17] M. C. Roziqin, A. D. A. Prameswari, A. P. Wicaksono, and V. Vestine, "Sistem Rekam Medis Elektronik Berbasis Web," *JOINTECS (Journal Inf. Technol. Comput. Sci.*, vol. 7, no. 3, p. 111, 2022.
[18] G. S. Mahendra and I. K. A. Asmarajaya, "Evaluation Using Black Box Testing and System Usability Scale in the Kidung Sekar Madya Application," *Sinkron*, vol. 7, no. 4, pp. 2292–2302, 2022.
[19] M. Sholeh, I. Gisfas, Cahiman, and M. A. Fauzi, "Black Box Testing on ukmbantul.com

Page with Boundary Value Analysis and Equivalence Partitioning Methods," *J. Phys. Conf. Ser.*, vol. 1823, no. 1, 2021.

[20] K. Mohd. Ehmer and K. Farmeena, "A Comparative Study of White Box , Black Box and Grey Box Testing Techniques," *Int. J. Adv. Comput. Sci. Appl.*, vol. 3, no. 6, pp. 12–15, 2012.

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ANALYSIS OF REMOTE CONTROL-BASED ONION SPRINKLERS FLOAT

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ABSTRACT

The design of the Portable Floating Water Pump Flush Machine for Red Onions Based on Rc-Remote Control is a portable flush tool to facilitate the work of farmers watering shallots the formulation of this final project problem, namely; (1) How is the design of the Portable Floating Water Pump Flush Machine for Red Onions Based on Rc-Remote Control? (2) What is needed for the manufacture of Portable Floating Water Pump Flush Machine for Red Onion Based on Rc-Remote Control? (3) How is the machining of Portable Floating Water Pump Flush Machine for Red Onion Based on Rc-Remote Control? The method used is identification of needs, design, tool making, testing, and product documentation. Data collection includes; design, manufacture, assembly as follows: (1) Analyzing the needs of the tool, (2) Designing the image first before making the product, (3) Making the product according to the design, (4) Testing whether the product passes or not, (5) Revisions are made if there is a lack of needs during the performance test.The conclusions of this final project are; (1) The work on the tool starts with designing using the Autodesk Fusion 360 application, (2) Materials for manufacturing, namely: bilge submersible pump, 12v battery, container box, rc boat module, pipe, plywood, potentiometer, voltmeter, on / off switch (3) The manufacture of this tool includes; plywood and pvc pip measurements, plywood installation, rc boat module, submersible water pump, potentiometer, voltmeter and battery in the container box.

Keywords: bilge submersible water pump, remote control-rc, product, tool.

1. INTRODUCTION

From 2018 to 2021, red onion consumption is expected to increase, even in 2021, it is estimated that red onion consumption will reach 876,479 tons. Based on data from BPS, it can be concluded that annual national consumption continues to increase. Even though national consumption continues to increase, there are several factors that influence shallot production to be less than optimal. Some of these factors are watering methods that still use traditional methods, namely by farmers taking water directly from water sources (drainage) or irrigation canals and pouring it in. . With this method, there are several weaknesses experienced by farmers, namely: firstly, it takes quite a long time for the watering process, secondly, the water requirement for the plants is not optimal because it is not evenly distributed during watering, thirdly, farmers need a large amount of money to provide sufficient water so that the onion plants remain stable. grows especially in the dry season and must be watered every day (morning and evening). The fourth is that farmers need more money to pay the wages of workers

watering shallots, namely IDR 80,000 per day per person and the fifth is that farmers feel more tired because they have to water. traditionally.
With this problem in mind, in the Final Project of students at the Indonusa Surakarta Polytechnic campus, I intend to create a product "Design and Build a Portable Floating Water Pump Watering Machine for Shallots Based on Rc-Remote Control." "which can simplify/lighten the work of farmers, it is also hoped that farmers will be more prosperous, increase shallot production, be more efficient in using water or costs and farmers' bodies will be healthier because they are not too tired when working on watering the fields, farmers' bodies will become healthier. healthy because you are not too tired from irrigating the fields

The biggest problem for shallot farmers is ineffective irrigation methods. From the background of the problem above, a problem can be formulated, namely: 1) What is the portable floating water pump washing machine with remote control for shallots? 2) What materials are needed to make a Shallot Rc Portable Floating Water Pump Dishwasher with Remote Control? 3) How does the Portable Rc-Remote Control Floating Water Pump Rinsing Machine work? 4) What are the performance test results of the Portable Rc-Remote Control Shallot Floating Water Pump Washing Machine?

Meanwhile, the objectives of this design are: 1) To find out the design and construction of a portable shallot water pump washing machine based on RC remote control. 2) Find out what materials are needed to make a portable shallot washing machine with an RC remote control based water pump. 3) To find out about making a portable remote control floating water pump washing machine for shallots. 4) To find out the final test results of the RC remote control based portable water pump weighing washing machine.

According to research from (Puspito, 2018) included in Mendeley entitled "design of onion sprinkling equipment using dc motors with renewable energy" aims to determine the performance results of portable submersible water pumps. The method used is the design and manufacturing method of the tool. The conclusions of this research are: 1) This shallot watering tool uses a solar panel with a capacity of 120 WP with a maximum panel current of 6.96 A which is used for the accumulator charging process which will be connected to a chopper boost and then connected to the load. 2) This onion sprinkler is supplied via a chopper boost of 36 Volts and the chopper boost itself is supplied from an accumulato of 12 Volts. 3) This tool can water shallots with an initial voltage of 11.1 Volts with a current of 6.09 A. This tool can work optimally if the chopper boost is turned to 100% and the current supplied is 1.79 A with a voltage of 35.3 V. 4) This tool can be applied directly by shallot farmers, but improvements need to be made to the accumulator storage system so that it can be used for a long period of time to make its use more effective.

According to (Yana & Wigraha, 2017) entitled "Design And Building Of A Water Pump Machine With A Recharging System" aims to determine the performance results of a portable submersible water pump. The method used is the method of designing and making tools. The conclusion of this research is that the experiment using this recharging system at 2000 rpm rotation of the water pump machine with this recharging system is capable of producing a current of 8 A and a voltage of 14 volts and is capable of sucking water from a depth of 4 meters with a water jet of 2.27 liters/minute

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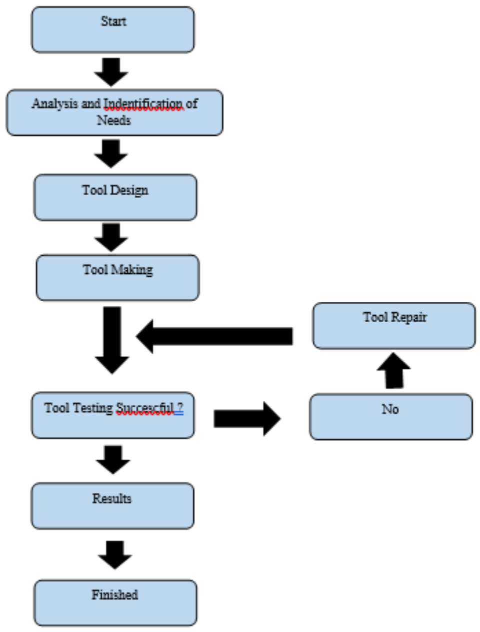
2. METHOD



In designing a portable floating water pump watering machine for shallots based on Rc-Remote Control, there are several paths that can be followed so that the tool can be made according to the plan, as follows:

1. Making tools begins by looking for references with tools that have been made previously from YouTube media and looking for weaknesses in the tools that have been made.
2. Analysis and identification of needs includes observing and researching existing tools as well as planning the form and function of the tools so that they are better than those that have already been made.
3. The tool design here includes the design/drawing of the tool to be made as well as the design of the materials to be used.
4. Tool making is the process of realizing the design of a tool that has been made previously.
5. Tool testing is the step of testing or testing the tool on the vehicle and this is the final step in making the tool. If the tool passes the trial, then the results of the tool can be used by partners, whereas if it has not passed the trial then there will be improvements to the tool.

The tools and materials needed to design a Portable Floating Water Pump Flushing Machine for RC-Based Shallots are as follows:

Table 3.1 Tool

No	Toll	Unit
1	Hacksaw	1
2	electric soldering iron	1
3	Glue gun	1
4	*Roll Meter*	1
5	Whitebord marker	1
6	Screwdriver plus	1

Table 3.2 Material

No	Material	Unit
1	Kontainer Box	1
2	Submersible water pump	1
3	Pipe ¾	1
4	Pipe connection T	1
5	Cepor	2
6	Modul *RC-Remote Control*	1
7	ACCU 12 V	1
8	*Voltmeter*	1
9	Potensio	1
10	Switch *on/off*	1
11	Cable	1
12	Plywood	1
13	Pipi 4”	1
14	Cork	1

The design of the Portable Floating Water Pump Watering Machine for Shallots Based on RC-Remote Control includes the depiction of a box container, submersible water pump, pipe with exhaust pipe, battery and RC-Remote Control module into one. Following are the design stages:

1. Design the container box, submersible water pump, pipe with exhaust pipe and RC-Remote Control module into one.
2. Design the layout of the container box, submersible water pump, pipe with exhaust pipe and RC-Remote Control module into one.
3. Manufacture of 2D and 3D container boxes, submersible water pumps, pipes with exhaust channels and RC-Remote Control modules into one

Design Concept, at this stage the concept of making a Portable Floating Water Pump Watering Machine for Shallots Based on Rc-Remote Control will be discussed. The initial concept that needs to be considered is knowing the design/drawing of the Portable Floating Water Pump Watering Machine for Shallots Based on Rc-Remote Control which will make the following stages easier.

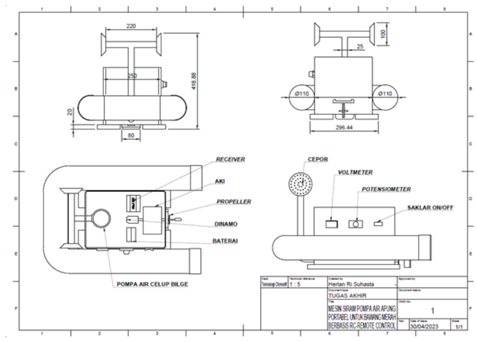
1. Design of a Portable Floating Water Pump Watering Machine for Shallots Based on Rc-Remote Control.
2. Preparation of the place for the manufacturing process
3. Prepare tools and materials
4. Tool design process
5. Tool work test results

3. RESULTS AND DISCUSSION

3.1. Design of a Portable Floating Water Pump Watering Machine for Shallots Based on Rc-Remote Control

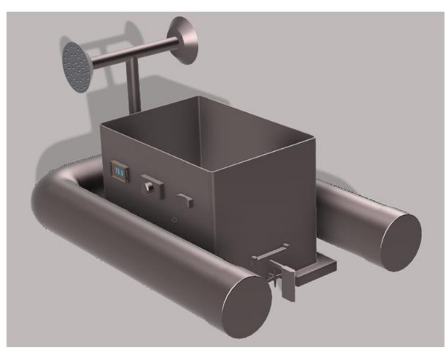
Autodesk fusion 360 is a cloud-based 3D, CAD, CAM, CAE and PCB modeling software platform for product design and manufacturing. To make it easier to make this tool or need a picture, therefore this 3D design functions as a view of the product that we will make, thereby simplifying the process of making a Portable Floating Water Pump Flushing Machine for Shallots Based on Rc-Remote Control. To make this tool, use the Autocad Fusion 360 design application which uses a container box measuring 35x26x20cm, a submersible water pump measuring 5.5x10cm, a battery measuring

11x7x9cm, an output pipe with a height of 30cm and a cap measuring 10cm, resulting in dimensions measuring 70x45x42cm.



Picture 4.1. Produck Design 2D

Information :
1. Receiver
2. Battery
3. Propellers
4. Dynam
5. Battery
6. Bilge submersible pump
7. Cepo
8. Voltmeter
9. Potentiometer
10. On/off switch



Picture 3.1. Produck Design 3D

3.2. Materials needed to make products

The materials needed are as follows:

1. Container Box
   This component is used as a holder for submersible water pumps, PVC pipes, RC-Remote Control modules, and batteries.
2. 1100 GPH Bilge Submersible Water Pump
   This component functions as a place to suck/channel water from below to the output/cepor channel.
3. 12V Dry Batter
   This component functions to provide the electricity source needed by the submersible water pump when operating.
4. RC-Remote Control Boat Module
   These components function to move the box container/as a controller for the box container when operating which can be controlled from a maximum distance of 150m.
5. Potensio Electric Sprayer Electric Water Pump DC 12V

This component functions as a regulator of the water flow that will come out of the submersible water pump into the output/cepor channel.

6. DC voltmeter
   A voltmeter is a measuring instrument that functions to measure the amount of electric voltage in an electrical circuit in certain quantities and units.
7. On/off switch
   An on/off switch is a device used to disconnect an electrical network, or to connect it.
8. ¾" PVC pipe
   This component functions to channel water from bottom to top/output channel.
9. Cepor / Spray
   This cepor/spray is used as a flush tool to produce water that spreads and condenses using a 3/4 inch connecting pipe (hose).
10. 4” pipe
    This component functions to keep the box container floating in the water and maintain the balance of the box container

3.3. Process of Making

1. The process of measuring 4" PVC pipe according to the specified size using an iron meter.
2. The process of cutting the 4" PVC pipe according to the specified size using a hacksaw.
3. Attach the L elbow pipe to the end of the pipe, then put a pipe cap on the other end, do the same thing on the second pipe, then connect the 2 pipes with a 20 cm long pipe through the L elbow.
4. Cut the plywood using a hacksaw according to the specified size which will be used as a battery holder.
5. After the plywood has been cut to the specified size, then install the battery holder in the container box and then install the battery.
6. Measure the cork using an iron meter according to the specified size, then it will be used as a bearing for the box container.
7. After the cork has been cut to the specified size, then attach the piece of cork to the bottom of the container box as a buffer using hot glue.
8. Then, at the bottom of the container box, a hole is provided as a place for the input channel for the submersible bilge water pump as well as a seat for the pump. After that, place the bilge submersible water pump in the hole, then apply hot glue to the sides so that water does not seep into the container box. Then also install the ¾” output pipe which is connected to the output channel of the bilge submersible water pump.
9. Then the next step is to make mounting holes for the voltmeter, potentiometer and on/off switch on the top side of the box container using electric soldering iron which has previously been made to size using an iron ruler. Then glue it using hot glue on the outside and inside of the container. box.
10. Install the receiver, dynamo and battery on the plywood holder by using hot glue as an adhesive and combined with bolts so that these components do not shift.
11. Connect the cables between receiver, dynamo, battery,
12. potentiometer, voltmeter, on/off switch, rear light, and bilge submersible water pump cable.
13. Install a 4" U-shaped pipe as a float, by applying hot glue to the sides and bottom so that it is strong/doesn't shake, then after that we paint the entire body to make it more durable and resistant to hot weather

3.4. How to Operate the Tool

1. Make sure all batteries are fully charged, including AA batteries in the remote, AA batteries in the receiver and the battery.
2. Connect/connect the port between the receiver's AA battery to the receiver port, then close the box container tightly.
3. Install the cepor on the output pipe.
4. Place the box container in the water and make sure the water sensor is exposed to water, so that the receiver can be connected to the Remote Control.
5. Turn on the on button on the remote for the signal synchronization process between the remote and the receiver, until you hear two sounds "tit...tit...." on the remote and the indicator light on the remote stops flashing as a sign that the remote and receiver are successfully connected
6. Set the propeller rotation speed and water control turning angle using the setting button on the remote.
7. Turn on the on switch on the box container.
8. Turn the potentiometer to the right to turn on the water pump and adjust the rotation speed of the water pump/current output by looking at the voltmeter.
9. Portable Floating Water Pump Watering Machine Tool for Shallots Based on Rc-Remote Control is ready to operate.

3.5. Tool Work Test Results

Picture 3.3. Tool Work Test Results

This RC-Remote Control Based Portable Floating Water Pump Watering Machine for Shallots was tested by knowing the ability to float, the range of the water jet through the cepor, the ability to turn when in the irrigation channel and leaks in the body which will be used as a benchmark for testing the tool. By using The 4 dim pipe as a float for the box container can function well because it has a cross-sectional area that is wide enough to hold the box container and its components. If we turn the potentiometer to the right until we get a current of 3 Amperes and it can be seen on the voltmeter, the amount of water that comes out is through. The cepor will emit a maximum of +/- 1 meter, by using the Remote Control you can set the water steering to be used when turning on the irrigation canal, after testing the irrigation canal three times there are no leaks in the body or float because it has been glued evenly and firmly .

4. CONCLUSION

Based on the results and discussion above, the final project with the title "Design of a Portable Floating Water Pump Flushing Machine for Shallots Based on Rc-Remote Control" can be concluded as follows:

1. The design of the Portable Floating Water Pump Watering Machine Tool for Shallots Based on Rc-Remote Control uses Autodesk Fusion 360 software covering all sizes with 2D and 3D designs with dimensions of 700x450x420mm.
2. The materials used to make the Portable Floating Water Pump Watering Machine for Shallots Based on Rc-Remote Control include: box container measuring 35x26x20cm, submersible water pump measuring 5.5x10cm, output pipe with a height of 30cm, 4" pipe with a size of 44x70 and a cepor size of 10cm, resulting in dimensions measuring 70x45x42cm.
3. The process of making this tool includes: the measuring process using an iron ruler and roll meter, the process of cutting materials using a hacksaw, connecting PVC pipes and box containers using hot glue and paralon glue, as well as the painting process using iron color paint.
4. This Rc-Remote Control Based Portable Floating Water Pump Watering Machine for Shallots was tested by determining the ability to float, the range of water jets through the cepor, the ability to turn when in the irrigation channel and leaks in the body which will be used as a benchmark for testing the tool. By using a 4 dim pipe as a float for the box container, it can function well because it has a cross-sectional area that is wide enough to hold the box container and its components inside. If we turn the potentiometer to the right until we get a current output of 3 Amperes which is visible on the voltmeter then the range the water that comes out through the cepor will radiate a maximum of up to +/- 1 meter, by using the Remote Control you can set the water steering to be used when turning on the irrigation channel, after testing three times on the irrigation channel there are no leaks in the body or float because it has been tested. glued evenly and firmly

REFERENCE

Aziz, M. S. (2014). Bab 3 Metodologi Penelitian Kualitatif. *E-Theses Universitas Islam Negeri Maulana Malik Ibrahim.*, 74–78. http://etheses.uin-malang.ac.id/1960/

James A. Hall, P. (2017). Rancang Bangun Knowledge Management Sistem Berbasis Web Pada Madrasah Mualimin Al-Islamiyah Uteran Geger Madiun. *Teknik Informatika Universitas Muhammadiyah Ponorogo*, 7–35. http://eprints.umpo.ac.id/3019/

Keinsinyuran. (2020). Pengertian Remote Control. In *Pengertian Remote Control*.

Niagamas. (2020). Pengertian Pompa Air. *Pengertian Pompa Air*, *59*.

Rachmawati, I. N. (2017). Pengumpulan Data Dalam Penelitian Kualitatif: Wawancara. *Jurnal Pengumpulan Data Dalam Penelitian Kualitatif: Wawancara*, *11*(1), 35–40. https://doi.org/10.7454/jki.v11i1.184

Salma. (2021). Studi Pustaka: Pengertian, Tujuan dan Metode. *Studi Pustaka: Pengertian, Tujuan Dan Metode*, 6.

Yana, D., & Wigraha. (2017). Rancang Bangun Mesin Pompa Air Dengan Sistem Recharging. *Jurnal Pendidikan Teknik Mesin Undiksha*, *5*(2). https://doi.org/10.23887/jjtm.v5i2.10872

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Perception Of Understanding About Tpack To Achieve The Sustainable Development Goal (SDGs): Quality Education By Vocational Teacher Candidates

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Abstract

One of the targets of the SDGs is that education must be supported by qualified, trained, and professional teachers. One of the concrete steps that need to be taken to achieve this goal is the preparation of prospective vocational teachers. Efforts to prepare prospective vocational teachers are carried out by increasing the understanding of TPACK. TPACK consists of Content Knowledge (CK), Pedagogical knowledge (PK), Technological Knowledge (TK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content knowledge (PCK). This study aims to measure the perceptions of TPACK understanding of students of the Electrical Engineering Education Study Program who are prospective vocational teachers. Measurements were carried out using a questionnaire containing statements about Content Knowledge (CK), Pedagogical knowledge (PK), Technological Knowledge (TK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content knowledge (PCK) and Technological Pedagogical. Content Knowledge (TPACK). The subjects of this study were 6th-semester students who had attended the Schooling Field Practice course consisting of 19 people. The measurement results show that the understanding of CK is in a good category, PK is in a good category, TK is in the very good category, TPK is in a good category, TCK is in a good category, PCK is in a good category and TPACK is in a good category.

Key words: *Perception, TPACK, SDGs, Vocational Teachers Candidates, Quality Education.*

1. Introduction

The urgency of Sustainable Development Goals (SDGs)-oriented learning at the higher education level is currently in the spotlight. The United Nations has made SDGs the most pressing public policy [1]. Education is one of the factors for the progress of a nation and a form of human capital for economic growth and sustainable development, following the background of the formulation of the SDGs (Sustainable Development Goals) [2]. The purpose of education is used as the basis for pushing the goals and targets of the SDGs program, one of which is by building the country through quality and proper education [3]. The teacher is one of the elements of education that is the center of development and innovation. This is in line with one of the targets in the SDGs which states that education must be supported by qualified, trained, and professional teachers. One of the concrete steps that need to be taken to achieve this goal is the preparation of prospective vocational teachers. Colleges that produce prospective teachers must continue to innovate to prepare their graduates. Along with current technological developments, prospective teachers are also required to master the use of technology in learning. As prospective teachers, they need to have ICT skills to support learning activities and create a fun learning atmosphere. Furthermore, the ability to use this technology is also needed to form professional teacher candidates [4]. This is in line with research which states that the use of technology in the teaching and learning process is inevitable to increase the efficiency of education following the development of information technology in the 21st century [5]. The synergy in the use of technology, pedagogy, and mastery of this material is known as TPACK or Technological Pedagogical Content Knowledge. TPACK has several elements in it namely Content Knowledge (CK), Pedagogical knowledge (PK), Technological Knowledge (TK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content knowledge (PCK) [6] .

Efforts to prepare prospective vocational teachers are carried out by increasing the understanding of TPACK. Learning for prospective teachers needs to be developed regarding TPACK and its application to improve the skills of prospective vocational teachers so that they can use technology to maximize learning in the era of the Industrial Revolution 4.0 [7]. Using TPACK as a basis for teacher preparation is an appropriate step. TPACK can be used to guide prospective teachers to deal with challenges that occur in learning due to rapid technological advances [8]. By 2030, all students are ensured to acquire the knowledge and skills needed to promote sustainable development through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and contribution culture for sustainable development [9], [10]. Here the teacher's role is very important in creating education following the SDGs targets.

Therefore, to prepare for this, the preparation of prospective teachers, especially vocational teachers, is very important.

The preparation of prospective vocational teachers starts with the implementation of various learning innovations in the classroom. Vocational teacher candidate students are required to have TPACK abilities. This is intended so that students can prepare for learning at school by current developments and demands. Students must be able to synergize material, pedagogical skills, and technology integration in learning. Students must be able to create effective and efficient learning following the current demands of the 21st century. One that is relevant to the needs of 21st-century life skills is creative thinking skills [11], [12].

2. Method

This research is a quantitative research using a survey method to explore the perceptions of prospective vocational teacher students in mastering technology through TPACK skills. Survey research is research in which data is collected using self-report, meaning that the parties studied are asked to report data about things that are in the respondent's self through instruments that have been tested for face validity and empirical validity through the Pearson correlation and reliability with Cronbach's alpha [11]. The instrument used in this study was a questionnaire containing TPACK elements, namely Content Knowledge (CK), Pedagogical knowledge (PK), Technological Knowledge (TK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content knowledge. (PCK) and Technological Pedagogical Content Knowledge (TPACK). The subjects of this study were students who took the Introduction to Schooling Field course, which consisted of 19 students. The questionnaire in this study uses a Likert scale which has five answer choices 1-5. The five answer choices are strongly agree, agree, moderately agree, disagree, and strongly disagree [13]. Questionnaires are given at the end of lectures or after students have completed their final assignment in the Introduction to Schooling Field course. This questionnaire has 35 questions. The grid of questions on the questionnaire can be seen in Table 1.

Table 1. Questionnaire grid

No.	Aspects that are measured	Statement number
1	Content Knowledge (CK)	1-5
2	Pedagogical knowledge (PK)	6-10
3	Technological Knowledge (TK)	11-15
4	Technological Pedagogical Knowledge (TPK)	16-20
5	Technological Content Knowledge (TCK)	21-25
6	Pedagogical Content knowledge (PCK)	26-30
7	Technological Pedagogical Content Knowledge (TPACK)	31-35

The results of filling out the questionnaire were then analyzed and interpreted. The interpretation for the questionnaire is presented in Table 2. [14].

Table 2. Interpretation

Coefficient	**Category**
$1 \leq Va < 2$	Very Not Good
$2 \leq Va < 3$	Not Good
$3 \leq Va < 4$	Good Enough
$4 \leq Va < 5$	Good
$Va = 5$	Very Good

3. Result and Discussion

The results of the questionnaire that was filled in by the respondents are presented in Table 3.

Table 3. Questionnaire Filling Results

Statement	Aspect	Value per item	average	Interpretation
1	CK	3.89	4.13	Good
2		3.74		
3		3.53		
4		4.58		

Statement	Aspect	Value per item	average	Interpretation
5		4.89		
6	PK	4.89	4.56	Good
7		4.47		
8		4.58		
9		4.47		
10		4.37		
11	TK	5.00	5.00	Very good
12		5.00		
13		5.00		
14		5.00		
15		5.00		
16	TPK	4.53	4.66	Good
17		4.63		
18		4.47		
19		4.84		
20		4.84		
21	TCK	4.63	4.63	Good
22		4.74		
23		4.47		
24		4.79		
25		4.53		
26	PCK	4.53	4.63	Good
27		4.53		
28		4.79		
29		4.68		
30		4.63		
31	TPACK	4.79	4.75	Good
32		4.79		

Statement	Aspect	Value per item	average	Interpretation
33		4.53		
34		4.84		
35		4.79		

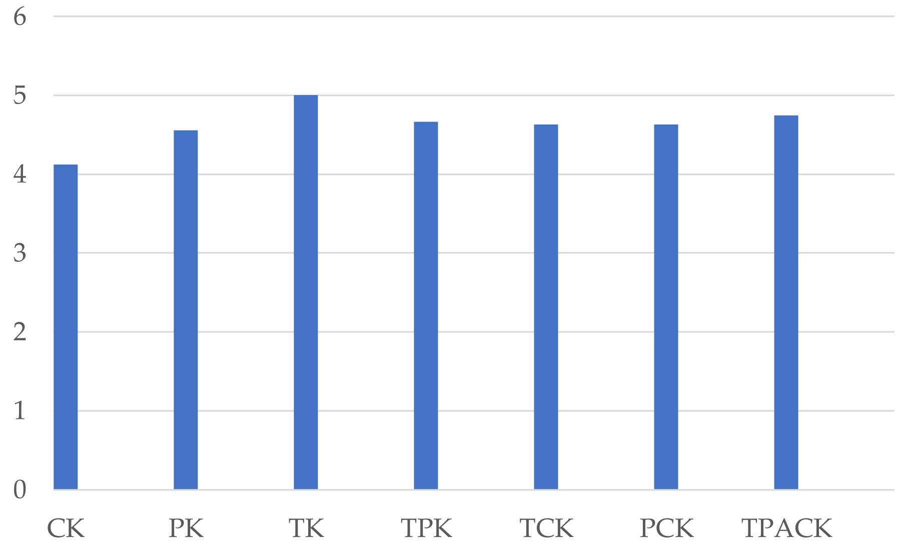

Figure 1. Graph of TPACK Perception Results

As seen in Table 3 and Figure 1 above, content knowledge ability has an average value of 4.13 and is included in the good category, pedagogical knowledge (PK) has an average value of 4.56 and is included in the good category, for technological knowledge (TK) has an average value of 5.00 and is in the very good category, for technological pedagogical knowledge it has an average value of 4.66 and is included in the good category, for technological content knowledge it has an average value of 4.63 and included in the good category, then pedagogical content knowledge (PCK) has an average value of 4.63 and is included in the good category, then for the last is the ability of technological pedagogical content knowledge (TPACK) which has a value of 4.75 and is included in the good category. Based on this data presentation, it can be concluded that prospective vocational teacher students have good TPACK abilities. Prospective vocational teachers who have TPaCK skills can integrate technology in the learning process according to learning materials and appropriate learning strategies according to student characteristics [15].

The value of technological knowledge (TK) has an average value of 5.00 and is in the very good category. Technological Knowledge (TK) is the prospective teacher's knowledge about what and how technology, software, or applications can be used for learning. TK also includes the ability to adapt and learn new technologies [16]. The ability to continue learning and find out about the latest technology that can be used in learning is very important considering that technology continues to develop very rapidly. For example, the development of software in learning, starting from PowerPoint, Lectora, Adobe Captivate, and Adobe Flash, until now Augmented Reality technology appears. This software can be used for the learning process [15]. The acquisition of high TK scores indicates that prospective vocational teacher students have very good knowledge of technology. This is in line with research which states that technology is a development that needs to be mastered by teachers [17].

Furthermore, based on the data above, the values of CK, PK, TPK, TCK, PCK, and TPACK are obtained which are in the good category. This shows that students have good pedagogical abilities and mastery of the material. In addition, students also can integrate technology into certain materials and can use technology in learning. Technological Pedagogical Content Knowledge (TPACK) is the teacher's ability to organize learning by integrating learning strategies and technology. This is what distinguishes the depth of competency mastery for each subject teacher. TPACK is an optimization of TK used in learning to integrate CK, PK, and PCK into a unified whole that can produce an effective, efficient, and more interesting learning process [15]. Mastery of TPACK is a very important skill for prospective vocational teacher students. This is in line with research which states that TPACK is very important for educators, prospective educators, and researchers to have as a theory and concept to measure the readiness of prospective teachers and teachers to teach effectively with technology [18]. Further, similar studies also mention that with TPACK capabilities, teachers can create innovative learning processes and quality learning [17]. Mastery of TPACK is certainly an indicator of the readiness of prospective vocational teachers to achieve the SDGs targets.

4. Conclusion

Based on the above data exposure it can be concluded that understanding is in a good category, PK is in a good category, TK is in the very good category, TPK is in a good category, TCK is in a good category, PCK is in the good category and TPACK is in the good category. Mastery of TPACK owned by prospective vocational teacher students is one of their assets in achieving the SDGs.

5. Acknowledgement

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6. References

[1] R. P. R. Haerani and E. Suhartini, "Analisis Kebutuhan Pengembangan Game Edukasi Online Untuk Meningkatkan Sustainability Literacy Pada Tema Perubahan Iklim," *Pendas : Jurnal Ilmiah Pendidikan Dasar*, vol. 9, no. 1, pp. 1792-1803, 2023.

[2] F. O. Manurung and H. Pujiastuti2, "Studi Kasus SDGs 4.4.1: Kemampuan ICT Mahasiswa Pendidikan Matematika dalam Mendesain Perangkat Pembelajaran 21st CLD," *Jurnal Media Pendidikan Matematika*, vol. 10, no. 1, pp. 109-118, 2022.

[3] A. O. Safitri, V. D. Yunianti and D. Rostika, "Upaya Peningkatan Pendidikan Berkualitas di Indonesia: Analisis Pencapaian Sustainable Development Goals (SDGs)," *Jurnal Basicedu*, vol. 6, no. 4, pp. 7096-7106, 2022.

[4] N. P. Wulandari, D. Novitasari, J. Junaidi and B. Baidowi, "Pandangan Mahasiswa : Pentingnya Kemampuan Information And Communication Technology (ICT) Bagi Calon Guru Matematika," *Jurnal Pendidikan Matematika Universitas Lampung*, vol. 9, no. 3, pp. 266-275, 2021.

[5] H. I. Yildirim and O. Sensoy, "Effect of Science Teaching Enriched with Technological Practices on Attitudes of Secondary School 7th Grade Students towards Science Course," *Universal Journal of Educational Research*, vol. 6, no. 5, pp. 947-959, 2018.

[6] M. Fahadi and M. S. H. Khan, "Technology-enhanced Teaching in Engineering Education: Teachers'," *International Journal of Instruction*, vol. 15, no. 2, pp. 519-541, 2021.

[7] D. Nurhadi, E. Purwaningsih, K. Masjkur and L. Nyan-Myau, "Using TPACK to Map Teaching and Learning Skills for Vocational High School Teacher Candidates in Indonesia," in *Proceedings of the 5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018)*, Bandung, 2019.

[8] Kazu, I. Yasar, Erten and Pinar, "Teachers' Technological Pedagogical Content Knowledge Self-Efficacies," *Journal of Education and Training Studies*, vol. 2, no. 2, pp. 126-144, 2014.

[9] N. Erlina, "Kesiapan Calon Guru IPA dalam Pengembangan Rencana," *Jurnal Pendidikan dan Pembelajaran Sains,* vol. 4, no. 2, pp. 142-150, 2021.

[10] K. Budiastra, H. Hartinawati, I. Ichwan and N. Erlina, "The Effectiveness of Blended Learning for New Generation Learning Materials to Train Science Process Skills," *SAR Journal,* vol. 4, no. 2, pp. 63-71, 2021.

[11] W. P. Sari and I. R. Mega, "Analysis of STEM Integrated TPACK Ability Prospective Elementary Teachers for Science Learning in Growing Edusciencetechnopreneur Values," *Cendekiawan,* vol. 5, no. 1, pp. 71-84, 2023.

[12] T. Andrews, "Bourdieu's Theory of Practice and the OECD PISA Global Competence Framework," *Journal of Research in International Education,* vol. 20, no. 2, pp. 154-170, 2021.

[13] Riduwan, Pengantar Statistika untuk Penelitian Pendidikan, Sosial,Ekonomi, Komunikasi dan Bisnis, Bandung: Alfabeta, 2015.

[14] N. Imansari, U. Kholifah and A. M. Sasono, "Evaluation of Programmable Logic Controller Training Implementation Using Kirkpatrick (4 Levels)," *SAR Journal,* vol. 6, no. 3, pp. 73-77, 2023.

[15] M. Sintawati and F. Indriani, "Pentingnya Technological Pedagogical Content Knowledge (TPACK) Guru Di Era Revolusi Industri 4.0," in *Seminar Nasional Pagelaran Pendidikan Dasar Nasional (PPDN)*, Yogyakarta, 2019.

[16] A. Rosyid, "Technological Pedagogical Content Knowledge : Sebuah Kerangka Pengetahuan Bagi Guru Indonesia Di Era MEA," in *Prosiding Seminar Nasional Inovasi Pendidikan*, Surakarta, 2016.

[17] B. Murtiyasa and M. D. Atikah, "Kemampuan TPACK Mahasiswa Calon Guru Matematika Pada Mata Kuliah Praktkum Pembuatan Alat Peraga Matematika," *AKSIOMA: Jurnal Program Studi Pendidikan Matematika,* vol. 10, no. 4, pp. 2577-2590, 2021.

[18] I. U. Nuha, M. A. Latief and N. Yuliati, "Analisis Technological Pedagogical and Content Knowledge (TPACK) Calon Guru PAUD Angkatan Tahun 2015 Di Universitas Jember," *Jurnal Edukasi,* vol. 7, no. 2, pp. 13-16, 2020.

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Deep Vocational Education Strategy

Facing The Era Of Society 5.0

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Abstract

Era Society 5.0 is a term that refers to the development of society which is colored by the wider and deeper use of digital technology. In this era, vocational education has an important role in preparing individuals to face the challenges and opportunities presented by technological advances. By conducting a literature study on the Society 5.0 concept and the analysis process using SWOT analysis, the strategies that need to be carried out in vocational education in facing the Society 5.0 era include; Enhanced digital skills including understanding of software and hardware usage, data analysis, cybersecurity, and application development. Increased adaptation to rapid technological changes such as artificial intelligence, the Internet of Things (IoT), and Robotics. Increasing understanding of the social impacts of technological developments, including realizing the social implications, ethics, and responsibilities attached to the use of technology. Development of multidisciplinary collaboration capabilities, namely combining knowledge and skills so as to create innovative solutions to complex problems. Development of entrepreneurial skills so that they can become innovators and drivers of change in an increasingly digitally connected society

***Key words**: Society 5.0 Era 5.0, Vocational Education, Skills, Entrepreneurship, Digital*

I. INTRODUCTION

The SDGs or Sustainable Development Goals are a set of goals that contain 17 goals and 169 targets which are global action plans used by UN member states to frame agendas and political policies for the next 15 years, which will be effective from 2016 to 2030. Sustainable Development Goals are things that have goals to eradicate poverty, reduce inequality and protect the environment aimed at everyone from policymakers, civil society, business, academics, and every individual.

In the Technical Guidebook for Developing Action Plans *for Sustainable Development Goals (TPB/SDGs, Bappenas)* that SDG 4 is "Ensuring inclusive, equitable and quality education, and promoting lifelong learning opportunities for all". By achieving SDG goal number 4, it is hoped that education will become the main engine for achieving sustainable development as a whole, reducing poverty, increasing employment opportunities, and improving the quality of life for people around the world.

Education has an important role in the development of the *Society 5.0* era, namely to advance the quality of human resources. Era *Society 5.0* is a term that describes the era of digital transformation that we are currently experiencing. Technological developments and global economic transformation have changed the demands of the job market. The changing needs of the labor market in the *Society 5.0* era are marked by rapid changes in technology and digitization in various sectors. Vocational education in this regard is developing in response to the industry's need for a skilled and competent workforce in fields such as information technology, health, engineering, hospitality, and others.

Society 5.0 emphasizes the importance of digital skills in the world of work, therefore vocational education must be able to integrate learning digital skills into its curriculum. In addition, vocational education must also provide an understanding of the concepts of innovation and entrepreneurship as well as the skills needed to develop and implement new ideas. Vocational education can support students in developing creative, critical, and collaborative attitudes to respond to change and create innovative solutions in a constantly changing work environment.

According to ***Irjus Indrawan et al (2020)*** so far, vocational education has received less attention and has become the second choice when continuing education. In general, the development of vocational education in Indonesia can be said to have not been fully implemented. There is an imbalance between the ideals of vocational education and reality, which refers to the difference between the expectations or ideal goals of vocational education and the existing real situation. In fact, several vocational education institutions are lagging behind in providing curricula that are up-to-date and relevant to technological and industrial developments, so that graduates are not always ready to face the challenges of the world of work. Many vocational education institutions, especially in remote areas or with limited budgets, may not have access to adequate facilities and equipment for effective training. Some vocational education institutions have experienced difficulties recruiting and retaining qualified teaching staff due to a lack of incentives or low salaries. According to ***Wargijono Utomo (2021)***, the unemployment rate for vocational education graduates can still be high due to a lack of coordination between educational institutions and industry, as well as a lack of compatibility between the skills learned and the needs of the labor market. Some groups in society still face accessibility barriers, such as the high cost of education, lack of information about vocational education opportunities, or social stereotypes about certain types of work.

Based on the above problems, there is an imbalance between the ideals of vocational education and reality, one of the efforts that can be made is to understand the challenges and strategies of vocational

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education in dealing with Society 5.0 by conducting a literature study on Society 5.0 and the analysis process using the SWOT analysis method is expected to find a strategy that can be used as a policy reference for the world of education in facing the challenges of Society 5.0.

THEORETICAL BASIS

2.1. *Sustainable Development Goals (SDGs)*

2.1.1 Definition of Sustainable Development Goals *(SDGs)*

According to ***Armida Salsiah Alisjahbana & Endah Murniningtyas (2018),*** The essence of sustainable development is the internalization of the impact of every social and economic action on the environment. This means that every social and economic activity needs to avoid/prevent or take into account its impact on environmental conditions so that the environment can continue to carry out its function to support life now and in the future.

The SDGs have "four pillars of sustainability", covering important aspects of sustainable development which include social, economic, and environmental. The four pillars are:

1. Sustainable Economy: Promote inclusive and sustainable economic growth, ensure decent employment opportunities, and promote innovation and sustainable consumption.
2. Social Sustainability: Improving the quality of life of society as a whole, reducing social and economic disparities, and increasing access to education, health, and other basic services for all people.
3. Sustainable Environment: Protect, restore, and maintain the sustainability of the earth's ecosystems, including conserving natural resources, reducing pollution, and dealing with climate change.
4. Sustainable Governance: Ensuring effective, inclusive, and accountable governance, and promoting public participation in decision-making related to sustainable development

2.1.2. Goals Sustainable Development Goals *(SDGs)*

The SDGs have goals designed to address various social, economic, and environmental problems facing the world today, as well as to improve the quality of human life as a whole. There are 17 SDGs goals that cover various aspects of human life and the environment, among others:

1. Zero Poverty: End poverty in all its forms and dimensions worldwide.
2. Zero Hunger: End hunger, achieve food security, improve nutrition, and support sustainable agriculture.
3. Good Health and Well-Being: Ensuring good health and promoting well-being for all people of all ages.
4. Quality Education: Ensure inclusive, equitable, and quality access to education for all.
5. Gender Equality: Achieve gender equality and empower all women and girls.
6. Clean Water and Sanitation: Ensure universal access to clean water and proper sanitation.

7. Renewable and Affordable Energy: Support universal access to affordable, reliable, sustainable, and modern energy.
8. Decent Work and Economic Growth: Achieve inclusive, sustainable economic growth and decent work for all.
9. Innovation and Infrastructure: Build resilient infrastructure, promote inclusive industrialization, and encourage innovation.
10. Reducing Inequalities: Reducing disparities between and within countries.
11. Sustainable Cities and Settlements: Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. Sustainable Consumption and Production: Reducing negative environmental impacts from consumption and production.
13. Action on the Climate: Take urgent action to address climate change and its impacts.
14. Life Underwater: Conserving and sustainably using marine resources for sustainable development.
15. Life on Land: Preserving and sustainably managing terrestrial ecosystems, forests, and biodiversity.
16. Peace, Justice, and Strong Institutions: Promote peaceful, inclusive, and just societies and strengthen effective institutions.
17. Partnerships for the Goals: Enhance ways to implement sustainable development goals through strong and inclusive global partnerships.

By achieving these SDGs goals, it is hoped that the world can move towards sustainability, equity and justice for all people, while also preserving the natural environment for future generations.

2.1.3. Purpose Benefits *Sustainable Development Goals (SDGs)*

The benefits of the SDGs are very diverse and broad, including:

1. Reduce poverty: The SDGs aim to end poverty in all its forms and everywhere. By reducing the number of poor people, the quality of life and social welfare will increase.
2. Health and well-being: The SDGs emphasize efforts to improve the health and welfare of the community. These goals include access to quality health services and improvements in the prevention and treatment of disease.
3. Inclusive and quality education: The SDGs are committed to providing inclusive, equal and quality education for all people. With better education, a more knowledgeable and creative society will be created.
4. Gender equality: The SDGs fight for gender equality and women's empowerment. By achieving this goal, women will have better opportunities in various fields and in their lives.
5. Clean water and sanitation: The SDGs aim to provide universal access to clean water and proper sanitation. This will help reduce the risk of disease and improve people's quality of life.

6. Access to sustainable energy: The SDGs advocate for universal access to affordable, reliable, sustainable and modern energy. This will increase productivity and quality of life in areas that currently lack access to adequate energy.
7. Environmental protection: SDGs seek to protect ecosystems and maintain biodiversity. Protecting the environment will provide long-term benefits to life on Earth.
8. Inclusive economic growth: The SDGs aim to achieve inclusive and sustainable economic growth. This means comprehensive and equitable growth, so that no sector of society is left behind.
9. Global partnership for sustainable development: The SDGs encourage global cooperation and partnership in achieving its goals. Cooperation between countries, the private sector, and civil society organizations will accelerate the achievement of the SDGs.

2.1.4. Adoption of Sustainable Development Goals (SDGs) in Education

The adoption of Sustainable Development Goals (SDGs) in the world of education is an effort to encourage sustainable and inclusive educational development. The SDGs provide a broad and comprehensive framework for addressing challenges in the education sector and promoting universal access, equity, and high-quality of education.

According to Armida Salsiah Alisjahbana and Endah Murniningtyas (2018) Access and equity in education: SDG 4 emphasizes the importance of ensuring inclusive, equal and quality access for all people to education. To achieve this, the government and stakeholders in the education sector need to work together to eliminate barriers such as education costs, gender discrimination, and access gaps between urban and rural areas. They should also develop policies that support children with special needs, migrants and other vulnerable groups to obtain an equal education.

Quality education: SDG 4 also emphasizes the importance of improving the quality of education. This includes improving the quality of teachers and educational facilities, developing relevant curricula, and innovative learning approaches. Governments and educational institutions need to invest in teacher training and development, and ensure that curricula and teaching methods reflect sustainable values and future needs.

Education for sustainable development: The adoption of SDGs in education involves integrating education for sustainable development into the curriculum and school activities. This means teaching students about concepts such as environmental protection, peace, gender equality, human rights, and social responsibility. Education must prepare students to become global citizens who are aware and responsible for the sustainability of this planet.

In the Guidebook for ***Building Partnerships (Bappenas 2021)*** Partnership and Collaboration: SDG 17 highlights the importance of cross-sectoral partnerships and collaboration to achieve sustainable development goals. In the context of education, this means involving various stakeholders such as the government, educational institutions, civil society organizations, the private sector, and the wider community. This collaboration can promote the exchange of knowledge, resources, and best practices to increase the quality and impact of education.

Research and innovation: Adoption of SDGs in education encourages research and innovation in efforts to improve sustainable education. Governments and educational institutions need to invest resources in research on continuing education and create space for new educational experiments and innovations. By adopting the SDGs in education, people can work together to achieve broad sustainable development goals and ensure that education becomes a powerful tool in creating a more sustainable, inclusive, and just world

2.2. *Society 5.0*

In the Discussion of Sulastri Harun (2021) Society 5.0 is a concept developed to describe a new stage in the development of human society that is influenced by technological advances and social transformation. This concept is still in the stages of exploration and growing understanding, and there is no clear agreement on its exact definition and characteristics. However, several thinkers and experts have come up with the idea of Society 5.0. One of the key concepts is that Society 5.0 will be characterized by a closer integration of people and technology, with a focus on higher social and human values.

Here are some backgrounds that may underlie the con:

1. Society 1.0: This era is marked by an agricultural-based society and centered on the local exchange of goods. Humans live in small groups with limited social interaction.
2. Society 2.0: The Industrial Revolution brought about major changes in society. Technological advances, such as the steam engine and mass production, led to urbanization and population growth of cities. Social interactions are becoming more complex, but technology is still separated from everyday life.
3. Society 3.0: Advances in information and communication technology (ICT) play an important role in connecting people around the world. The internet and social media are changing the way we communicate, work, and interact. This era is characterized by global connectivity and the rise of the digital economy.
4. Society 4.0: This era is defined by technological advances such as Artificial Intelligence (AI), big data, and the Internet of Things (IoT). Automation and digitization are creating major changes in industry and society. Human interaction with technology is deepening, but there is still a separation between the physical and digital worlds.
5. Society 5.0: This era is expected to see closer integration between humans and technology, where technology is not only a tool but also functions as a partner in everyday life. The focus will shift from efficiency and productivity to higher human values, such as empathy, creativity, collaboration,

6. and complex problem-solving. This era may involve the development of technologies such as augmented reality, virtual reality, more sophisticated robotics and brain-computer interfaces.

However, it is important to note that the concept of Era Society 5.0 is still at the stage of discussion and different interpretations. The definition and subsequent developments of Era Society 5.0 are still a topic of research and discussion among experts and thinkers.

2.3. Education in the Age of Society 5.0

One of the main pillars of Society 5.0 is education. In the context of education, Society 5.0 envisions a paradigm shift in the way learning and knowledge is imparted. Following are some aspects of education in the era of Society 5.0.

1. Inclusive and Lifelong Learning: Society 5.0 emphasizes the importance of providing inclusive education to people of all ages and backgrounds. It focuses on lifelong learning opportunities, enabling individuals to continuously acquire new skills and knowledge to adapt to the changing demands of the digital age.
2. Personalized Learning: Technology plays an important role in Society 5.0's educational approach. Personalized learning platforms and AI-based systems can analyze individual learning patterns and preferences, adapting educational content to suit the needs of each learner.
3. Blended Learning: Society 5.0 promotes a blended learning approach that combines traditional classroom teaching with online learning and digital resources. This integration allows for greater flexibility and accessibility in education.
4. STEAM Education: Science, Technology, Engineering, Arts, and Mathematics (STEAM) Education is increasingly important in Society 5.0. These areas are considered critical to driving innovation and addressing the complex challenges of the digital age.
5. Education for Sustainability and Social Good: Society 5.0 promotes education that emphasizes sustainability and social responsibility. This includes education on environmental issues, ethical use of technology, and global citizenship.
6. Emphasis on Soft Skills: While technology skills remain important, Society 5.0 recognizes the importance of soft skills such as critical thinking, creativity, adaptability, and emotional intelligence. These skills are seen as essential for success in a rapidly changing world.
7. Digital Literacy and Cybersecurity: Given the increasing reliance on technology, Society 5.0 emphasizes the importance of digital literacy and cybersecurity education to equip individuals with the skills necessary to safely navigate the digital landscape.

8. Collaborative Learning and Problem Solving: Society 5.0 encourages a collaborative learning environment, where students can work together to solve real-world problems and challenges. This approach aims to foster teamwork and a sense of community among learners.

2.4. Vocational Education

Vocational education or vocational education is a form of education that focuses on developing practical skills and theoretical understanding specific to a particular field of work or industry. The main objective of vocational education is to prepare students to be ready to enter the world of work with skills that are relevant and directly applicable.

According to Sarah & Talita Shafa Salsabila (2022) Vocational education has a close relationship with Society 5.0. Changing needs of the labor market: Society 5.0 is characterized by rapid changes in technology and digitization in various sectors. Vocational education must be responsive to the needs of this evolving labor market. Vocational education must ensure that students receive the relevant training and skills needed in this changing work environment. Society 5.0 emphasizes the importance of digital skills in the world of work. Vocational education must integrate digital skills learning into its curriculum, such as programming, data analysis, artificial intelligence, graphic design, and others. This will prepare learners with the skills necessary to contribute in a technology-driven work environment. Society 5.0 provides opportunities for rapid innovation and entrepreneurship. Vocational education should provide students with an understanding of the concepts of innovation and entrepreneurship as well as the skills necessary to develop and implement new ideas. Vocational education can support students in developing creative, critical and collaborative attitudes to respond to change and create innovative solutions in a constantly changing work environment. Society 5.0 emphasizes the importance of collaboration between education and industry. Vocational education must forge strong partnerships with relevant companies and industries to ensure that students receive training that is relevant to current industry needs. Through internships, co-op programs and other collaborations, students can gain practical experience and a deeper understanding of the real work environment. Society 5.0 also affects worker mobility. ***According to Lili Marlinah (2019)*** Technological changes and globalization create opportunities to work outside traditional geographical boundaries. Vocational education must prepare students with global mobility skills, such as the ability to adapt to different cultures, the ability to communicate in foreign languages, and an understanding of challenges and opportunities in a global work environment.

In order to face Society 5.0, vocational education must continue to develop a curriculum, teaching methods, and industry partnerships that are relevant. This will ensure that students gain the skills they need and are ready to face challenges and opportunities in a world of work that is impacted by digital transformation.

II. METHOD

In this research what is needed is literature literacy regarding concepts and knowledge that discusses Society 5.0 and SWOT analysis, it is also necessary to review the literature on Sustainable Development Goals, this is needed to find out the relationship between study materials.

The stages carried out in this research are

1. Identification of Problems & Formulation of Problems
2. Library Search/Literature Disbursement
3. Data Collection
4. Data Processing/Data Analysis
5. Delivery of Results

III. HASIL

4.1. Hubungan antara Society 5.0 dengan Sustainable Development Goals (SDGs)

Use of Technology for Sustainable Development Goals: Society 5.0 emphasizes the application of high technology to increase efficiency and productivity in various sectors, such as energy, health, transportation, and industry. By integrating this technology with the goals of the SDGs, it may be easier to achieve sustainable development goals in a more effective way

Inclusivity and Accessibility: One of the main principles of Society 5.0 is inclusivity, namely ensuring that the benefits of technology are accessible to all levels of society. This is in line with the aspirations of the SDGs which emphasize the importance of creating equal opportunities for all people without discrimination. By ensuring fair and equitable access to technology, it is more likely to increase well-being and reduce social inequalities

Innovative Solutions to Global Challenges: Society 5.0 seeks innovative solutions to complex problems facing the world today, such as climate change, rapid urbanization and health problems. This concept encourages the use of technology to create more effective and sustainable solutions in achieving the SDGs goals.

Use of Data for Decision Making: Society 5.0 relies heavily on the collection, analysis, and utilization of data. In the context of the SDGs, data obtained from this technology can be used to understand developments, monitor progress, and identify areas that require more attention to achieve sustainable development goals.

4.2. SWOT Analysis Results of the Vocational Education Strategy in Facing Society 5.0

SWOT analysis is a method used to evaluate the strengths, weaknesses, opportunities and threats of a strategy or plan. In the context of the Vocational Education Strategy facing Society 5.0, the following SWOT analysis can be considered:

Strength):

a. Focus on practical skills: Vocational education has the advantage of providing practical skills that are in line with the demands of Society 5.0 which tend to require a skilled and work-ready workforce.
b. ndustry connectivity: Vocational programs usually have close partnerships with industry, allowing students to gain first-hand insight into current needs and trends in the job market.
c. Program adaptability: Vocational education can be more responsive to changing market needs because it is more flexible in changing curricula and adapting training to technological and social developments.

***Weaknesses*:**

a. Social stigma: In some societies, vocational education is still considered less prestigious than academic education, so it is less attractive to potential students.
b. Limited scope of knowledge: Focus on practical expertise may limit the development of theoretical understanding and broader views.
c. Technological change: Vocational education must try to keep up with changing technologies to maintain their educational relevance and quality, however, it can also be a challenge as technology continues to evolve rapidly

***Opportunities*:**

a. Skilled labor demand: Society 5.0 will lead to a higher demand for skilled labor in various fields of technology, science, and industry.
b. Stronger industry partnerships: As Society 5.0 develops, employers will increasingly invest in collaboration with vocational education institutions to ensure that graduates have skills relevant to their needs.
c. Technology-based learning: Adoption of technology in vocational education can open up new opportunities for more interactive learning methods, such as simulation, augmented reality, and virtual reality

***Threats*:**

a. Automation and AI: Technological developments and automation can threaten the traditional jobs that are the focus of vocational education, so programs must stay abreast of trends and adapt curricula.
b. Competition with other education: In Society 5.0, there will be competition to attract students to many types of education, including online education and other programs that offer greater learning flexibility.
c. Lack of funds and resources: Vocational education requires investment in facilities, equipment, and skilled instructors. Lack of financial support can be an obstacle to expanding the program and improving the quality of education.

4.3. Vocational Education Strategy Facing Society 5.0

Based on the SWOT analysis, the strategies that can be used by vocational education in dealing with Society 5.0 include:

a. Enhanced digital skills: In Society 5.0, digital technologies are becoming an integral part of everyday life. Vocational education has an important role in improving students' digital skills. This includes understanding software and hardware usage, data analysis, cybersecurity, and application development. With strong digital skills, individuals will be better equipped to face the demands of jobs that are increasingly connected to technology.

b. Adaptation to technological changes: Vocational education needs to teach students to be able to adapt quickly to technological changes. Society 5.0 is marked by rapid technological advances, such as artificial intelligence, the Internet of Things (IoT), and robotics. Vocational education must provide knowledge and skills that are relevant to the latest technology and teach students to continue learning and keep abreast of changing technological developments

c. Understanding of social impacts: Vocational education in Society 5.0 must also encourage understanding of the social impacts of technological developments. Learners need to be aware of the social, ethical, and responsibility implications attached to using technology. They should be trained to consider aspects of sustainability, privacy and fairness in the context of the technology they use.

d. Multidisciplinary collaboration: Society 5.0 demands collaboration between different disciplines and sectors. Vocational education must prepare students to work collaboratively with professionals from various backgrounds. The ability to work in multidisciplinary teams will enable students to combine their knowledge and skills with others, thereby creating innovative solutions to complex problems.

e. Entrepreneurship development: Vocational education must also equip students with the entrepreneurial skills needed to face the challenges and opportunities in Society 5.0. They need to be trained in business idea development, risk management, creativity, leadership, and marketing skills. With these entrepreneurial skills, students can become innovators and drivers of change in an increasingly digitally connected society.

By understanding the SWOT above, parties involved in the vocational education strategy must take advantage of strengths and opportunities to overcome weaknesses and overcome existing threats. Flexibility, collaboration and adaptability will be key in responding to the demands of Society 5.0 and ensuring the success of future vocational education.

f. CONCLUSION

a. The reality of Society 5.0 leads to the achievement of the goals of the Sustainable Development Goals (SDGs)

b. The Vocational Education Strategy in dealing with Society 5.0 is to improve digital skills including understanding the use of software and hardware, data analysis, cyber security, and application development.

c. Increased adaptation to rapid technological changes such as artificial intelligence, Internet of Things (IoT), and Robotics.

d. Increasing understanding of the social impacts of technological developments, including realizing the social implications, ethics, and responsibilities attached to the use of technology.

e. Development of multidisciplinary collaboration capabilities, namely combining knowledge and skills so as to create innovative solutions to complex problems.

f. Development of entrepreneurial skills so that they can become innovators and drivers of change in an increasingly digitally connected society

g. BIBLIOGRAPHY

1. Sarah Renata, Talita Shafa Salsabila ”Implementation Of Society 5.0 In Education” 2022. Available: (PDF) PENERAPAN DASAR SOCIETY 5.0 DI BIDANG PENDIDIKAN (IMPLEMENTATION OF SOCIETY 5.0 IN EDUCATION) (researchgate.net)
2. Sulastri Harun, “Pembelajaran Di Era 5.0” (Pascasarjana Universitas Negeri Gorontalo, Prosiding Seminar Nasional Pendidikan Dasar) 2021 Avaliable https://ejurnal.pps.ung.ac.id/index.php/PSNPD/article/download/1074/771
3. Dr. Agus Sutarna, S.Kp., MN.Sc, Hadion Wijoyo, S.E.,S.H.,S.Sos.,S.Pd.,M.H.,M.M.,Ak.,CA.,QWP®, Dr (C). Irjus Indrawan, S.Pd.I., M.Pd.I, Bero Usada, S.Kom ”MANAJEMEN PENDIDIKAN VOKASI” , Banyumas 2020
4. Armida Salsiah Alisjahbana & Endah Murniningtyas ”TUJUAN PEMBANGUNAN BERKELANJUTAN DI INDONESIA: Konsep target dan Strategi Implementasi” Bandung 2018
5. Dokumen PANJA DPR RI tahun 2019-2020
6. Wargijono Utomo ”Paradigma Pendidikan Vokasi: Tantangan, Harapan dan Kenyataan” Jurnal Vol1 No.2, Desember 2021 Avalaible http://almufi.com/index.php/AJMAEE
7. Bappenas ” Kajian Indikator Sustainable Development Goals (SDGs)” , Jakarta: Badan Pusat Statistik, 2014
8. Bappenas PEDOMAN TEKNIS PENYUSUNAN RENCANA AKSI TUJUAN PEMBANGUNAN BERKELANJUTAN (TPB)/*SUSTAINABLE DEVELOPMENT GOALS* (SDGs) 2020
9. Lili Marlinah “Pentingnya Peran Perguruan Tinggi Dalam Mancetak SDM Berjiwa Inovator dan Technopreneur Menyongsong Era Society 5.0” Jurnal IKRA-ITH Ekonomika Vol 2 No. 3 Bulan November 2019

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DEVELOPING MODULE FOR COMPUTER SCIENCE STUDENTS' VOCABULARY MASTERY

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This development research aimed to develop a learning module for students of Computer Science, to determine the feasibility of the module, and to determine the students' response towards the module. This study used Research and Developmet (R&D. The module was developed based on the results of the research. The results of the feasibility of the module showed the following points: 1) The material expert and the lecturer of the Computer Science Department gave percentage of 69,63% which means that the developed module gets "B" score The media expert and the lecturer of Computer Science Department gave percentage of 75,3% which means that the developed module gets "B" score. The students of Computer Science Department through the questionnaire also gave positive response. It can be concluded that the module for Computer Science Department students is eligible and can be used as media to teach English.

Keywords : *Computer Science, Module, Research and Development*

INTRODUCTION

Vocabulary is knowledge of word and meaning. Vocabulary is all the words in a language that are familiar and used by someone to communicate with each other (Handayani), To own excellent vocabulary knowledge, it is beneficial to infer the meanings of an English sentence but a lot of learners think that memorizing English vocabulary is something difficult especially for long or infrequently used vocabularies (Harmon). There are four categories of vocabulary i.e. Listening, Speaking, Reading, Writing vocabulary. So, in English there are four skills that should be mastered, and each skill needs vocabulary mastery (Lewis in Tanto).

Learning vocabulary is fundamental to support the learners to master English. The students will understand paragraphs and texts better if they have good vocabulary. Teaching vocabulary is very important for all education level. One of them is Universitas Duta Bangsa Surakarta.. Computer Science faculty is one of faculties in Universitas Duta Bangsa Surakarta preparing the students to face the global world especially in business. They are four programs in this faculty namely: Information System or Sistem Informasi (SI), Computer Engineering or Teknik Informatika (TI), Network Computer Engineering or Teknik Komputer Jaringan(TKJ) and Informatic Managemet or Manajemen Informatika.

English for Computer Science is a teaching approach in order to achieve the goals or competence of the students to master English. The students of computer science department are expected to have competence related to the computer science field. Students who graduate from the department are expected directly to work. One of the ways to prepare them is by learning English. When the students are qualified, they will be able to apply for a job successfully. In teaching English to Computer Science department, a lecturer should have appropriate media to make the learning more interesting. One of media can be a module.

Module is relatively short self-contained independent unit of instructional designed to achieve a limited set of specific and well-defined educational objectives Meyer (in Lasmiyati), component of module consists of three parts, namely: introduction, contents, and end . The introductory section consists of cover, introduction, table of contents, guide for readers. The content section consists of the division of subject matter, each of which consists of several components: subtitles, student worksheets, material descriptions, and questions. The final section contains glossary and bibliography (Dasna et al). Module for Computer Science Department students is eligible and can be used as media to teach English (Kusumawati. et. Al).

However, during the learning, the researcher found some problems in the students of Computer Science Department, especially when learning English for Specific Purposes (ESP). The problems were: students lack vocabulary. Most of the students had relatively low learning motivation, and the students were difficult to translate the Computer Science terms into English. Furthermore, the students were difficult to learn English (ESP) because module used contains more general English.

Based on the problems identification above, the researcher choose to develop module as media instructional that can make students to practice and improve their vocabulary related to their study programme. By doing such a study, it is hoped that it can help students to learn English more easily and successfully.

RESEARCH METHOD

In this research, researcher developed module as learning media in the form of a vocabulary and relate it to sentence. The method used is research and development (Research and Development). Research and development is a research method used for a particular product and testing the effectiveness of the product. This development research refers to Borg & Gall research in the development of (Sugiono), which is adapted to the needs of researcher. Researcher have a limited time that is determined, so researcher choose eight of the ten stages but still include what will be studied according to the settings chosen so that researchers focus and can be completed immediately. Then the researcher simplifies the steps according to the needs and context of the research as follows:

1. Needs analysis, was carried out in this step to provide students with the appropriate learning needs and objectives.
2. Determine the specific material, after knowing the students' needs related to the design of supplementary materials, the next step was to determine the appropriate material and task that put in the product.
3. Design Product, In this step, the researcher designed the first draft of product developed.

4. Design validation. The process for assessing whether a new work design or a new product is rationally fit for use by invoking the judgment of experienced experts.
5. Design revision, product revised based on limited trial research.
6. Product testing, conducting limited trial.
7. Usage testing, Product revised based on limited trial results.
8. Dissemination and implementation for related purpose.

The subject of this research are, the lecturer of Computer Science Department of Universitas Duta Bangsa Surakarta (to provide input on the materials used), material experts, media experts, the English lecturers and the second semester students of Computer Science Department of Universitas Duta Bangsa Surakarta amounted to 22 students. To get the data, these followings thing were used:

Questionnaire

The instruments used in this research and development includes student needs questionnaires and student satisfaction questionnaires for the second semester of information system. This questionnaire about student needs was used to collect information about student responses to develop vocabulary. This questionnaire contains a statement of students' needs for vocabulary by filling in the statement column. While the student satisfaction questionnaire was used to obtain data on student satisfaction after using the product. However, before the questionnaire was given to students, the questionnaire was validated first by the instrument validator. The students' response towards the module of English for ComputerScience were taken from 22 students who filled the questionnaire containing 20 questions. The answer from these students were categorized into: 1 = *disagree*,2 = *less agree*, 3 = *hesitate*, 4 = *agree*, 5 = *strongly agree*. *Agree* and *strongly agree* answers are considered positive. Meanwhile, *disagree, less agree*, and *hesitate* answers belong to negative response. The percentage of students' response is calculated using the formula below:

$$\%P = \frac{F}{N} x 100\%$$

Legend:
$\%P$ = percentage score
F = frequency
N = total number of respondents

The student's response is said to be positive if the average percentage of student responses is greater than or equal to 60%.

The following table shows the frequency distribution of respondents response to the product:

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Table 1: The frequency distribution of respondents response to the product

Category response	Category score
Very Positive	80-100 %
Positive	60 – 80 %
Negative	40 – 60 %
Very negative	20 – 40 %

Interview

Interview is conducted to obtain information about vocabulary used previously. And to know the extent of the students interest in learning English. Interview is also used as guidelines for asking the material to be summarized in the Module vocabualry. The alternative answers using the Likert Scale provided for the media feasibility questionnaire with 5 alternative answers, which are very good, good, fair, less, poor.

Validation

Validation is a measure that shows the level of validity or authenticity of an instrument. Valid instruments have high validity and low validity for instruments that are less valid. (Arikunto, 2010) instrument validity test is intended to achieve accurate measurements. (et al, 1966) say a product is said to be true if it can calculate what it should count. Product validation is carried out to assess whether vocabulary developed and learning is valid or not. The product validity test is carried out by a team of experts consisting of material experts and media experts.

Reliability

Data analysis techniques used to analyze the result of validation is to calculate the final value of the item in question. The following formula calculates the average value. According to (Arikunto, 2010), reliability is then interpreted using the percentage of results that can be calculated using the following formula:

$$P = \frac{\Sigma x}{\Sigma xi} \times 100\%$$

Information:
P = Eligibility
ΣX = Number of assessment answers
ΣXi = Highest number of answers

Table 2: The percentage analysis eligibility criteria for expert validation, lecturer responses and students.

No	Percentage (%)	Eligibility Category
1	< 21 %	Very improper
2	21 - 40 %	Less feasible
3	41- 60 %	Decent enough
4	61-80 %	Feasible

FINDING AND DISCUSSION

The researcher identified the need for vocabulary in learning for lecturers and students. Identify the need for vocabulary by giving questionnaires to students and conducting interviews with lecturers from Universitas Duta Bangsa Surakarta. The purpose of conducting this analysis is to assist lecturers in the teaching and learning process so that the difficulties experienced by students can be overcome by using learning media that will be developed by researchers. Questionnaires and interviews were conducted on lecturers and students of Informatic Management at the second grade in the academic year 2022/2023.

To know the eligibility of the developed modules, it was done through some validation processes by some experts. Product appropriateness validation for a module was done by a material expert, media expert, and lecturers of Computer Science Department. After that module revision process was done with the students of Computer Science Department. The result of this process was the decision whether the module is worth to test in the field or not. After that, the module was implemented among the Computer Science students of the second semester. Field trials were conducted with 22 students. The researcher introduced the module, explained the contents of the module, then explained the benefits of modules for learning of Computer Science subject. After that, the researcher did practice teaching to the students. The students looked enthusiastic when learning English using the module.

After learning using the module, the students assessed the module through a questionnaire. The researcher provided questionnaires containing 20 questions to 22 students. The questionnaire used Likert scale of 1-5. This functions to obtain the data of the students interest towards the module. Based on the questionnaire response it showed that the module, which was developed under aspects of vocabulary and then use them to make sentences got students' positive response.

To know the students' response towards the module, it was done through interview. The interview results showed that the students were interested and more motivated in following the lesson by using the English module. In addition, the students informed that the English module made the learning interesting. In sum, the results of the interviews showed that the students gave positive response towards the use of module during the learning process.

Expert Judgment

a. Media Expert Validation Result

Media that has been finished and approved by the supervisor, then brought to the expert forassessment. The media is validated by two experts, namely media experts and material experts.

Table 3. Media expert validation results

Criteria	Score	Max score	Percent	Category
Graphic Feasibility aspect	25	44	69,63%	Feasible

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The media expert validation result table gives the results of the validity of the learning media andshows a presentation of 69.63% and can be categorized as feasible.

b. Learning Expert Validation Result

Table 4. Learning expert validation results

Score	Max score	Percent	Category
4	37	75,3 %	Feasible

On the table learning expert validation results give the results of the validity of the learning material and shows a presentation of 75.3% and can be categorized as feasible.

The Try-Out

Learning media product testing activities generate data on the effectiveness of the learning media used. Exercises are carried out by giving tests to students according to the material being tested. It is known that from the test scores with a total of 22 students all completed 100%. It is indicated that the learning media received are in accordance with what is expected score.

Revision

The media expert gives suggestion from the product. The suggestion can be seen in the table below:

Table 5. Revisions from media experts

Suggestion	Revision
Additional learning objectives	Learning objectives been added
Give more detail materials related to computer and technology	Detail materials related to computer and technology have been added

Revisions are made on the advice of media experts who have validated this product.

CONCLUSION

Based on the results of the research, it can be concluded that the module of ESP for students of Computer Science Department of Universitas Duta Bangsa Surakarta is eligible and therefore can be used for English learning media. However, it is suggested that the next researches can be focused on developing English materials for Computer Science which specializing in other skills, such as listening, writing, speaking, and reading.

BIBLIOGRAPGHY

Arikunto, S. (2010). *Prosedur Penelitian Suatu Pendekatan Praktik*. PT. Rineka Cipta.Dasna, Parlan & Rita Susilawati.(2006). Pengembangan Bahan Ajar Kimia SMP untuk Pengajaran Materi Bahan Kimia Rumah Tangga. *Jurnal Pendidikan dan pembelajaran* 13 (2): 197-208.

Handayani. (2007). *Look Ahead an English*. Jakarta:Erlangga.

Harmon, J. M. (2002). Teaching independent word learning strategies to struggling readers. Journal of Adolescent & Adult Literacy, 45(7), 606–615.

Kusumawati, F. P., Darmawan, S. L., Latifah, S. (2018). Developing English For Specific Purposes (ESP) Module For Computer Science Students Vocabulary Mastery *English*. Language Teaching Educational Journal, *1*(1), 13-21.

Lasmiyati.(2014).*Pengembangan Modul Pembelajaran untuk Meningkatkan Pemahaman Konsep dan Minat SMP*. Universitas Muhammadiyah Surakarta.Sugiono. (2017). *Metode Research & Development*. Alfabeth.

Tanto, Fahri. (2014). *Developing English Learning Material for Vocabulary Mastery Based on Word Games Technique at First Semester of Eleventh Grade of Senior High School*. Universitas Muhammadiyah Metro.

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Identification Of The Meaning Of Apem Products At The Wahyu Kliyu Festival As The Embodiment Of Local Wisdom Values Of Cultural Tourism In Karanganyar Regency

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ABSTRACT

Dynamics of tourism have made several regions in Indonesia start competing to develop tourism potential in their regions, including Karanganyar district. In the Karanganyar area, there are also many cultural tourism based on local wisdom, especially in the Kendal Jatipuro with the Wahyu Kliyu festival. The method in this study used a descriptive analysis method, where for the descriptive analysis method, data was collected through interviews by taking several sources, both the head of Kendal Jatipuro , community leaders in Kendal hamlet and also from the Karanganyar district tourism office. The results of the research here state that the identification of the meaning of apem products at the Wahyu Kliyu festival as an embodiment of the implementation of local wisdom in cultural tourism depends on several factors, namely having legendary folklore in a strong society, having unique product values, having a strong cultural base, having participation from the local community, and has its own charm in commemorating the Hijriah new year in Kendal Jatipuro, Karanganyar district.

Keywords: *Meaning Identification, Wahyu Kliyu Festival, Cultural Tourism Wisdom*

1. Introduction

The quite dynamic dynamics of tourism have made several regions in Indonesia start competing to develop tourism potential in their regions, including Karanganyar district. In the Karanganyar area, there are also many cultural tourism based on local wisdom, especially in the Kendal Jatipuro village with the Wahyu Kliyu festival. Wahyu Kliyu itself is a ritual of countering reinforcements that is carried out by villagers in Jatipuro by making apem and throwing apem made in the Wahyu Kliyu traditional ceremony. So it can be said that every family in Kendal Jatipuro village is obliged to donate apam which is handed over to the traditional ceremony committee and the residents throw their homemade apam one by one to the place provided by the traditional ceremony committee by reading Bismillah and then saying Wahyu Kliyu.

Seeing this, it is implied that with this traditional ceremony, it indirectly attracts public attention and indirectly it can also be developed into a cultural tourism attraction. As stated above, of course there are economic activities that occur there, although not as big as well-coordinated tourist attractions. One of the objects that should be developed into an economic value in Kendal Jatipuro village is the apem cake, where in traditional rituals, apem cake is a means of carrying out traditional processions. So in the discussion of this article, we will review the background of the Wahyu Kliyu tradition in Kendal village, Jatipuro, in which it explains the identification of the meaning of this tradition, starting from folklore that is legendary in a strong society, has unique product values, has a strong cultural base, has participation from the local community, and has its own charm in commemorating the Hijriah New Year in Kendal Jatipuro village, Karanganyar district.

To explain this context, cultural communication both verbally and visually will be used in explaining the identification of meaning in the Wahyu Kliyu tradition. In terms of verbal, namely language that cannot be separated from the influence of communication in it, verbal language includes spoken and written language, while the output components of verbal language are sound or sound and writing or graphs. Visual interaction is non-verbal language which includes gestures, body language such as head movements, bodies, colors, and material objects, someone's gaze, etc. (Kusuma & Nurhayati, 2019) Humans carry out daily social activities by sending and receiving messages that can be transmitted through written or spoken communication, and various types of telecommunication. There is also what is referred to as audio, which is sound or sound produced by the vibration of an object. Everything that can be captured by the sense of hearing is audio. In this case, audio usually functions to complement the communication process, where audio is able to assist in conveying the contents of the message to make it more memorable. A communication if it consists of visuals, verbal, and is supported by the presence of audio, of course, it will be easier to convey messages and create a separate atmosphere. Ways of thinking, ideas and even hopes associated with ways of thinking are symbols in communication. In addition, norms and perspectives in society are also symbols. Semiotics, as explained by Ferdinand de Saussure in (Long, 2018) Course in General Linguistics, is "the study of the role of signs as part of social life. Semiotics is a science that studies the structure, type, typology, and relations of signs in their use in society. There are a number of applied fields of semiotics. In a sense, semiotics can be used for many applied fields that are not limited, starting from mass media reporting, advertising communications, nonverbal signs, films, comics, literature, music, to culture. (Hernández-Mogollón et al., 2015)

A tradition that is maintained from generation to generation can also influence tourism development opportunities in the area. This was explained by Nabillah et al, in explaining his research in Jambangan village. Kampung Jambangan is transformed into a village that is clean and aware of the method of sorting waste in which the waste can be reprocessed in the form of various kinds of crafts that can be useful so as to generate income for its residents (Nabillah et al., 2022). More than that, the progress of Kampung Jambangan can be seen from the presence of a culinary tour whose uniqueness has become an attraction for tourists. The uniqueness of the culinary tour that is served by Kampung Jambangan can be seen from the packaging, the form of food served, the types of food that are traded, to the ambiance of places to eat in Jambangan culinary tourism which is often the destination for tourists to visit this place.

To seen from other research, namely the Research of Sukerti, Marsiti, and Suriani in (Ida Bagus Ketut Soma Antara, 2022) which discusses the reinventarization of traditional Buleleng food, Sunada in (Christiawan et al., 2014) which discusses the potential and involvement of the community to attract culinary tourism, then research from Kurniawan in (Rizka Ayu Setyani, Fika Lilik Indrawati, 2021) which discusses the potential of culinary tourism in developing tourism in Yogyakarta, and Har there and Widayati (2009) regarding tourist perceptions of culinary tourism in Sleman. Research conducted by Sukerti et al in (Nabillah et al., 2022) entitled "Reinventory of Traditional Buleleng Food as an Effort to Preserve Balinese Culinary Arts" aims to obtain a strategy for reinventing traditional

Buleleng food as an effort to preserve Balinese culinary arts. Research by Sukerti et al in (Nabillah et al., 2022) which only discusses traditional food inventories, another study, namely Sunada in (Christiawan et al., 2014) examines "The Potential of Community-Based Traditional Balinese Food as a Tourist Attraction in the Gianyar Public Market". Sunada's aim is to find out the gastronomic potential, examine the efforts made by the market manager, and to find out the extent of the local village community's involvement in the development of traditional Balinese food which is sold at the Gianyar Public Market. Then, research from Agustina in (Ida Bagus Ketut Soma Antara, 2022) examines the Potential for Culinary Tourism and Tourist Characteristics in West Kotawaringin Regency. The results of his research are that culinary tourism in West Kotawaringin Regency can be mapped into 8 (eight) areas, namely Mendawai, Sidorejo, Raja, Madurejo, Kampung Baru, Pasir Panjang, Kumai, and Kubu. Research that also discusses culinary potential is from Kurniawan in (Rizka Ayu Setyani, Fika Lilik Indrawati, 2021), regarding "Culinary Tourism Potential in Tourism Development in Yogyakarta", showing that culinary tourism has potential in Yogyakarta tourism development. The Yogyakarta government continues to strive to develop culinary tourism, one example of which is the holding of the 10th annual Traditional Food Festival (FMT).

Apem itself uses the ingredients/obo rampe in various types of offerings. The offerings using Apem cakes are unique in each region according to the beliefs and traditions of the local community. For the people of Blora, Central Java in (Nurhayati et al., 2016) Apem is known as Pasung cake, which is used to welcome the harvest season called "Gas Deso" or Earth Alms. This tradition is intended to honor Dewi Sri who gave a gift in agriculture. Keu Apem, known as Pasung cake, is used not as a means of death ceremonies, but to be presented to God who manifests as Dewi Sri as an expression of gratitude for an abundant harvest.

For the people of Cirebon, the Apem cake is used at the Ngapeman event. This event is a tradition of the people of Cirebon to ask God for waranugra to be given safety. Likewise the people of Gunung Kidul, Special Region of Yogyakarta, Apem is a cake which, apart from being used for culinary offerings, is also used as a means of ceremonies such as the

Grebek Sawal and the Request for Rain ceremony (Sujaelanto, 2019). The ceremony of asking for rain is held in every Punden (punden=sacred place/petilasan). This ceremony is held by the farming community to ask for a change of season, either from the dry season to the rainy season and or vice versa by using apem dilute (apem given diluted sugar). The ceremony of asking for rain at the village leadership with the introduction of the sound of the kentongan/an ancient communication device.

2. Method

In this study using research methods with descriptive analysis. Seen from the data the data collected is primary data, where in this primary data category are interview transcripts with 3 informants namely Mr. Sukarno as one of the community leaders in Kendal village, Rofiq Purnama as chairman of the Karang Taruna in Kendal village and Mrs. Umi Latifah as secretary in Kendal village, Jatipuro. For secondary data, the authors take references, both journals and books related to the theme of this research. The approach used in writing this article uses a cultural communication approach as well as cultural & culinary tourism. The data analysis used is to analyze the results of interviews with the three informants and reduce them into a text in this article.

3. Discussion

Various cultural charms that exist in various places in Indonesia indeed make things quite unique for the region so that they become a color that characterizes an existing area. This can be seen from the traditions of each region ahead of the first Suro night / Hijriah New Year, one of which is in Karanganyar district. Of the several traditions in Karanganyar district, one of them is the Wahyu Kliyu tradition in Kendal village, Jatipuro. Looking at this context, in the presentation put forward by Umi as the secretary of the Kendal village, he said "This tradition has existed before I was born, sir, and this is a here ditary tradition that has always been held by the people of Kendal village, Jatipuro since the time of my grandparents and great-grandmothers before the evening of one Suro until the event was over...". In line with Umi's presentation, Rofiq as chairman of the Karang Taruna village of

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Kendal also explained "The Wahyu Kliyu tradition has indeed been around for a long time sir, where is this tradition, the people in Kendal village welcome it by making apem and bringing the made apem to be brought to the village hall to pray for."

Not only that, the explanation from Mr. Sukarno as a community leader in Kendal village also explained "The Wahyu Kliyu tradition does have its own story, sir, which starts from the Pagebluk incident in this hamlet which was told from generation to generation since my father, where this Pagebluk included drought, which could lead to starvation for a prolonged period of time, therefore according to the story the elders also conveyed this news to the palace and the palace was advised to carry out a ritual of countering reinforcements by sending several poets on the night of one Suro." From the paraphrase put forward, it is clear that actually some traditions that exist, especially in this region of Java, have a story that is almost similar, starting with several series of events such as famine, drought, etc., so that a ceremony of countering reinforcements must be held to overcome these problems. Mr. Sukarno also explained again "in the Wahyu Kliyu tradition procession, the people in the Kendal village, sir, make apem cakes which were previously prayed at their respective homes, then after the time shows 24.00 WIB, they are taken directly to the village hall to be prayed again by Modin in accordance with Islamic procedures and all members of the Kendal hamlet community must be involved, if there are still Kendal village people who have not come, they will be waited for until they come and then the ritual procession begins...". From Sukarno's explanation, it is very clear that the procession of the Wahyu Kliyu tradition is indeed very sacred from generation to generation, where acculturation has occurred between Javanese culture and Islamic values in the prayers recited on the first night of Suro.

It can be seen from the instrument in the Wahyu Kliyu tradition, namely Apem cake, wherein several local traditions in the Java region also use the same instrument, namely by using apem cake as the ingredients. Seen to from Umi's speech as the secretary of the Kendal hamlet, he explained "The apem cakes here are made by the residents themselves, and every house in Kendal village must make them before they are taken to the village hall to pray.." If you look at this description, you can see that there is an instrument concept in the use of apem cakes. In a semiotic view, apem cakes in almost all regions of Java have almost the same perception, namely as the embodiment of traditional cake products. Therefore, there are several meanings that can be taken from the existing cultural base. The cultural basis in question is the element of kinship in Javanese society, which is strong enough, especially in rural areas, to initiate traditions that can later be passed down from generation to generation. It also has a fairly close relationship with the Wahyu Kliyu tradition, in which the cultural basis instrument is both the people and the instrument of the apem cake product itself. If you look at the texture of apem cake in general, the cake is indeed a circle with white shades on the outside, which indicates or has a sacred meaning. Seen to from the manufacturing process, it does require a relatively long process when compared to cake products in general, so it takes patience to make these apem cake products. So other meanings apart from the white color, also mean patience considering that the context of patience is also the key to the perfection of apem cake products.

In the explanation put forward by Mr. Sukarno "for all the apem cakes made here, sir, there are 384 cakes that will be prayed for at the village hall during New Year's Eve before 24.00 WIB...". Indeed, if we review what has been explained by Mr. Sukarno, it is enough to underline the meaning of cultural product values which are quite strong in the Kendal Jatipuro village area in carrying out the Wahyu Kliyu tradition, which has underlined the existing product, namely apem cake. Although it is not explained in detail, it is indeed very visible how the apem cake and its meaning are. If you look at it as a whole, the context of apem products displays an image, namely alms which was formed from an unfavorable situation when viewed from the background of the Wahyu Kliyu tradition. Unfavorable conditions here are when food commodities are expensive, poverty. Therefore, in the following elaboration there is a meaning of a fairly strong bond that underlies the Wahyu Kliyu tradition, in which the more you give charity even at unfavorable times or conditions, the door of sustenance will be wide open considering the sincerity in giving alms regardless of future profits and losses. On the other hand, it can be seen that the number of apem cake products is 384, which for this side is an illustration of the acculturation of Islamic culture with local culture as a depiction of the number of tasbih in Moslem.

Looking Mr. Sukarno also explained "the procession of the Wahyu Kliyu tradition which was realized by making apem cakes by each community in Kendal village will later be gathered at the village hall to pray. Before being prayed for, the Kendal hamlet community leaders made a place to throw the apem cake at the village hall with a size of 5 meters by 2 meters,". The context explained by Sukarno himself is the process of the customary ritual from the Wahyu Kliyu tradition procession which is held every Suro New Year's Eve in Kendal village, Jatipuro. In line with this, Rofiq as the chairman of the Karang Taruna Kendal village also said "Mr. Sukarno explained earlier, where the apem cakes were prayed for and after praying by saying bismilah which was continued with the words Wahyu Kliyu, the apem cakes were thrown into the place provided by the community leaders...". So, in looking at the two explanations, it is clear that the Wahyu Kliyu tradition procession on the first night of Suro and it can be understood that the traditional procession does indeed look quite sacred considering that it cannot be separated from the background of the emergence of the tradition described above which started with something like hunger, and also the high price of food commodities and death due to hunger. This sacredness can also be seen from the initial procession when it was held in the Kendal village, which used to be without media exposing it and also the silence when the people of the Kendal village came in droves to the village hall in the middle of the night without speaking while carrying their respective apem cakes which had been made at home and prayed at home as well. This also needs to be seen from the point of view of the kinship element of the residents in Kendal village who can work together and also complement each other when conditions are not possible as at the beginning of this tradition.

They more, the explanation put forward by Mr. Sukarno "For now, the Wahyu Kliyu tradition has indeed indirectly or directly become a spectacle, sir, in which the rapid development of the media is able to transmit this tradition so that it can be seen by the general public and from ourselves as the committee of the Wahyu Kliyu tradition also adding a cultural procession starting from the heirloom carnival to the apem scroll carnival and there are also certain spectacles such as shadow puppets and music but do not change the sacred tradition of Wahyu Kliyu at midnight before the new year Suro..”. The same thing was conveyed by Umi in her explain "There are many shows, sir, ahead of the Wahyu Kliyu tradition procession, such as shadow puppets and also music and traders selling at the location so that it attracts the interest of the outside community to see the Wahyu Kliyu tradition procession in Kendal village." This context was also supported by the visit of the Karanganyar regent, Mr. Juliyatmo, who directly inaugurated the Wahyu Kliyu tradition as one of the local wisdoms in the Karanganyar district. From what has been stated above, the attractiveness of the Wahyu Kliyu tradition is able to attract the attention of the wider community and also indirectly contributes to increasing the tourism brand based on local wisdom without reducing the essence or meaning of the Wahyu Kliyu tradition ritual ceremony.

4. Conclusion

The Wahyu Kliyu tradition is one of the traditions that is routinely carried out by the people of Kendal village, Jatipuro in welcoming the first Suro night. In this tradition, every community in Kendal village makes apem cakes as a means of carrying out the Wahyu Kliyu tradition. Seen to from the meaning in the apem cake, seen from the manufacturing process, it can be said that it takes a long time when compared to cake products in general, so it takes patience to make these apem cake products. So other meanings apart from the white color, also mean patience considering that the context of patience is also the key to the perfection of apem cake products. Not only that, if related to the background of the emergence of the Wahyu Kliyu tradition, where it was similar to starting with several series of events such as famine, drought etc. so that a counter-measures ceremony had to be held to overcome these problems, then it could be interpreted that with the unfavorable conditions at the beginning of the tradition emerged with the high cost of food/food commodities, poverty. Therefore, in the following elaboration there is a meaning of a fairly strong bond that underlies the Wahyu Kliyu tradition, in which the more you give charity even at unfavorable times or conditions, the door of sustenance will be wide open considering the sincerity in giving alms regardless of future profits and losses.

5. Acknowledgement

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6. References

Christiawan, F., Yoyok, B., & Sutanto, R. P. (2014). Perancangan Destination Branding Kawasan Wisata Kuliner Lentog Tanjung Kabupaten Kudus. Jurnal DKV Adiwarna, 1(4), 12.

Hernández-Mogollón, J. M., Di-Clemente, E., & López-Guzmán, T. (2015). Culinary tourism as a cultural experience. The case study of the city of Cáceres (Spain). Boletin de La Asociacion de Geografos Espanoles, 68. https://doi.org/10.21138/bage.1868

Ida Bagus Ketut Soma Antara. (2022). Eksistensi Dalam Globalisasi: Peran Wisata Kuliner Dalam Pengembangan Pariwisata Berkelanjutan Di Sanur. Journal of Tourism and Interdiciplinary Studies, 2(1), 11–20. https://doi.org/10.51713/jotis.v2i1.64

Kusuma, P. K. N., & Nurhayati, I. K. (2019). Analisis Semiotika Roland Barthes Pada Ritual Otonan Di Bali. Jurnal Manajemen Komunikasi, 1(2), 195. https://doi.org/10.24198/jmk.v1i2.10519

Long, L. M. (2018). Cultural politics in culinary tourism with ethnic foods. In RAE Revista de Administracao de Empresas (Vol. 58, Issue 3). https://doi.org/10.1590/S0034-759020180313

Nabillah, P. T., Hidayati, E. N., Wikartika, I., & Khoiratunnisa, F. (2022). Strategi Branding Sentra Wisata Kuliner Jambangan. Jurnal Pengabdian Pada Masyarakat, 2(2), 1446–1453.

Nurhayati, E., Mulyana, -, Ekowati, V. I., & Meilawati, A. (2016). Inventarisasi Makanan Tradisional Jawa Unsur Sesaji Di Pasar-Pasar Tradisional Kabupaten Bantul. Jurnal Penelitian Humaniora, 19(2). https://doi.org/10.21831/hum.v19i2.8039

Rizka Ayu Setyani, Fika Lilik Indrawati, T. M. K. (2021). BRANDING ECHO (ENAK CETHO) SEBAGAI STRATEGI PENINGKATAN KUALITAS WISATA KULINER ANGKRINGAN DI KOTA YOGYAKARTA Tim. Jurnal Jarlit, 17, 7–26.

Sujaelanto. (2019). Apem Sesaji Selamatan Kematian Bagi Masyarakat Hindu Di Blitar. Widya Aksara : Jurnal Agama Hindu, 23(1), 1–10. https://doi.org/10.54714/widyaaksara.v23i1.29

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Entrepreneurship Education Model Based on Religious Values (Case Study on Students in Central Java)

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Abstract

The research aims to build a character-based entrepreneurial model for the millennial generation which is generation Y in Indonesia by studying students at universities. This research is expected to increase knowledge, skills and entrepreneurial behavior for the millennial generation who are students by prioritizing the development of religious character. The study used three factors, namely (1) religious-based character education, (2) entrepreneurship education, (3) religious character-based entrepreneurship education. Research methods are observation, exploration.The study population is the millennial generation which is dominated by students at universities. The research sample is a group of students domiciled in Central Java province.Data collection is carried out by surveys, field observations, interviews, questionnaires both open and closed, documentation and followed by evaluation. The results showed that the character-based entrepreneurship education model in vocational high schools (SMK) can be applied and developed for character-based entrepreneurship education models in higher education. The research outputs are (1) entrepreneurship education models, (2) accredited international/national publications, (3) the compilation of entrepreneurship education modules based on religious characters in universities

Keywords: *Model, Entrepreneurship Education, Character, Religious, Millennial*

1. Introduction

Education in Indonesia today tends to prioritize mastery of scientific aspects, intelligence, and pay less attention to character education [1]. The lack of moral education in Indonesia will affect the progress of the nation, one of which is due to the tendency of modern society to begin to separate religious or religious life from daily life activities [2]. Values and methods of religious character building are necessary in the education system [3]. The characteristics of religious values to build an entrepreneurial spirit are honesty, justice, benefit to others, humility, work efficiently, vision for the future, high discipline, balance [4].

Education that develops character is an effort made by education to help students understand, care, and act based on ethical values [5]. Entrepreneurship education based on religious character is an educational model that is applied as an effort to help students understand entrepreneurship by prioritizing religious principles, namely honesty, justice, benefit to others, humility, work efficiently, vision for the future, high discipline, balance.

Entrepreneurship education in Indonesia is an interesting issue considering the empirical situation or reality. Data from BPS (2020) noted that the open unemployment rate (TPT) in August 2020 was 7.07 percent, an increase of 1.84 percentage points compared to August 2019. The working population was 128.45 million people, down by 0.31 million people from August 2019. Producing prospective entrepreneurs who are willing to be one of the tasks of educational programs at all levels of education.

Table 1. Unemployment by Age Group

Age Group	Open unemployment rate by age group		
	2020	2021	2022
15-19	24.34	23.91	29.08
20-14	18.71	17.73	17.02
25-29	9.77	9.26	7.13
30-34	5.75	5.43	3.70
35-39	4.32	4.02	2.65
40-44	3.92	3.42	2.43
45-49	3.54	3.30	2.33
50-54	3.61	2.18	2.38
55-59	3.21	1.98	2.37
60 and above	1.70	2.73	2.85
Average	7.07	6.49	5.86

Source : National Labor Force Survey

Table 1 shows that the largest unemployment group in Indonesia is aged 15-19 years, where this age group is the millennial generation who are still attending higher education. The key to entrepreneurship education based on religious character is the curriculum [6]. The curriculum is the spearhead of entrepreneurship education, but often what is applied in the world of education today tends to be theoretical, this contributes to the unreadiness of graduates for entrepreneurship because students are only prepared to become employees.

Some of the factors causing high unemployment and low entrepreneurship in Indonesia are lack of education and skills [7].

Looking at the above phenomenon, researchers consider it necessary to evaluate the entrepreneurship education system and reformulate an entrepreneurship education model that prioritizes religious character values. Dengen correlates the entrepreneurship education model with the religious character education model is expected to produce an educational model based on religious character. The target achievement of this research is the existence of a character-based entrepreneurship education model that can be implemented in a higher education environment.

The development of a religious character-based entrepreneurship education model for students as higher education students has the same essence and meaning as moral education and moral education. The meaning of religious character-based entrepreneurship education is to form an entrepreneurial character that prioritizes religious values such as honesty, politeness, courage, perseverance, loyalty, self-control, sympathy, tolerance, justice, respect for individual self-esteem, responsibility for the good of others.

Building an Entrepreneurial Spirit among generation Y, psychologically and socio-culturally character building in each individual is a function of all human individual potentials (cognitive, affective, conative, and psychomotor) in the context of socio-cultural interactions (family, school, and community) and lasts throughout life. The configuration of character in the context of the totality of psychological and socio-cultural processes can be grouped into categories, namely (1) heart sports (Spiritual and emotional development), (2) thought sports (intellectual development), (3) sports and kinesthetics (Physical and kinesthetic development), and (4) sports taste and charsa (Affective and Creativity development) [8].

Character is a basic value of behavior that is a reference to the value system of interaction between humans (when character is lost then every ting is lost). Universally, various characteristics are formulated as the value of living together based on the pillars: peace, respect, cooperation, freedom, happiness, happiness, honesty, humility, love, responsibility, simplicity, tolerance, and unity [9].

Character education in theory can be done with several approaches, namely (1) rational development approach, (2) consideration approach, (3) value clarification approach, (4) moral development approach, (5) cognitive, and (6) social behavior approach [10]. In particular, character education is efforts designed and implemented systematically to help students understand the values of human behavior related to God Almighty, oneself, fellow humans, the environment, and nationality manifested in thoughts, attitudes, feelings, words, and deeds based on religious norms, laws, manners, culture, and customs.

In the context of entrepreneurship education, the functions and objectives of national education as explained in the Law on the National Education System No. 20 of 2003 chapter II article 3 as follows: National education functions to develop the ability and shape the character and civilization of a dignified nation in order to educate the nation's life aims to develop the potential of students to become human beings who believe and fear God Almighty, Have a noble character, healthy, knowledgeable, capable, creative, independent and become a democratic and responsible citizen.

Academic approach in building entrepreneurial spirit in schools through character values that can be further described by universities in order to develop education based on character and cultural values: (1) cognitive development approach; (2) value analysis approach; (3) value clarification approach; (4) Doing-learning approachAcademic approach in building entrepreneurial spirit in schools through character values that can be further described by universities in order to develop education based on character and cultural values: (1) cognitive development approach; (2) value analysis approach; (3) value clarification approach; (4) Doing-learning approach [11] The objectives of character value education are threefold: (1) producing graduates with superior character; (2) produce graduates who are able to communicate openly and honestly with others, relating to their own values; (3) produce graduates who are able to use together the ability to think rationally and emotional awareness, to understand feelings, and behavior patterns [12].

Previous research, Literature studies on character-based entrepreneurship education have been widely conducted by researchers. The character education model and the

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entrepreneurship model have been correlated in the basic education system [13]. The perception of lecturers and students towards the implementation of character-based entrepreneurship models has a high influence on entrepreneurship education [14]. Entrepreneurship education as character education for children in basic education [15]. Character-based entrepreneurship education is also carried out at the senior high school education level [16].

The religious character-based entrepreneurship education model is a derivative of the character-based entrepreneurship education model applied to vocational schools. can be presented as follows:

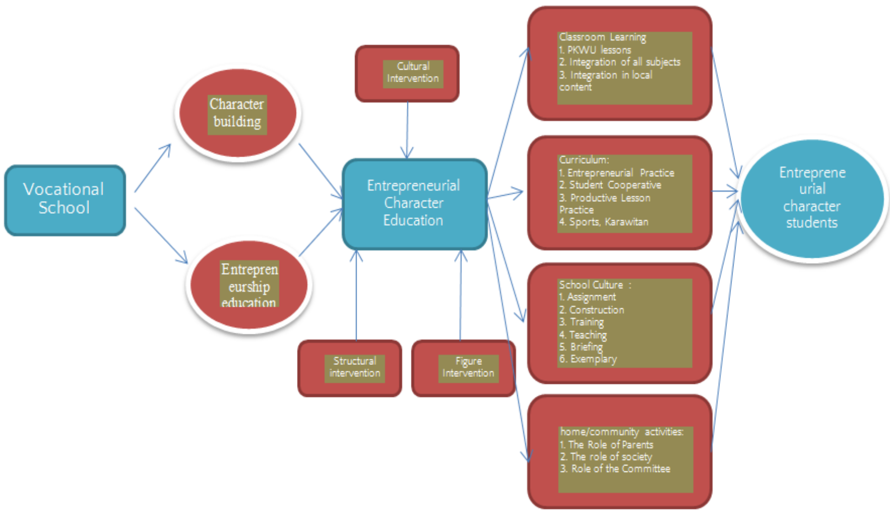

Figure 1: Student Model of Entrepreneurial Character [5]

The model developed in this study is as follows:

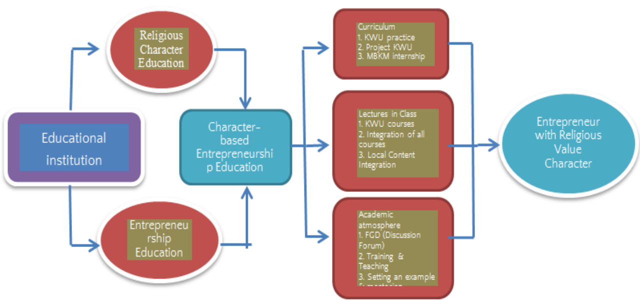

Figure 2: Development of Character-Based Entrepreneurship Model of Religious Values

2. Methods

This research uses qualitative methods with a case study strategy. A qualitative approach is used to be able to answer research questions that require researchers to explore in depth the problems posed. Qualitative research has the following characteristics: Direct field data sources are natural situation data and researchers are key instruments, are descriptive, emphasize the work process, data analysis is inductive, and meaning is the main concern in the research approach.

A case study is research that aims to explore a bound system or a case (or cases) that occurred over a period of time through the collection of in-depth and detailed data from various reliable sources of information. Some cases are very rare (a disease or rare occurrence) and therefore not many studies have attempted to unravel them into the basis of a study using case studies. This is the reason researchers use case studies considering that entrepreneurship is becoming a problem topic in society.

This research focused on one type of respondent, namely students who are entrepreneurial with the following criteria: 1) Students who are active in lectures (registered / not on leave), 2) Have a role as an owner and are actively involved in building a business. Data collection in this study will use in-depth focused interviews. This research will use a theoretical coding data analysis model, which is an analysis model that is often used to develop grounded theory. This is intended to obtain a theoretical construct that is purely derived from respondent data, as well as to test existing theories. Theoretical coding is divided into three types, namely open coding, axial coding, and selective coding

3. Results and Discussion

3.1. Presenting the Results

The results of the research prioritize the characteristics of the character-based entrepreneurship education model applied to college students. The reasons for unemployment are still a strategic issue in entrepreneurship education. Furthermore, below will explain all the data obtained from each respondent

Findings on respondent I:

I agree that the application of religious character is applied in entrepreneurship education because this will help students have a high tolerance attitude towards other religious worship and reflect faith in God Almighty towards their beliefs and be able to have values to respect religious differences.

Findings on respondent II:

In my opinion, entrepreneurship education based on religious character is an entrepreneurial education approach that integrates religious values in entrepreneurship learning. This approach emphasizes the importance of strong character and morale in running a business and being a successful entrepreneur. In entrepreneurship education based on religious values, in addition to providing business knowledge and skills, it can also provide teaching on how to think correctly and positively, and overcome challenges and difficulties in business in a healthy and ethical way. It aims to form entrepreneurs who have good morals and ethics and can be responsible, and benefit the community.

Findings on respondent III:

My opinion: the model of entrepreneurship education based on religious character as above is good, if applied it will definitely produce good things or produce entrepreneurs with good character, because indeed good character is very important in life without exception in the world of entrepreneurship therefore the education model above is good to apply only it must be accompanied by a high enough effort considering the views or perspectives of people Regarding the business world and the religious world, it is still difficult to unite.

Findings on respondent IV: My opinion about religious-based entrepreneurship education is to develop entrepreneurial character based on religious values, such as honesty, integrity, and social responsibility. Religious-based entrepreneurship education model can make a positive contribution in entrepreneurship development, This model can help develop a positive attitude towards entrepreneurship and improve skills in business.

Findings on respondent V:

Religious character education, is a process of transformation of religious values to be developed in a person's personality so that it becomes one in the behavior of that person's life. Entrepreneurship Education is a planned and applicable effort to increase the knowledge, intention or intention and competence of students to develop their potential by being manifested in creative, innovative and courageous behavior to take and manage risks. The purpose of entrepreneurial characteristics is a person's behavior, attitude, characteristics, or actions to create and realize a business unit.

1. Entrepreneurial practice is an activity in developing and applying directly the creative ideas of students that lead to creating a product that is of selling value and marketing it to consumers.
2. Conduct entrepreneurship training. Conduct data collection for those who have a business to help market products through online media. Produce useful products to increase financial income.
3. MBKM internship is an internship program that students can do in industry for six months which is recognized as equivalent to 20 credits. The internship carried out must be in accordance with the competence of the field of science so that it is in accordance with the CPL Study Program.

In-class lectures:

1. MBKM internship is an internship program that students can do in industry for six months which is recognized as equivalent
2. Integrating character education in lectures can be done by including character values in planning (syllabus and lesson plans), teaching materials and media, implementation in class, assessment, monitoring, and evaluation of activities as a whole.
3. Local content can be: regional languages, English, regional arts, regional skills and crafts, customs and knowledge of various characteristics of the surrounding natural environment, as well as things deemed necessary for the development of the potential of the area concerned.

Academic atmosphere

1. Forum (E-Discussion Forum) is an online discussion media that can be accessed without being limited by space and time. Through the forum, users can discuss with each other on a topic moderated by moderators so that discussions run conducively.

2. The training aims to improve mastery of theory and decision skills on issues related to achieving goals.
3. Career mentoring is a strategic HR development program..

Entrepreneurship with religious value characterHigh commitment, discipline, honest, confident, never give up, have unlimited creativity, dare to take risks, like to work hard, future-oriented.

3.2. Create a Discussion

The findings of respondents indicate that a character-based entrepreneurship education model has become an important need in the entrepreneurship education system. The integration of religious values in entrepreneurship education is a strong factor to produce prospective entrepreneurs with character and ethical morals in running their business. Character-based entrepreneurship education starts from changing the way of thinking to changing behavior.

Entrepreneurs with religious character have characteristics including: having the right and positive way of thinking, able to overcome challenges and difficulties in business, moral, ethically responsible, have high tolerance for differences, be creative, innovative and brave in decision making and able to manage risks.

In religious character-based entrepreneurship education, it can be done through several stages, namely 1) increasing knowledge, 2) building intentions / intentions for entrepreneurship, 3) building competence. The forms of activities that can be carried out in this religious character-based entrepreneurship education model include 1) entrepreneurial practices where prospective entrepreneurs create new product startups, 2) institutions provide entrepreneurship training, 3) institutions provide internship opportunities to learn entrepreneurship, 4) development of academic atmosphere that supports entrepreneurship education such as creating discussion groups, providing mentoring to prospective entrepreneurs.

Some obstacles that can arise in religious character-based entrepreneurship education include changing the perception or mindset of people who tend to still think that the business world and the religious world are two things that are difficult to unite, the rapid development of information technology that greatly impacts character building, institutional commitment in implementing religious character-based character education consistently.

The results of the survey also showed that the five respondents agreed and agreed with the construction of a religious character-based entrepreneurship education model (as shown in figure 2) to be applied in higher education.

Conclusions

The results showed that the character-based entrepreneurship education model in vocational high schools (SMK) in principle can be applied to the character-based entrepreneurship education system in higher education. Entrepreneurship education based on religious character in higher education aims to produce entrepreneurial candidates with religious characters such as high commitment, discipline, honesty, confidence, never give up, have unlimited creativity, dare to take risks, like to work hard, oriented to the future. Entrepreneurship education based on religious character begins with changing the perception or mindset that the business world and the religious world are a unity in the entrepreneurship education system. The success of entrepreneurship education based on religious character is strongly influenced by the role of institutions such as curriculum implementation, mentors, academic atmosphere.

References

[1] F. Irsad, "Ini Alasan Pentingnya Pendidikan Karakter," *Majalah Suara Hati*, 2018. [Online]. Available: https://www.suarahati.org/artikel-suara-hati/ini-alasan-pentingnya-pendidikan-karakter/
[2] C. Hericahyono, *Dimensi-dimensi Pendidikan Moral*. IKIP Semarang Press, Semarang, 1995.
[3] M. Riadi, "Nilai dan Metode Pembentukan Karakter Religius," *KajianPustaka.com*, 2019. https://www.kajianpustaka.com/2019/09/nilai-dan-metode-pembentukan-karakter-religius.html
[4] Sahlan, *Mewujudkan Budaya Religius di Sekolah*. Malang: UIN-Maliki Press, 2009. [Online]. Available: https://www.kajianpustaka.com/2019/09/nilai-dan-metode-pembentukan-karakter-religius.html
[5] Rusman and Raharjo, "Model Pendidikan Karakter Kewirausahaan di Sekolah

Menengah Kejuruan," *J. Pendidik. Teknol. dan Kejuru.*, vol. 21, no. 2, 2012.

[6] E. Wasisto, "PENDIDIKAN KEWIRAUSAHAAN MELALUI PEMBINAAN KARAKTER BAGI SISWA SEKOLAH KEJURUAN DI KOTA SURAKARTA," *ProBank J. Ekon. dan Perbank.*, vol. 2, no. 1, 2017, [Online]. Available: https://e-journal.stie-aub.ac.id/index.php/probank/article/view/131

[7] R. F. Widyananda, "10 Penyebab Pengangguran di Indonesia dan Alasannya," *Merdeka.com*, 2020. https://www.merdeka.com/jatim/10-penyebab-pengangguran-di-indonesia-dan-alasannya-kln.html

[8] Kemendiknas, *Pengembangan Pendidikan Budaya dan Karakter Bangsa*. Jakarta: Kementrian Pendidikan Nasional, 2010.

[9] Ekowarni, *Desain Pendidikan Karakter*. Jakarta: Kencana., 2010.

[10] Muslichah Erma Widiana, Henky Supit, and Sri Hartini, "Penggunaan Teknologi Internet dalam Sistem Penjualan Online untuk Meningkatkan Kepuasan dan Pembelian Berulang Produk Batik pada Usaha Kecil dan Menengah di Jawa Timur," *J. Manaj. dan Kewirausahaan*, vol. 14, no. 1, pp. 72–82, 2012, doi: 10.9744/jmk.14.1.72-82.

[11] H. Rusman, *Dengan Berwiraswasta Menepis Krisis: Konsep Membangun Masyarakat Entrepreneur Indonesia*. Alex Media Komputindo, Jakarta, 1998.

[12] Buchari, *Kewirausahaan Sekolah Berbasis Kreativitas dan Inovasi*. Direktorat Tenaga Kependidikan Departemen Pendidikan Nasional, Jakarta, 2006.

[13] K. Dewi and I. Giantari, "Peran Emosi Positif dalam Memediasi Store Atmosphere terhadap Pembelian Impulsif (Studi pada Konsumen Matahari Department Store Duta Plaza Denpasar)," *E-Jurnal Manaj. Univ. Udayana*, vol. 4, no. 12, 2015.

[14] Y. Ismiyanti and E. Handoyo, "Analisis Persepsi Dosen dan Mahasiswa terhadap Penerapan Model Kewirausahaan Berbasis Karakter," *IDEAS*, vol. 7, no. 4, 2021, [Online]. Available: https://www.jurnal.ideaspublishing.co.id/index.php/ideas/article/view/478

[15] E. Wasisto, "Pendidikan Kewirausahaan Melalui Pembinaan Karakter bagi Siswa Sekolah Kejuruan di Kota Surakarta," *ProBank J. Ekon. dan Perbank.*, vol. 2, no. 1, 2017, [Online]. Available: https://media.neliti.com/media/publications/161652-ID-pendidikan-kewirausahaan-melalui-pembina.pdf

[16] Sarina and B. Lian, "Pengembangan Pendidikan Kewirausahaan Berbasis Pendidikan Karakter di SMA Negeri 1 Tanjung Raja," *J. Manajemen, Kepemimpinan, dan Supervisi Pendidik.*, vol. 3, no. 2, 2018, [Online]. Available: file:///C:/Users/ACER/Downloads/admin,+5.+JMKSP+Sarina.pdf

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Procedure Of Procurement of Operational Needs By Purchasing At Pt. Bali Homes Management

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Abstract

In the tourism industry, especially in the hospitality sector, accounting is one of the departments that plays a very important role in the development of a company. Accounting is part of the department that functions as a financial manager and regulates the procurement of goods for the company's operational needs. Therefore, it is necessary to identify and control the procedures for purchasing and receiving goods as well as any obstacles that occur so that the operational needs of a company can be fulfilled properly. The Accounting section that is in charge of the procurement process is the Purchasing section. This research was conducted at PT. Bali Homes Management is a company engaged in the management and marketing of villas. Until now, PT. Bali Homes Management has managed 300 villas spread across various countries in Asia and specifically manages 90 villas located in the Bali and Lombok regions. The main focus of this company is to provide comfort with the best service and offer five-star villa facilities. The research method used is by observing, interviewing, and documenting. After all the data has been collected, it will be reviewed and explained the procedure for procuring goods by Purchasing. This study uses qualitative descriptive data analysis techniques. Based on the results of the study it was concluded that the procedure for procuring goods at PT. Bali Homes Management has been running well in accordance with the Standard Operating Procedure at PT. Bali Homes Management. Meanwhile, the obstacle faced was the absence of receiving staff so that purchasing staff had more duties and responsibilities which led to a buildup of goods in the store room.

Key words: *Accounting, Purchasing, Procurement of Goods, Management and Marketing of Villas, Standard Operating Procedure*

1. Introduction

The tourism industry in Indonesia is progressing very rapidly and is receiving increasing attention, especially from the government because it is closely related to the government's expectation that tourism can be relied upon as the country's main source of income and foreign exchange. The tourism sector is expected to continue to develop properly and optimally and should be supported by components that are directly or indirectly related to tourism activities. Tourism is closely related to accommodation, in this case villas and hotels as places to stay and as places to relax for tourists. Bali is one of the islands in Indonesia which has a variety of tourist attractions. The increase in tourist attractions in Bali is followed by the emergence of more and more new villas. With so many villas in Bali, the tourism business competition in Bali is getting tougher. This has spurred every villa or hotel to survive and be able to compete with its competitors.

PT. Bali Homes Management is a company engaged in the management and marketing of villas and hotels which has been established since 1998. As a company engaged in the tourism sector which manages dozens of villas in Bali, PT. Bali Homes Management is responsible for meeting the operational needs of offices and villas under company management. PT. Bali Homes Management has several departments that integrate with each other in realizing and making the operational success of its villas and hotels. Each department has its own duties and responsibilities, one of which is the Accounting Department whose job is to take care of expenses or financing and the results obtained from the operational activities of villas and hotels. To carry out their duties in the Accounting Department, there are several sections.

Purchasing is a sub-section of the Accounting Department that is in charge of buying all types of goods needed for hotel operations, both goods to be stored in warehouses as inventory items and goods that are directly used by the requesting department. All types of procurement of goods or raw materials must go through purchasing, be it credit or cash purchases, this is so that each item purchased is truly in accordance with its function and use. For credit purchases that make debt payments to suppliers are the duties and responsibilities of the Account Payable. Account Payable is the section in charge of processing debt payments to suppliers as a result of purchases of goods by Purchasing on credit after receiving documents from Purchasing.

In the process of procuring operational goods, good and effective work procedures are needed considering the company's operational needs are quite high. However, on several occasions, errors occurred in the process of procuring operational goods, such as errors in ordering types of goods, shortages of stock or excess stock in the warehouse, so it is necessary to review the procedures for procuring goods at PT. Bali Homes Management. Based on the description above, the writer is interested in making a Final Project Report with the title "Procedure for Procurement of Operational Needs by Purchasing at PT. Bali Homes Management".

2. Method

The method used in this research is descriptive method. The stages of the research methodology are as follows:

a. Literature Survey

In this stage, the writer collects literature and information related to the research title.

b. Problem Identification

Identify the problems to be discussed related to the procedure for procuring goods based on the literature and information obtained.

c. Library Studies

The author studies the literature that will be used as a theoretical basis in research.

d. Determination of Data Collection Methods

The data collection method is the method used by researchers to collect data. Data collection was carried out to obtain the information needed to achieve research objectives. The author uses data collection methods in the form of observation, interviews, literature study, and documentation.

e. Research Data Analysis

Data analysis is the process of systematically searching for and compiling data obtained from interviews, field notes and documentation to describe the procedure for procuring goods at PT. Bali Homes Management.

f. Draw Conclusions

Conclusions are drawn based on data analysis and checked whether it is in accordance with the aims and objectives of the research, so that the results of the research can be obtained produce results in the form of conclusions and suggestions that are constructive and useful for the future.

This study uses qualitative descriptive data analysis techniques. A qualitative descriptive research method is a research technique that produces descriptive data in the form of written or spoken words from people and observable behavior aimed at describing or explaining something, for example circumstances, conditions, situations, events, activities, etc. The use of a qualitative descriptive method in this study is intended to describe the procedures for procurement of goods implemented at PT. Bali Homes Management.

3. Result and Discussion

Results and discussion can be made as a whole that contains research findings and explanations.

3.1. Presenting the Results

Procurement of goods carried out by Purchasing PT. Bali Homes Management are items specifically for office operational needs such as stationery, office supplies, cleaning equipment, and needs for the kitchen or pantry such as mineral water, coffee, tea, milk and others or the specific needs of each department in the office. Purchases of goods are made every 1 (one) month, precisely at the beginning of the month. However, for certain operational needs that are sudden or urgent, they will be ordered as soon as possible when the item is needed. The author interviewed Mrs. Sri Lestari who is a Purchasing staff at PT. Bali House Management.

3.2. Create a Discussion

Based on interviews conducted with Purchasing staff, the procedures for procuring goods for operational needs were carried out by Purchasing staff starting from the procedure for purchasing goods, receiving goods, and submitting notes to Account Payable at PT. Bali Homes Management are as follows:

a. Prepare purchase supporting documents, namely Purchase Orders (examples in Appendix 1 and Appendix 2) for each type of purchase.
b. Check the price, quantity and type of goods to be purchased and then submit approval to the Operational Manager and Chief Accounting. If the Purchase Order has been approved, the Operational Manager and Chief Accounting will sign and return the Purchase Order to Purchasing.
c. Purchasing orders goods from suppliers according to what is stated in the Purchase Order.
d. The supplier comes to the office bringing the ordered goods along with triplicate invoices which are then received by Purchasing (examples in attachments 3 and 4).
e.

f. Purchasing checks the goods that have been sent based on the quality, price, and quantity stated in the Purchase Order.
g. If the goods that arrive are not in accordance with the Purchase Order, Purchasing has the right to refuse the goods and return them to the supplier.
h. If the goods that come are in accordance with the Purchase Order, then the goods that come are accepted by Purchasing. Purchasing will sign the invoice from the supplier and make a receipt or receipt from PT. Bali Homes Management and affix signatures of the sender and recipient of the goods and the date of receipt of the goods (example in attachment 5).
i. Three (3) white invoices and three (3) red receipts will be submitted to the Account Payable and the red invoice with yellow receipts will be held by Purchasing. While the yellow invoice and white receipt will be handed over to the supplier.
j. Payment for operational goods is made on credit with a maturity period of 30 days starting from the date the goods are sent to the company.

As for the constraints faced by Purchasing staff in the process of procuring goods for operational needs at PT. Bali Homes Management are as follows:

a. The items ordered are not in accordance with the Purchase Order. An example is the Purchasing party ordering HVS A4 paper but the item given is HVS A5 paper.
b. There are items that are lacking in the shipping process due to the lack of accuracy on the part of the supplier checking the goods before sending them to the office.
c. The supplier was late in sending the goods that should have been sent during the day but the goods were sent in the afternoon when the office closing time was approaching.
d. Purchasing staff also doubles as Receiving and works alone starting from the purchasing process to receiving goods is carried out independently so that focus, dexterity and accuracy are needed in work so that the operational needs of the office are always available.
e. There is a buildup of goods in the store room, the arrangement is not neat and Purchasing staff's inaccuracy in checking the existing inventory of goods so that goods that should not have been ordered were instead ordered back by Purchasing which led to excess inventory in the store room. With a neat arrangement of goods, it will make it easier for Purchasing staff to pick up the items needed and also make it easier for the Stock Taking process.

4. Conclusion

Based on the results of the research above, the authors conclude that the procedure for procuring goods for operational needs carried out by Purchasing is in accordance with the Standard Operating Procedure at PT. Bali Homes Management. The role of Purchasing staff at PT. Bali Homes Management is a goods procurement officer, both buying and receiving goods. Purchasing is in charge of ordering goods from suppliers in accordance with Purchase Orders that have been approved by the Operational Manager and Chief Accounting. Purchasing examines incoming goods and if it is appropriate, a receipt will be issued and the invoice will be submitted to the Account Payable for payment processing. If the goods that arrive are not in accordance with the Purchase Order, the Purchasing staff has the right to return the goods to the supplier.

5. References

To make accountable references, the author can use reference management software, such as **EndNote or Mendeley**. Make a list of references and citations in text that fit the IEEE style. Example of writing references in IEEE style:

[1] L. Augusto Horta Nogueira and R. Silva Capaz, "Biofuels in Brazil: Evolution, achievements and perspectives on food security," *Global Food Security*, vol. 2, no. 2, pp. 117–125, 2013.

[2] A. Pradhan and C. Mbohwa, "Development of biofuels in South Africa: Challenges and opportunities," *Renewable and Sustainable Energy Reviews*, vol. 39, no. 2014, pp. 1089–1100, 2014.

[3] M. Messagie, K. Lebeau, T. Coosemans, C. Macharis, and J. Van Mierlo, "Environmental and financial evaluation of passenger vehicle technologies in Belgium," *Sustainability*, vol. 5, no. 12, pp. 5020–5033, 2013.

[1] Gunawan, A. W. (2017). *Genius Learning Strategi.* Jakarta: Gramedia Pustaka.

[2] Kustini, H. (2016). *Tinjauan Prosedur Penerimaan Barang Terhadap QQuality Of Goods Dalam Kelancaran Operasional Di Solo Paragon Hotel & Residence* . 17.

[3] Mulyadi. (2015). *Sistem Akuntansi Edisi Tiga.* Jakarta: Salemba Empat.

[4] Munandar. (2012). *Hotel Store And Purchasing Department.* Jakarta: Gramedia.

[5] Susanto, H. (2017). *Prosedur Pembelian Dan Penerimaan Barang Oleh Department Accounting Di Hotel Ibis Slipi Jakarta* .

[6] Tambunan, R. M. (2013). *Standard Operating Procedures.* Jakarta: Maiestas.

E-ISSN: 3030-9948
https://iite-proceeding.poltekindonusa.ac.id

[7] Utojo. (2019). *Manajemen Pengadaan Barang Dan Jasa.* Sleman: CV Budi Utama

[8] Wijaya, Darma dan Roy Irawan. (2018). *Prosedur Administrasi Penjualan Bearing Pada Usaha Jaya Teknika Jakarta Barat.*

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Presenting Figures and Tables

Figure 1. Logo PT. Bali Homes Management

Table 1. *Purchase Order Clean and Pantry Needs*

No	Description	Qty	In House Stock	Remark
1	Gula Pasir	12kg	0	PantryStock
2	Kopi Setia Bali	6bgks	1	PantryStock
3	MAX Creamer	4box	2	PantryStock
4	Susu Full Cream	2box	3	PantryStock
5	Color Ball Toilet	2bgks	4	PantryStock
6	Plastik Sampah Large	3bgks	5	PantryStock
7	Plastik Sampah Medium	2bgks	6	PantryStock
8	Susu Law Fat	2box	7	PantryStock
9	Glade Sensation	5pcs	8	PantryStock
10	Glade Automatic	4btl	9	PantryStock
11	Kecap Bango	4btl	10	PantryStock
12	Charm Pembalut	1bgks	11	PantryStock
13	Sunlight Cuci Piring	1jirigen	12	PantryStock
14	Sanitizer	1jirigen	13	PantryStock
15	Saos Chilli	3btl	14	PantryStock
16	Saos Tomat	2btl	15	PantryStock
17	Tissue Facial	1box	16	PantryStock
18	Tissue Roll	1box	17	PantryStock
19	Tissue Multifold	2 box	18	PantryStock
20	Indocafe Refill	4bgks	19	PantryStock
21	Sendok Makan	1lusin	20	PantryStock
22	Sponge Cuci Piring	5pcs	21	PantryStock
23	Teh Sariwangi	2kotak	22	PantryStock
24	CIF Serbaguna	1btl	23	PantryStock
25	Baygon Electric	3pcs	24	PantryStock
26	Toples Gula Kedap Udara	1pcs	25	PantryStock

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Analysis of Lending to Prospective Debtors with a Risk-Based Approach

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Abstract

This article discusses the analysis of lending to prospective borrowers using a risk-based approach. The main objective of this study is to identify the factors that influence lending decisions and develop strategies that are more effective in evaluating credit risk.

This study uses a literature study approach with a qualitative approach. Data collection by interviews with lender institutions.

The results of the study show that there are several factors that have a significant influence on the decision to grant a loan. These factors include the prospective debtor's credit profile, payment history, debt-to-income ratio, and work background. In addition, there are also macroeconomic factors that need to be considered, such as market conditions and interest rates.

The need for a strict policy in lending requires clear guidelines in determining the terms of lending, including the maximum loan limit and payment terms. Clear policies help reduce the risk of default and ensure fairness in the lending process. In the era of increasingly advanced information technology, the use of sophisticated data and risk analysis methods is the key to making the right decisions and reducing credit effectively.

In conclusion, based analysis of lending to prospective debtors plays an important role in maintaining the financial stability of financial institutions and preventing unwanted credit risks.

Key words: *analysis of lending, debtor's credit profile, loan factors, risk based*

1. Introduction

Sustainable Development Goals: Leading Towards a Better Future

The Sustainable Development Goals (SDGs) are a global call to create a better world for all people and the planet. Defined by the United Nations (UN) in 2015, the SDGs consist of 17 interrelated goals, designed to address the various social, economic and environmental challenges facing the global community today.

The SDGs carry an ambitious but important vision: eradicate poverty, protect our planet and ensure that all people can enjoy peace and prosperity. Each goal has its own focus, from hunger and gender inequality to tackling climate change and ensuring quality education for all.

However, the true essence of SDGs lies in integration. TPB understands that the challenges facing the world cannot be solved in isolation. The success of one goal is often tied to progress on another. For example, good quality education (SDG 4) can have a positive impact on health (SDG 3) and gender equality (SDG 5), which in turn contributes to inclusive economic growth (SDG 8).

In addition, the TPB recognizes that achieving this goal requires partnership and collaboration between government, the private sector, civil society, communities and individuals. By combining knowledge, resources and joint efforts, TPB drives the creation of innovative solutions that can have a greater positi With a deadline of 2030, the SDGs reflect a global determination to create a world that is more sustainable, just and inclusive for all. Every action taken by individuals, communities and countries has the potential to make a meaningful difference in achieving these goals. On the way to a better future, TPB is a shared commitment to create positive changes for current and future generations.

The SDGs represent a collaborative outlook for realizing positive changes in all dimensions of life. Each number reflects the direction we must take to build a better future for all.

According to (BAPENAS, 2014) starting with SDG 1, we pledge to end poverty in all its forms. This is a call to ensure that every individual has access to basic needs, living without hunger and uncertainty.

SDG 2 evokes the spirit of food security and sustainable agriculture. Here, we remember the importance of sufficient and nutritious food for all, as well as efforts to maintain biodiversity and secure the future of the earth.

However, well-being is not only in the abdominal cavity, but also in health which signifies SDG 3. Ensuring a healthy and prosperous life for all ages is our commitment, where quality health services and access to medicines are human rights.

Just as importantly, SDG 4 embraces the right to quality education. In a colorful classroom, we open doors to knowledge, creativity and opportunity. This SDG encourages us to ensure that no one is left behind in the search for knowledge

SDG 5 puts gender equality at the center of attention. This is a call to eliminate all forms of discrimination against women and girls, and to empower them at all levels of society.

No less impressive, SDG 6 encourages us to protect crucial water resources. By ensuring everyone's access to clean water and proper sanitation, we maintain health and environmental sustainability.

SDG 7 invites us towards the era of renewable and affordable energy. From sun to wind, we embrace sustainable natural resources, bringing light to every corner of the world.

However, sustainable development is not just about the economy, it is also about decent work and inclusive growth (SDG 8). We strive for a world where every working hand gets the rewards it deserves and opportunities for growth.

SDG 9 takes us to the realm of sustainable industry, innovation and infrastructure. In the niches of technology and creativity, we design a strong and sustainable future.

However, sustainable development will not be fully achieved if inequality remains a barrier (SDG 10). In the light of equality, we pave the way for all, prevent lag and ensure that voices are heard.

SDG 11 guides us to build cities and human settlements that are inclusive, safe and sustainable. In a lush network of buildings and roads, we create a home for everyone.

Then, SDG 12 invites us to reflect on responsible consumption and production patterns. By minimizing waste and caring for the environment, we create a sustainable footprint.

SDG 13 calls for action on climate change. In this global bond, we care for our planet and protect the legacy for generations to come.

SDGs 14 and 15 invite us to protect life underwater and on land. In our vast oceans and forests, we embrace the biodiversity that gives life to this planet.

SDG 16 promotes justice and peace. Within the bosom of strong institutions, we uphold the law, address inequality and create a harmonious society.

Finally, SDG 17 symbolizes the spirit of partnership to achieve common goals. In a stream of cooperation and collaboration, we strengthen our global efforts and unify potential for a better future.

The 17 Sustainable Development Goals are not just numbers. It is a collective promise and vision that embraces the diversity of humanity, creating a world that is more just, sustainable and more humane for all who live in it. Under this umbrella, we unite to achieve a brighter future, and leave a trail of positive change for generations to come.

THEORETICAL BASIS

In his book Armida Salsiah Alisjahbana & Endah Murniningtyas (2018), that the goal of sustainable development is internalizing the impact of every social and economic action on the environment. Which means, every social and economic activity needs to avoid/prevent or take into account its impact on environmental conditions so that the environment can continue to carry out its function in supporting life now and in the future.

Then according to (BAPPENAS, 2014) the SDGs (Sustainable Development Goals) are not officially grouped into "four pillars," but there is a way to link SDGs to the four main pillars which are often used to encapsulate sustainable issues. These four pillars are often referred to as the four pillars of sustainable development or the four dimensions of sustainability. These pillars are: sustainable economy, sustainable social, sustainable environment and sustainable governance.

Here is a brief description of each pillar:

1. Sustainable Economy: It focuses on economic growth that is not only concerned with financial returns, but also takes into account social and environmental impacts. SDGs goals related to this pillar include poverty alleviation, decent work, inclusive growth, and sustainable industrialization (SDGs 1, 8, 9, 10, and 12).

2. Social Sustainability: This relates to efforts to create a just, inclusive and equitable society, where human rights are respected and equality is upheld. These include quality education, good health, gender equality and tackling inequality (SDGs 3, 4, 5, 10 and 16).

3. Environmentally Sustainable: The main focus is protecting the earth's ecosystems, tackling climate change, and managing natural resources wisely. This involves protecting biodiversity, managing fresh water, and protecting the seas and land (SDGs 6, 13, 14 and 15).

4. Sustainable Governance: This refers to effective, transparent and accountable governance at all levels, including national and international levels. These include peace, justice, strong institutions and global cooperation (SDGs 16 and 17).

Although the SDGs are not formally grouped into these four pillars, this approach helps in understanding how the various SDG goals and targets relate to one another and how they together contribute to the ultimate goal of holistic and inclusive sustainable development.

Referring to the first pillar above, that the banking industry plays a central role in the modern economy, functioning as the backbone that supports economic and financial activities throughout the world. As a financial institution that has a variety of functions and services, the banking industry has a significant impact on various aspects of the economy, from extending credit to facilitating global financial transactions. The following is an overview of the role of the banking industry in the economy:

1. Lending and Funding: One of the core roles of the banking industry is to provide credit to individuals, businesses and governments. This enables people and entities to obtain the capital needed to start or expand a business, buy a home, educate, and for other purposes. Therefore, banking becomes a catalyst for economic growth by providing access to the necessary funds.

2. Financial Intermediation: Banking acts as a liaison between borrowers and lenders. They collect funds from public savings and allocate them to those who need loans. This helps bridge the gap between surplus funds and funding needs.

3. Risk Management and Security: Banking plays an important role in managing financial risk. They provide services such as insurance, investment management, and derivatives that help individuals and companies protect their assets from economic risks, such as currency fluctuations or changes in interest rates.

4. Financial Transactions and Payments: The banking industry provides payment services that enable fund transfers, bill payments, and commercial transactions. With services such as credit, debit cards and electronic transfers, banking has changed the way we carry out our daily transactions.

5. Mobilization of Funds: Through fundraising activities, banks support economic development by channeling funds from individuals who have excess funds to sectors that require investment. This provides a boost to growth and job creation.

6. Developing Financial Innovation: The banking industry continues to innovate in financial products and services, such as online banking, financial technology (fintech), and digital payments. This influences the way we interact with money and facilitates easier and inclusive access to financial services.

7. Promoting Financial Stability: Banking has an important role in maintaining financial system stability. Tight regulation and supervision of banks helps prevent systemic risk and financial collapse that could disrupt the economy as a whole.

The banking industry plays a very important role in creating a stable and sustainable economic environment. Through the services they offer, banks help drive growth, minimize risk and facilitate the flow of funds needed for various aspects of life and business.

Risk

Risk management

According to Bank Indonesia Regulations (2009) risk management is a set of methodologies and procedures used to identify, measure, monitor, and control risks arising from all bank business activities.

And the purpose of implementing risk management is to minimize existing risks. According to Yushita (2008) there are three important things in bank risk management, which should be of concern to bank managers and owners, namely complete procedures, internal controls, and human resource factors.

Implementation of Risk Management at least includes::

a. active supervision of the Board of Commissioners and Board of Directors;

b. adequacy of policies, procedures, and setting limits;

c. adequacy of the processes of identification, measurement, monitoring and control of Risks as well as Risk Management information systems; And

d. comprehensive internal control system

Management of risk management by means of risk measurement must be carried out periodically both for products and portfolios as well as all bank business activities.

In carrying out operations in order to achieve the goal of making a profit, the company will be faced with various risks. This risk is the uncertainty of the results to be obtained in the future, or the risk of potential loss due to an incident. The relationship that occurs between risk and profit or income to be obtained by the company is unidirectional, meaning that when the level of income to be obtained is very high, the risks faced are also very high. And vice versa when the risk that is dared to be faced is only at the level is low, the income to be earned is also low. Although basically, the nature of investors is to expect high returns with low risk.

Due to the risks faced by the company, it is necessary to have management efforts for these risks. Risk management aims to manage the risks faced, so that these risks can hopefully be reduced or even eliminated. The banking industry is one of the industrial sectors that has a high level of risk. Its main activity is as a mediation institution between those who have excess capital and those who need capital. Immediately will face high and various risks. The risks faced by banks can come from within the company itself or from outside.

The high risk conditions, so that the government requires the application of risk management policy rules in every bank in Indonesia, through Bank Indonesia regulation number 11/25/PBI/2009, regarding the application of risk management for commercial banks. Aims to maintain the stability of the bank's condition against existing risks as well as to increase the trust of all existing stakeholders.

Risk management that is carried out properly and correctly by a bank will certainly affect its competitive ability. So that you are more prepared to face the risks that arise. The big risk is that the bank will face various problems related to risk and can result in losses and even bankruptcy. Therefore banking as an industrial sector with a high level of risk really needs to implement risk management.

The progress of today's increasingly modern era, technological developments are very rapid so that companies are required to keep up with developments. Do not miss the banking industry is also an industry that is required to dynamically follow the development of information technology. This will support banks in carrying out their operational activities as well as improving services to their customers so that they can compete with other banks. Related to the risks arising from the use of information technology, banks must be able to implement risk management properly, so that the utilization of information technology can be maximized and avoid existing risks.

According to the Financial Services Authority Regulation (OJK, 2016), Concerning the Application of Risk Management for Commercial Banks. There are 8 types of risks that must be managed by commercial banks, namely:

a. credit risk

Risk due to failure of the debtor and/or other parties in fulfilling obligations to the Bank

b. market risk

Risks on balance sheet positions and off-balance sheet positions including derivative transactions, due to overall changes in market conditions, including the risk of changes in Option prices

c. liquidity risk

Risk due to the bank's inability to meet its maturing obligations from cash flow funding sources and/or from high quality liquid assets that can be used as collateral, without disrupting the activities and financial condition of the bank

d. operational risk

Risks due to insufficient and/or malfunctioning of internal processes, human errors, system failures, and/or external events that affect bank operations.

e. legal risk

Risk due to lawsuits and/or weaknesses in juridical aspects

f. reputation risk

Risk due to decreased level of stakeholder trust originating from negative perceptions of the bank

g. strategic risk

Risk due to inaccuracy in making and/or implementing a strategic decision and failure to anticipate changes in the business environment

h. compliance risk.

The risk due to the bank not complying with and/or not implementing the applicable laws and regulations.

According to (Darmawi, 2005) the benefits of risk management are given to the company, can be divided into 5 (five) main categories including:

1. Risk management is likely to prevent a company from failing.

2. Risk management can directly support the increase in profit.

3. Risk management can provide indirect benefits.

4. There is peace of mind for managers due to a protection against pure risk, is a non-material asset for the company.

5. Risk management can protect a company from pure risk, and because customers and suppliers prefer companies that have protection, it can indirectly increase public image.

According to Kasmir (2014) The purpose of credit analysis is to avoid credit financed later that is not feasible. The analytical tool that can be used to determine the eligibility of a credit is by 5 of C as follows:

1. Character is the nature or character of the customer, this analysis is to find out the nature or characteristics of a credit applicant customer. From this character or nature, it will be seen that the customer's willingness to pay under any circumstances. However, on the contrary, if the customer does not have the nature of being willing to pay, the customer will try to avoid paying for various reasons, of course. This character or trait can be seen from the customer's past through observations, experiences, curriculum vitae, as well as the results of interviews with customers. Instructions for the Bank to know the character of the customer.

2. Capacity, namely the analysis used to see the ability of customers to repay credit. This ability can be seen from personal income for consumer loans and businesses financed for productive trade credits. This ability is important to assess so that the bank does not experience losses. To assess the ability of customers can be assessed from the documents owned, the results of confirmation with parties who have the authority to issue certain letters (for example a person's income), the results of interviews or through the calculation of financial ratios.

3. Capital is to assess the capital owned by the customer to finance credit, this is important because the bank will not finance the credit 100%. This means that there must be capital from customers. The goal is that if the customer also owns the capital invested in these activities, the customer will also feel a sense of ownership so that he is motivated to work seriously so that the business is successful, and is able to pay his credit obligations.

4. Conditions, namely the current and future general conditions, the conditions to be assessed, especially the current conditions, whether it is feasible to finance credit for certain sectors. For example, the production conditions for certain crops are booming (saturated). Thus, credit for the sector is on the contrary reduced. Other conditions that must be considered are the conditions of the surrounding environment, for example security conditions and social conditions of the community.

5. Collateral is a guarantee provided by the customer to the bank in the context of financing the proposed loan. This guarantee is used as a last alternative for banks to guard against a breakdown in the credit being financed. Why is collateral or collateral the last assessment of 5 of C. This is because the most important is the assessment above beforehand. If it is feasible, the guarantee is only an addition, just in case there are unavoidable factors that cause bad credit, for example natural disasters.

Besides that, to motivate customers to pay because the guarantee is withheld by the bank, a loan feasibility study is carried out through the 7 P's

1. Personality or personality is an assessment used to determine the personality of the prospective customer. In assessing the personality that is carried out by the bank, it is almost the same as the character or character or character of the customer. It's just that personality matters are more emphasized on the person, while in character it includes his family.

2. Purpose, namely the purpose of taking credit. As previously known, there are three purposes for taking credit, namely, first, for productive businesses, second, for personal use (consumptive), third, for trade. The assessment of these three objectives is slightly different. Therefore, don't let the credit extended by the bank be misused by the customer.

3. Party, meaning that in extending credit, the bank sorts into several groups. This is done so that banks are more focused on handling these loans, for example loans for small, medium or large

businesses. Or it can also be selected based on region, for example rural areas, urban areas or business sectors, for example livestock, industry, or other sectors.

4. Payment is a way of paying credit by customers. An assessment is carried out to assess how the customer pays credit, whether from income (salary) or from the object being financed. From this assessment will be seen the ability of customers to pay credit.

5. Prospect, namely to assess expectations in the future, especially for the object of credit being financed. Of course the desired hope is to give a good or bright hope. Businesses that do not have bright prospects are postponed because they will make it difficult for banks and customers, for example businesses that have entered high saturation.

6. Profitability, meaning that credit financed by the bank will provide benefits for both parties, both the bank and the customer. If not, you should not give it. The advantage for the bank, of course, is in the form of remuneration provided by customers from interest or profit sharing. Preferably for the customer is the development of the business being financed which in the end is profit and additional capital for him.

7. Protection, meaning protection of the credit object being financed. Protection is not limited to physical guarantees given, but more than that, namely guarantees for the taker, such as death insurance and guarantees for protection against physical guarantees provided from loss, damage or otherwise.

2. Method

For this method, a qualitative descriptive methodology is used, namely a research approach that aims to understand and explain phenomena or symptoms in depth with a focus on detailed descriptions and context. Through concept development, gathering information and understanding from various literatures, which is appropriate to the subject matter and is helpful in the writing process.

3. Result and Discussion

Banks are required to have an integrated risk management approach to be able to identify, measure, monitor and control risk effectively. Technology-related risks must be reviewed together with other risks owned by a bank to determine the bank's overall risk profile. The main risks related to the implementation of information technology are:

a. Operational risk

Operational risk is inherent in every

products and services provided by the bank. The use of information technology can lead to operational risks caused by, among other things, inadequate or inappropriate design, implementation, maintenance of systems or computers and their equipment, security methods, testing and internal audit standards and the use of other parties' services in the operation of information technology.

b. Compliance risk

Compliance risk can arise if a bank does not have a system that can ensure bank compliance with regulations that apply to banks, such as the confidentiality of customer data. Compliance risk can have a negative impact on a bank's reputation and image, as well as impact on business opportunities and the possibility of expansion.

c. Legal Risk

Banks face legal risks caused by lawsuits, absence of supporting laws and regulations or weaknesses in engagements such as non-compliance with the legal requirements of a contract.

d. Reputation risk

Negative public opinion can arise, among others, due to system failures that support products, cases that exist in bank products and the inability of banks to provide customer service support in the event of system failure (downtime). This negative opinion can reduce the bank's ability

maintaining customer loyalty and the success of bank products and services.

e. Strategic risk

This risk arises due to the incompatibility of the information technology used by the bank with the strategic objectives of the bank and the strategic plans made to achieve these objectives. This is because the quality of implementation and the resources used by information technology are inadequate. These resources include communication channels, operating systems, as well as capacity and capability of information technology managers.

Information Security

Information is a very important asset for the Bank, both information related to customers, finance, reports and other information. Leaks, inaccuracies, unavailability or other disruptions to this information can have an adverse impact both financially and non-financially for both the bank and the customer. Given the importance of information, information must be protected or secured by all personnel at the Bank. Information security is highly dependent on securing all related aspects and components of information technology, such as software, hardware, networks, supporting equipment and human resources.

Background to Debtors: Financial institutions provide loans to individuals, companies or business entities that need funds for various purposes. Loan backgrounds can include the following:

a. Loan Purpose: Reasons why the debtor needs a loan, such as for venture capital, investment, project funding, asset purchases, or consumer needs.

b. Debtors Profile: Information about the debtor's profile, including credit history, financial reputation, and capacity to repay the loan.

c. Collateral: If applicable, the financial institution will consider the collateral submitted by the borrower to secure the loan.

d. Risk Analysis: The financial institution will carry out a risk analysis to assess the ability of the borrower to repay the loan.

e. Terms and Conditions: Details about the interest rate, term and other conditions that apply to the loan.

The background of a financial institution's loan is very important in the decision-making process to provide a loan. By understanding the background of financial institutions and borrowers, financial institutions can mitigate risks and ensure that loans are in accordance with sound financial principles.

General steps involved in providing information technology-based loans:

Registration and Registration: Prospective debtors must register and create an account on the platform or loan application. Personal and financial information is usually requested during this process.

Data Verification: The platform will verify the debtor's personal and financial data using information technology. This can include verifying identity, income, credit history, and more.

Risk Assessment: The lender uses algorithms and data analysis to assess the risk of the debtors. Information from different data sources is used to determine the extent to which a debtor is eligible for a loan.

Loan Offer: If the debtor is deemed eligible, they will receive a loan offer that includes the amount that can be borrowed, the interest rate, and the term of the loan.

Approval and Disbursement of Funds: If the borrower accepts the offer, they will agree to the loan terms and the funds will be transferred to the debtor's account quickly via digital payment methods.

Tracking and Payment: Debtors will be able to track their loans through platforms or applications. Payments are usually made automatically via automatic debit or bank transfer.

Loan Reporting and Management: Borrowers can access reports and other important information about their loans through platforms or applications. They can also manage their loans, such as applying for extensions or paying faster.

Information technology-based lending has several advantages, including a fast application process, more efficient risk assessment, and accessibility for many people. However, as a potential borrower, it is always important to be careful and carefully read the terms and conditions, and understand the interest rates and fees associated with the loan before agreeing to it.

4. Conclusion

Information technology-based lending has experienced rapid growth in recent years. Information technology has enabled financial institutions and online lending platforms to provide loan services more efficiently and easily for customers. Several conclusions regarding the provision of information technology-based loans are:

Greater accessibility: Information technology has opened up access to loan services for many people who previously had difficulty getting access to finance from traditional financial institutions.

Better risk assessment: With the adoption of information technology, financial institutions can perform more sophisticated risk assessments, including big data analysis and predictive modeling to assess borrower viability.

Process efficiency: Process automation in information technology-based loans reduces operational costs and increases efficiency in providing loans.

Diversification of loan products: Information technology allows financial institutions to offer different types of loans and customize products according to the needs of borrowers.

Suggestion:

Although information technology-based lending offers many advantages, there are several suggestions that need to be considered to ensure successful and sustainable implementation:

Legal and regulatory compliance: Financial institutions and lending platforms need to ensure that they comply with all applicable laws and regulations regarding lending, data privacy and consumer protection.

Data security: Protection of borrowers' personal and financial data is crucial. A strong security system must be implemented to protect sensitive information from unauthorized access.

Transparency and openness: Financial institutions must provide clear and complete information about fees, interest rates and other terms related to loans to potential borrowers.

Financial education: Information technology-based lending can be attractive to individuals with less financial experience. Therefore, it is important to provide adequate financial education to help borrowers understand the obligations and risks associated with loans.

Accurate risk evaluation: While information technology can assist in risk assessment, it is still important to ensure that the risk assessment model used is accurate and non-discriminatory.

Good customer service: Ensuring good and responsive customer service will increase borrowers' trust in lending platforms and financial institutions.

Taking these suggestions into account, information technology-based lending can serve as a powerful tool to promote financial inclusion and economic growth in a responsible and sustainable way.

5. Acknowledgement

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Implications and Limitations

This article uses a qualitative descriptive approach method so that it only examines existing information, so that further in-depth research can be carried out by analyzing more detailed and complete data related to the application of information technology risk management in banking in Indonesia.

6. References

[1] Armida Salsiah Alisjahbana & Endah Murniningtyas ”Tujuan Pembangunan Berkelanjutan Di Indonesia: Konsep target dan Strategi Implementasi” Bandung, 2018

[2] Bank Indonesia (central bank republic of Indonesia) “Peraturan Nomor 11/25/PBI/2009 tentang Penerapan Manajemen Risiko bagi Bank Umum”, 2009.

[3] BAPPENAS ” Kajian Indikator Sustainable Development Goals (SDGs)”, Jakarta: Badan Pusat Statistik, 2014

[4] Herman Darmawi,”Manajemen Risiko”, *Bumi Aksara,2016*

[5] Malayu H Hasibuan,, “Dasar-dasar Perbankan”, *Bumi Aksara*, 2006[

[6] Kasmir, “Bank dan Lembaga Keuangan Lainya” Raja Grafindo Persada, pp 265, 2014.

[7] Otoritas Jasa Keuangan Indonesia, Peraturan Otoritas Jasa Keuangan, Nomor 18/POJK.03/2016, tentang Penerapan Manajemen Resiko Bagi Bank Umum., 2016.

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Formulation And Physical Evaluation Of Cream Preparations Collagen With Concentration Variations Trietanolamine As an Emulgator

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Abstract

Indonesia is a country that has a climate with an average temperature above 18 °C, thus allowing the skin of the Indonesian people to be exposed to sunlight more often. Skin that is often exposed to sunlight causes skin condition to darken and causes a number of skin injuries. To improve the layer structure of the skin, collagen is needed. Collagen is a type of structural protein composed of several amino acids. Collagen is a protein that can be found in skin, tendons, cartilage, and organs by contributing about 30% or more of the total protein.

The research method used was an experimental method by making collagen cream preparations with varying concentrations of triethanolamine as an emulsifier of 2%, 3% and 4%. Testing the physical properties of the cream includes testing organoleptic, homogeneity, pH, type of cream, spreadability, adhesion, viscosity, irritation, and hedonic.

The results of the physical evaluation of the cream on the three formulas, namely F1, F2, and F3 respectively, namely the spreadability test F1 5.72 ± 0.36; F2 6.08 ± 0.35 and F3 7.16 ± 0.58. F1 adhesion test 8.38 ± 0.27; F2 6.78 ± 0.31 and F3 5.76 ± 0.61. F1 Viscosity Test 3927.52 ± 17.07; F2 3912.76 ± 0.36 and F3 3854.96 ± 42.88. The results of a good physical evaluation of collagen cream in the hedonic test were obtained in formula 3 which was the most preferred by the panelists. Based on the results of the One Way ANOVA and Kruskal-Wallis tests, it can be concluded that variations in the concentration of triethanolamine emulsifier have a significant effect on physical evaluation which includes pH, adhesion, spreadability, viscosity, and hedonic tests.

Key words: *Skin, Collagen, Cream, Physical Evaluation.*

1. Introduction

Indonesia is a country that has a tropical climate with an average temperature above 18°C, thus allowing the skin of the Indonesian population to be exposed to sunlight more often. Skin that is often exposed to sunlight causes skin conditions to darken and cause a number of skin damage.

Nowadays people are increasingly concerned about the health of the body, especially skin health. The outermost layer of the human body that is in direct contact with the environment is the skin. Therefore, the skin is sometimes prone to damage to the skin structure and injury. To improve the layer structure of the skin, collagen is needed[1].

Collagen is a type of structural protein consisting of several amino acids. Collagen is a protein that can be found in skin, tendons, cartilage, and organs and contributes around 30% or more of the total protein. This lack of collagen can cause disturbances in the body such as skin aging, inflammation, and slow wound healing[2].

Cream is a semi-solid preparation containing one or more drugs dissolved in a suitable base and containing at least 60% water, formulated as a water-in-oil emulsion or as an oil-in-water emulsion. Making collagen cream preparations is an interesting thing because collagen plays a role in skin health[3].

Cattle (Bos indicus) are livestock kept for the use of milk and meat. Cattle live in the wild or are raised in a traditional way and are easy to find in almost all parts of Indonesia. In addition to animal husbandry, cattle are also used for agriculture (pulling plows and others).[4]. Beef contains an average composition consisting of protein varying between 16-22%, fat 1.5-13%, inorganic compounds 1%, carbohydrates 0.5%, and water between 65-80%[5].

According to the research journal Kirana (2017), one of the beef components that has the potential to be developed is skin, because it contains 89% collagen. The proportion of skin from a cow is 6.84 - 8.11%. The high content of collagen in cows opens up opportunities for formulation[6].

Collagen is an important component of protein (25-30%) in bones, skin and connective tissue of animals[1]. Hydrolyzed collagen powder (hydrolyzed collagen) is obtained by hydrolyzing gelatin with acid and is available with molecular weights from 500 to 20,000 Da. As a raw material for preparations, the use of hydrolyzed collagen with low molecular weight (2,000-5,000 Da) is preferred because it prevents precipitation and turbidity problems in the preparation. The characteristics or characteristics of collagen are white, fibrous, or look like interlocking fibers. The benefit of collagen in the skin is that it works as an absorber of water through hydration so that it keeps the skin moisturised, thereby helping the skin to regenerate quickly[7].

According to Bayarjargal's research (2021) entitled "Antioxidant and Antihypertensive Activities of Collagen and Elastin Hydrolyzate with Different Molecular Weights". This study aims to determine the antioxidant activity and inhibitory activity of angiotensin-converting enzyme (ACE) and antioxidant properties of collagen elastin hydrolyzate, and their peptide fractions (<5 kDa, 5-10 kDa, 10-100 kDa). Collagen antioxidant activity test was carried out by fractionating hydrolyzed collagen at different molecular weights determined at the same concentration (4%) used for the ACEI test. The results are expressed as IC concentrations50, where 50% at a molecular weight of ≤ 5 kDa scavenged ABTS radicals of 5.2 mg/ml and DPPH free radicals of 39.0 mg/ml had strong antioxidant properties and it was concluded that hydrolyzed collagen has a perspective as a bioactive[8].

Meanwhile, another study was conducted by Jumasni Adnan (2019) entitled "The Effect of Triethanolamine Concentration as an Emulgator on the Stability of the Physical Quality of Cream of Papaya Fruit Extract (Carica papaya L.)", the purpose of this study was to find out the comparison of the use of variations in the amount of triethanolamine 2%, 3%, and 4% on the stability of the physical quality of papaya fruit extract cream. Preparation of cream by varying the concentration of triethanolamine. The results showed that the organoleptic test, pH, homogeneity, cream washability, and emulsion type showed that formula 3 with 4% triethanolamine concentration had good physical properties stability, while when the spreadability test was carried out it showed formula 1 with 2% triethanolamine concentration and formula 2 with 3% triethanolamine concentration has good stability[9].

Many research journals have examined collagen as a wound healing potential in the skin, both as a cosmetic, biomedical, and supplement. Some of the existing journals, not many journals have conducted research on cream formulations using collagen, based on this the author wants to do a final project research entitled "Formulation and Physical Evaluation of Collagen Cream with Triethanolamine Variations as an Emulgator".

2. Method

The research was conducted from February 2023 to April 2023 and was carried out at the Pharmacy Technology Laboratory of the Indonusa Polytechnic Surakarta and took Bovine collagen from PT. Source Food, Istanbul.

This type of research is the experimental method. The experimental method is a study in which the researcher treats research subjects and analyzes the effect of a treatment on the independent variable on the dependent variable by observing, noting the reactions that arise from the subject. This experimental study was to determine the effect of varying the concentration of triethanolamine in collagen cream.

The tools used include digital scales, mortar and pestle, measuring cup, beaker, dropper pipette, horn spoon, stirring rod, pH meter, porcelain dish, petri dish, object glass, watch glass, water bath, millimeter block, stopwatch, thermometer , Brookfield viscometer, test tube clamp and adhesion test kit.

The materials used include bovine collagen obtained from PT. Food sources, stearic acid, cetyl alcohol, methyl paraben (nipagin), propyl paraben (nipasol), triethanolamine (TEA), methyl blue, green tea essence, and distilled water (aquadest).

Table 1. Formulation of Collagen Cream

Material	**Function**	**F1 (%)**	**F2 (%)**	**F3 (%)**
Stearic acid	Oil Phase Emulgator	17	17	17
Cetyl alcohol	Emollient (Moisturizing)	2	2	2
Nipagin	Water Phase Preservative	0.1	0.1	0.1
Nipasol	Oil Phase Preservative	0.1	0.1	0.1
Collagen	Active Ingredients	4	4	4
Triethanolamine	Water Phase Emulgator	2	3	4
Jasmine Perfume	Additives	3 drops	3 drops	3 drops
Distilled water	Solvent	ad 100	ad 100	ad 100

Information :

(Each formula is made 70 grams)

F1 : Triethanolamine Formula(TEA) 2%.

F2 : Triethanolamine Formula(TEA) 3 %.

F3 : Formula Triethanolamine (TEA) 4 %.

2.1 How Formulas Work

Weigh all the ingredients, separate the ingredients into two, namely the water phase and the oil phase. The oil phase which includes stearic acid and cetyl alcohol is dissolved over a water bath (mass 1). The water phase consisting of triethanolamine and methyl paraben is dissolved in hot water which has been measured at 70°C on a hotplate (mass 2). Soaking mortar and stamper in hot water, drying. Enter mass 1 and mass 2 into the mortar, grind until homogeneous and add propyl paraben. After a homogeneous creamy mass is formed, gradually add the bovine collagen, crushed until the creamy mass is homogeneous. Add 3 drops of perfume then homogenize with the remaining distilled water until a cream forms. The procedure was repeated for all formulations with different variations of triethanolamine concentrations[10].

2.2 Evaluation of Cream Preparations

2.2.1 Organoleptic Test

Examination of the physical properties of the cream preparations, including: Form: examination of the shape / consistency of the cream. Color: cream color check. Smell : check the scent of the cream[11].

2.2.2 Homogeneity Test

This homogeneity test was carried out by applying the cream obtained on the glass slide, then covering it with another glass. Check whether the cream applied to the slide has homogeneous properties, the surface is smooth and the color is even.

2.2.3 pH test

Cream measured its pH with a pH meter. Examination of the pH of the cream was carried out by means of a pH meter calibrated with a buffer solution of pH 4 and 7. Then 1 gram of cream sample was mixed with 1 ml of distilled water, then measured the pH. The pH of the skin is 4.5-6.5.

2.2.4 Cream Type Test

The method used to observe the type of emulsion is the color dispersion method, by adding a few drops of methyl blue to a beaker containing the cream sample. If the blue color is directly mixed in the emulsion, the type of cream is oil in water (M/A) and vice versa, if the blue color is not completely mixed the type of cream is water in oil A/M[11].

2.2.5 Spreadability Test

Place the transparent glass on the millimeter block paper. Give 0.5 grams of cream sample on top, cover with another glass then let stand for 1 minute to get cream with a certain diameter. Then load it on the glass with a load of 50 g to 250 g and observe the diameter of the distribution obtained. A good cream is a cream that spreads easily and evenly[13].

2.2.6 Stickiness Test

This test is done by placing 500 mg of cream sample on a glass object, then covering it with a second glass object and pressing it with a 1 kg load for 5 minutes. The glass object is placed on the test stand, the 80 g weight is removed and the time it takes for the two objects to be released is recorded. Replicated 3 times. Repeat test on other formulas[13].

2.2.7 Viscosity Test

Cream viscosity was measured using a BrookField viscometer, by pouring 50 grams of cream into the ointment pot. Run spindle no. 3 with a rotor speed of 30 rpm. Test results are recorded[11].

2.2.8 Irritation Test

Irritation testing was carried out on 9 adult female and male panelists. The test is carried out on the arm behind the earlobe for 24 hours, if an itchy or reddish reaction does not occur then the cream is safe to use[14].

2.2.9 Hedonic Test

Hedonic testing on 20 male and female volunteers for the cream preparations that had been made and asked to assess the cream preparations which included color, texture, and ease of being spread. The test parameters were measured at the panelist's level of preference for the preparation[15].

2.2.10 Data analysis

The test data was analyzed using the Statistical Package For The Social Sciences (SPPS), which is a program used on computers for data analysis. The data tested in the first SPSS uses the normality test to see if the data is normally distributed or not based on its significance value, if the data obtained has a significance value > 0.05, which means that the data is homogeneously distributed, then parametric statistical tests are used with the Analysis of Varience (ANOVA) One test. Way whereas if the results obtained have a significance value of <0.05 which means the data is not distributed homogeneously then a nonparametric statistical test is used with the Kruskal wallis test[16].

3. Result and Discussion

The purpose of the physical evaluation of collagen cream with triethanolamine variations is to determine the quality of the cream produced with variations in emulsifier concentrations. Physical evaluation of cream preparations consisted of: organoleptic test, homogeneity, pH, type of cream, spreadability, adhesion, viscosity, irritation, and hedonic.

3.1 Organoleptic Test

Table 2. Organoleptic Test Results

Formulas	Smell	Color	Consistency
F1	Jasmine Perfume	White	Half Solid
F2	Jasmine Perfume	White	Half Solid
F3	Jasmine Perfume	White	Half Solid

The organoleptic test aims to determine the appearance of the cream by examining the color, smell and consistency of the preparation[11]. Based on the obtained test results, there is a difference in the consistency of the cream, namely in formulation 1 the consistency of the cream produced is semi-solid but thicker in texture, while formulation 2 is semi-solid and formulation 3 has a semi-solid consistency. The three formulas produce a different cream consistency in each formulation where the more triethanolamine (TEA) content, the resulting cream texture will be slightly thinner. In the organoleptic test for odor, all formulas have the same smell, which is typical of jasmine perfume. In the organoleptic test the consistency of all formulations obtained thick cream that is relatively liquid.

3.2 Homogeneity Test

The purpose of the test is to find out whether the collagen cream can be mixed evenly in the cream preparation or not. The test was carried out by placing a small amount of cream on a glass plate and cupping the other plate, then observing whether there were coarse grains and an even color in the cream. The test results of the three formulas are homogeneous, no coarse grains and uniform color.

3.3 pH Test

The purpose of testing the pH is to ensure that it is not harmful to use the preparation on the skin. Testing the pH by dipping the pH meter into the cream preparation then looking at the results of the pH measurement printed on the pH meter. The pH test results obtained were F1 pH 5.68, F2 pH 6.4, and F3 pH 6.6. The observation results for formulations 1 and 2 have met the quality requirements, while formulation 3 does not meet the requirements for good cream quality because it produces a pH > 6.5. There is a significant difference in pH between the three formulas, this could be due to triethanolamine having an alkaline nature with a pH of 10.5 so where the higher the concentration of triethanolamine, the resulting pH will be even higher[17]. Cream preparations are expected to meet the pH requirements for good cream preparations, namely pH 4.5-6.5.

Table 3. pH Test Results

Formula	pH
F1	5,68 ± 0,46
F2	6,40 ± 0,06
F3	6,60 ± 0,07

3.4 Cream Type Test

The test which aims to examine the type of cream in this formulation has 2 methods, namely the dilution method and the color dispersion method. The type of cream test that has been carried out is by using the color dispersion method, namely by giving a few drops of methylene blue into a beaker containing a sample of cream. If the blue color is immediately dissolved in the emulsion then the type of cream is oil in water (o/m) and vice versa, if the blue color is not completely dissolved then the type of cream is water cream in oil w/o[11]. The results of the cream test from the three formulas, namely the type of m/a, the three cream formulas are distributed in blue overall. Based on the formula design, the overall collagen cream formulation is dominated by the water phase category where the drug substance dissolves in water which is alkaline. In addition, the M/A type has a high water content because the oil is distributed in water so it can provide a hydrating effect to prevent the skin from drying out.

3.5 Spreadability Test

The purpose of this test is to measure how well a sample of the cream spreads on the skin. The results of the spreading power test were F1 5.72; F2 6.08; and F3 7.16cm. There is a difference in the spreadability of the cream which is affected by variations in the concentration of the emulsifier, this is because the triethanolamine before it is formulated is in the form of a liquid and slightly viscous, so it can be concluded that the higher the triethanolamine level, the greater the spreadability value because the resulting preparation is more liquid and easier spread. Formulas 1 and 2 meet the requirements for good cream spreadability, which is between 5-7cm[18], while Formula 3 exceeds 7 centimeters.

Table 4. Spreadability Test Result

F1 (cm)	**F2 (cm)**	**F3 (cm)**
5.72 ± 0.36	6.08 ± 0.35	7.16 ± 0.58

3.6 Stickiness Test

This test aims to determine how long the preparation can stick to the skin, the higher the adhesion value, the longer the preparation will stick to the skin. The results of the cream test were F1 8.38 seconds, F2 6.78 seconds and F3 5.76 seconds. From the data obtained, it can be seen that there are differences in results where differences in triethanolamine concentrations affect the adhesion test, this is due to the characteristics of triethanolamine before it is formulated, which is in the form of liquid and slightly viscous, where the higher the concentration of triethanolamine, the lower the stickiness. So it can be concluded that the adhesive power is inversely proportional to the spreading power. All three formulas have met the requirements for good adhesion of topical preparations, which is more than 4 seconds[18].

Table 5. Stickiness Test Results

F1 (Second)	F2 (Second)	F3 (Second)
8.38 ± 0.27	6.78 ± 0.31	5.76 ± 0.61

3.7 Viscosity Test

This test aims to determine the thickness of a preparation using a Brookfield viscometer. The results of the cream viscosity test on F1 were 3,927.516 cPs; F2 3913.753 cPs and F3 3854.953 cPs at 30 rpm. Of the three formulas, they meet the requirements for good cream viscosity, namely 2,000-50,000 cPs[18]. There is a difference in the resulting viscosity value because it is influenced by variations in the concentration of the triethanolamine emulsifier where the higher the triethanolamine concentration the lower the viscosity value because the resulting preparation will be more liquid.

Table 6. Viscosity Test Results

F1 (cPs)	F2 (cPs)	F3 (cPs)
3927.52 ± 17.07	3912.76 ± 0.36	3854.96 ± 42.88

3.8 Irritation Test

This test has the aim of knowing whether the preparations made cause irritation / serious side effects to the skin. This test is done by applying the cream behind the earlobe for 24 hours, if there is no itching or redness reaction, the cream is safe to use[14]. The test results of the three formulas met the requirements of a good cream, namely the three formulas did not cause itching or redness in 9 respondents.

3.9 Hedonic Test

This hedonic test was carried out to evaluate a sample by involving several panelists or volunteers who were then asked to give their opinions or comments on the quality of the sample. The hedonic test was carried out on 20 panelists (19 women and 1 man) on cream preparations that had been made and were asked to assess the cream preparations which included color, texture, and ease of smearing. The hedonic test results for the three formulations that the panelists liked the most were formula 3.

Table 7. Hedonic Test Results

Test Category	Subset Value Results			Best Formulas
	F1	F2	F3	
Color	3.80	3.70	4.00	F3
Texture	3.60	3.70	4.05	F3
Ease of Greasing	3.40	3.70	3.95	F3

3.10 Statistical Test of Physical Properties of Cream

Statistical results pH Fl = 0.486; F2 = 0.511 and F3 = 0.161. In the One Way ANOVA test, the pH of the cream yielded a value of 0.000 in significance which means <0.05 that the cream has a significant difference in the pH test.

The statistical results of the spreadability of Fl = 0.218; F2 = 0.327 and F3 = 0.583. In the One Way ANOVA test the spreadability of the cream yielded a value of 0.000 at significance which means <0.05 that the cream has a significant difference in the spreadability test.

The statistical results of stickiness Fl = 0.038; F2 = 0.084 and F3 = 0.001. In the Kruskal-Wallis test the adhesion of the cream yielded a value of 0.000 at a significance level which means <0.05 that the cream has a significant difference in the adhesion test.

The statistical results of the viscosity of Fl = 0.000; F2 = 0.319 and F3 = 0.000. In the Kruskal-Wallis test the viscosity yielded a value of 0.000 at a significance level which meant <0.05 that the cream had a significant difference in the viscosity test.

4. Conclusion

Based on the analysis of the One Way ANOVA and Kruskal-Wallis tests that have been carried out, it can be concluded that differences in varying triethanolamine concentrations significantly affect the physical evaluation which includes pH, adhesion, spreadability, and viscosity tests.

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6. References

[1] Miskiyah, "Karakteristik Mutu Gelatin Ceker Ayam Sebagai Alternatif Gelatin Halal," *Jurnal Balai Besar Pertanian*, vol. 22, no. 3, p. 239, 2020.

[2] N. R. M. W. Marliana, *IMUNOSEROLOGI*. Pusat Pendidikan Sumber Daya Manusia Kesehatan, Kemenkes RI, 2018.

[3] Depkes RI, *Farmakope Indonesia Edisi III*, 3rd ed. Jakarta: Kemenkes RI, 1979.

[4] G. Siagian, *Taksonomi Hewan*, 1st ed. Bandung: Widina Bhakti Persada Bandung, 2020.

[5] A. Fausiah, "Karakteristik Kualitas Kimia Daging Sapi Bali Di Pasar Tradisional," *Agrovital : Jurnal Ilmu Pertanian*, vol. 3, no. 1, p. 8, 2019.

[6] K. Sasmitaloka, "Kajian Potensi Kulit Sapi sebagai Bahan Dasar Produksi Gelatin Halal," *Buletin Peternakan*, vol. 41, no. 3, p. 328, 2017.

[7] Romadhon, "The Difference Characteristicsof Collagen from Tilapia (Oreochromis niloticus) Bone, Skin, and Scales," *J Pengolah Has Perikan Indones*, vol. 22, no. 2, pp. 403–410, 2019.

[8] B. Munkhuu, "Aktivitas Antioksidan dan Antihipertensi Kolagen dan Elastin Hidrolisat Berbeda Berat Molekul," *Atlantis Press*, vol. 2, pp. 21–27, 2021.

[9] J. Adnan, "Pengaruh Konsentrasi Trietanolamin Sebagai Emulgator Terhadap Stabilitas Mutu Fisik Krim Ekstrak Buah Pepaya (Carica papaya L.)," *Jurnal Farmasi Pelamonia*, vol. 3, pp. 14–19, 2019.

[10] Sudewi, "Formulasi Sediaan Krim Menggunakan Kolagen Tulang Ikan Patin (Pangasius sp.) sebagai Anti Aging," *Journal of Pharmaceutical and Health Research*, vol. 1, no. 2, pp. 27–31, 2020.

[11] M. Pratasik, "Formulasi Dan Uji Stabilitas Fisik Sediaan Krim Ekstrak Etanol Daun Sesewua (Clerodendron squamatum Vahl.)," *Pharmacon*, vol. 8, no. 2, p. 261, 2019.

[12] A. Setyopratiwi, "Formulasi Krim Antioksidan Berbahan Virgin Coconut Oil (VCO) Dan Red Palm Oil (RPO) Dengan Variasi Konsentrasi Trietanolamin."

[13] N. Lumentut, "Formulasi Dan Uji Stabilitas Fisik Sediaan Krim Ekstrak Etanol Kulit Buah Pisang Goroho (Musa acuminafe L.) Konsentrasi 12.5% Sebagai Tabir Surya," *Jurnal MIPA*, vol. 9, no. 2, p. 42, 2020.

[14] E. Ginting, "Formulasi Sediaan Krim Menggunakan Kolagen Tulang Ayam Broiler (Gallus gallus domestica) Sebagai Anti Aging," *Journal Of Pharmaceutical And Science (JPS)*, vol. 1, no. 1, pp. 1–10, 2022.

[15] Y. Supriyadi, "Formulasi Krim Ekstrak Etanol Daun Kersen (Muntingia Calabura L.) Konsentrasi 5% Dan 10%," *Medimuh*, vol. 1, no. 2, pp. 109–116, 2019.

[16] D. Mailana, "Antioxidant Cream Formulation of Ethanolic Extract from Avocado Leaves (Persea americana Mill.)," *Acta Pharmaciae Indonesia*, vol. 4, no. 2, pp. 7–15, 2016.

[17] F. A. Iriani, "Uji Mutu Fisik Lotion Kombinasi Minyak Atsiri Daun Zodia (Evodia Suaveolens) dan Daun Kemangi (Ocimum basilicum L .)," *Jurnal Poltekkes Jayapura*, vol. 13, pp. 54–68, 2021.

[18] S. Arbie, "Formulasi Krim M/A Dengan Variasi Konsentrasi Ekstrak Buah Pepaya (Carica papaya L.) Menggunakan Emulgator Asam Stearat Dan Trietanolamin," *Media Farmasi*, vol. 16, no. 1, p. 97, May 2021.

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A CYTOKINE RESPONSE IN LEPROSY: Literature Review

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Abstract

Leprosy is an infection that has strategic effects on society, especially in the economic sector. This diseases is caused by Mycobacterium leprae. Therapy based on the immune response caused by M. leprae infection, especially the cytokines response is an effective choice considering that each patients has a different immune response in dealing with M. leprae infection. This article aimed to identify cytokines that play a role in M. leprae. The innate and adaptive immune response has an important role against this infection.

Key words: *cytokines, immune response, Leprosy*

1. Introduction

Leprosy is a chronic disease caused by *Mycobacterium leprae* [1][2]. This infection attacks the skin and peripheral nerves [3]. The bacterium *M. leprae* is the only mycobacterial infection that causes widespread demyelinating neuropathy, which results in leprosy morbidity, autoamputation of the digits and blindness. The debilitating morbidity is associated with axonal demyelination resulting from the direct interaction of *M. leprae*-specific PGL-1 with GLIA myelination and subsequent infection [2]. Therapy has been proven effective in curing leprosy [4]. According to WHO data in 2020 around 127,558 new cases were found. Southeast Asia ranks first in the most cases of Leprosy. Indonesia is still the 3rd largest country in the world with the most Leprosy cases. A total of 9,061 new cases were found in 2020 [5].

The *M. leprae* bacteria are intracellular organisms that cannot move into the cytoplasm [6]. However, in a study by Van *et al* (2007) reported that *M. leprae* can translocate into the cytoplasm so that it can interact with the nucleotide-binding oligomerization domain (NOD)-like receptors (NLR) [7].

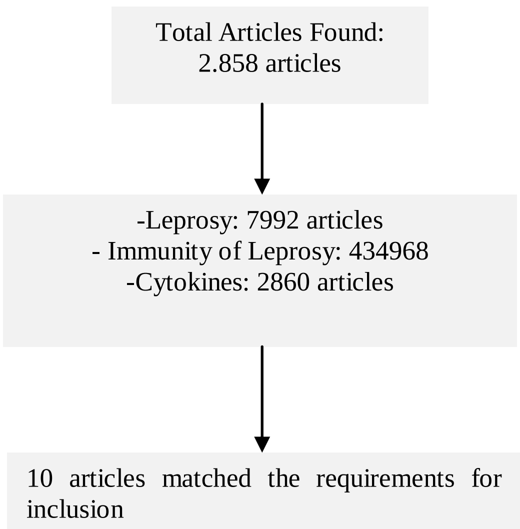
The immune response against *M. leprae* consists of innate and adaptive immune responses [4]. The innate immune system is activated by the pattern recognition receptor (PRR) which consists of Toll-like receptors (TLR) and NLR. The NLR functions to identify pathogens contained in the cytoplasm [8][4]. NOD-Like receptors (NLR) can activate caspase-1 and induce pro-inflammatory cytokines such as TNFα. IFNγ, IL-6 and IL-12. In cases of leprosis, cellular immunity plays a role, namely IFNγ and IL-12. IFNγ and other cytokines will promote/presented by IL-8 cytokines produced by macrophages, besides that IL-8 can also increase cytotoxic activity and proliferation of CD8+ T cells [9][4]. The purpose of writing this article is to discuss more deeply how the immune system fights bacterial infections, especially Mycobacterium leprae which causes leprosy.

2. Method

This research design is an identification of research journals within a period of 5 years, namely from 2018-2022. The research journals reviewed are those contain cytokines that play a role in Leprosy infection.

Article Selection Method

Several inclusion criteria in this study were a) articles reviewed in this study related cytokines that play a role in Leprosy; b) Using interleukin intervention that plays a role in Leprosy. The Exclusion criteria in this study were cytokines that play role in other than in Leprosy, and journals published before 2018.



Article Search Method

How to find articles in this study is examined methodically, starting with selecting research topics and generating English keywords for journal searches. The database used is PUBMED, SCIENCEDIRECT to search for articles throughout the year, from January 2021 to December 2022. The keywords are in English used are "Leprosy", "Cytokine", and "Immunity of Leprosy". The next step is to identify the title of the article that best fits the research we want. Then, abstract identification and overall content analysis were completed to provide study findings that match the researcher's objectives.

Search results in Figure 1. Then the researchers filtered the relevant article titles and inclusion criteria, in order to obtain 10 appropriate articles.

Analysis studies

According to the researcher's objectivities. Pertinent literature and data gathered utilizing the method of random controlled trial (RCT).

3. Result and Discussion

Based on research that has been conducted by looking at various populations, there are 10 articles that meet the inclusion criteria. There are 7 cytokines that play role in Leprosys, such as TNF-α, IFN-γ, IL-10, IL-2, IL-37, IL-17, IL-21.

Each cytokines produces a different immune response against *M. leprae*. Differences in the immune response in the form of cytokines indicate the need for different treatment needs based on the type of cytokines in dealing with *M. Leprae.*

Based on the above data, the 7 cytokines have anti-inflammatory and pro-inflammatory roles. After further analysis, the 7 cytokines were differentiated based on the response of Th1 and Th2 cells. The difference in Th1 and Th2 cells responses helps in finding therapies both vaccines and drugs to determine the desired mechanism of action of the immune response so that theraphy can be on target, attacking intracellular bacteria.

3.1. Results

Berdasarkan hasil pencarian di database, ditemukan bahwa sitokin yang berperan dalam infeksi Lepra tertera dalam table 2.

Table 2. Cytokines that play a role in the Leprosy infection process.

Cytokines	Role	Reference
TNF-α	Pro-inflammatory cytokines	[10]; [11]; [12]
IFN-γ	Anti-inflamatory cytokines	[13]

IL-10	Anti-inflammatory cytokines	[14]; [15]; [17]
IL-2	Anti-inflamatory cytokines	[16]
IL-37	Anti-inflammatory cytokine	[17]; [16];
IL-17	Pro-inflammatory cytokines	[18]
IL-21	Anti-inflammatory cytokines	[19]

IL-10

Interleukin (IL)-10 is an anti-inflammatory cytokine secreted by Th2 cells and inhibits cytokine synthesis and proliferation of Th1 cells. The balance between IL-12 and IL-10-producing monocytes is important for the final outcome of the T-cell cytokine response. Th1 cells in humans are IL-10-secreting cells. The function of Th1 cells is heterogeneous, some function as pro-inflammatory and others as anti-inflammatory. Strong IL-12 expression and weak IL-10 expression in TT lesions occur due to local IFNγ release [19][14][15][17].

TNF-α (Tumor Necrosis Factor)

TNF-*α* is a key cytokine involved in the immune response against various pathogens. These cytokines are pro-inflammatory for macrophage activation and granuloma formation in preventing mycobacterial infection. TNF-*α* is an antagonist to IL-12 levels. TNF-*α* is actively produced by macrophages and polymorphonuclear (PMN) cells. *Mycobacterial lipopolysaccharide* (LPS), which is the main inducer of monocytes**,** can stimulate neutrophils to produce TNF-α. TNF-α is a cytokine that is important for the formation of granulomas, which are the basic pathological features of leprosy in the skin and nerves, as well as for the movement of leukocytes during inflammation. The increase in the TNF-α/IL-10 ratio plays a role in controlling mycobacterial invasion and replication. A higher TNF-α/IL-10 ratio is associated with a better prognosis.

TNF-α levels in the serum of leprosy patients will decrease after administration of MDT (multi-drug therapy) in accordance with the decrease in the number of bacteria. This decrease in cytokine production can be seen from the skin lesions of TT leprosy patients after MDT administration, but will remain high in untreated TT leprosy. LL/BL type leprosy that had been treated for six months did not show any significant changes. It should be emphasized that the defects in specific cellular immunity in LL patients are permanent and cannot be reversed with treatment.

Inflammation in RR occurs due to increased proliferation of T cells against *M. leprae* antigens, increased production of IL-1β, IL-2, TNF-α and IFN-γ, and decreased levels of IL-4, IL-5 and IL-10. This indicates an increase in the cellular immune response against *M. leprae*. TNF-α will increase by IFN-γ induction and autocrine mechanisms (autoregulation). These cytokines also play an important role in the process of inflammation and damage to tissues and nerves through the induction of apoptosis.

The results of the study by Manandhar et al., showed that peripheral blood mononuclear cells from leprosy patients with untreated RR had significantly higher levels of TNF-α than leprosy patients without a reaction. Generally, IFN-γ and TNF-α in patients with RR decreased during steroid therapy, but TNF-α levels increased when the steroid dose was reduced. IL-10 levels also increased during the period of steroid therapy and were strongly associated with TNF-α levels. The results of another study by Faber et al., showed an increase in TNF-α in four out of seven leprosy patients with TNFα reaction plays an important role in the pathogenesis of ENL. The levels of this cytokine increase due to spontaneous release of TNF-α by peripheral blood mononuclear cells and stimulation of M. leprae cell wall components. No correlation was found between systemic symptoms and TNF-α levels. It can be concluded that TNF-α plays a role in leprosy reactions, both directly and synergistically with other cytokines. Recurrence of reaction episodes can occur due to other infections such as dental or periodontal abscesses, thereby increasing cytokines including TNF-α. High levels of IL-2 and TNF-α's are associated with relapse of borderline lepromatous (BL)/lepromatous (LL) to tuberculoid (TT)/borderline tuberculoid (BT) types. Whereas in TT/BT type leprosy that relapsed into BL/LL type, there was an increase in the production of Th2 cytokines (IL-4, IL-5, IL-6, IL-10). High IL-10 levels are also associated with reactivation.

IL-37

IL-37 plays a role in inhibiting the production of CXCL8, IL-8, and S100A7 in keratinocytes. Research by De Sousa et al., (2018) reported the results of immunohistochemical analysis showing very high expression of IL-37 in plaque psoriasis in humans. IL-37 plays a role in the immunosuppressive mechanism by modulating the activity of keratinocytes, endothelial cells, macrophages, and lymphocytes in the forms of TT and LL disease [16].

3.2. Discussion

Leprosy is a global disease

The globally transmitted *Leprosys* proses a significant threat to developing countries, 80% found in Brazil, India and Indonesia New leprosy cases have been remarkably reduced by multidrug therapy (MDT) developed with the support of the World Health Organization (WHO) [21], but in 2019 around 200,000 cases were still reported from over 100 countries [5].

Cytokines-cytokines that play a role in _Leprosys_ disease

Two cytokines important for the infection of Leprosys are TNF-α and IFN-γ. The innate immune system is the first line of defense against *M. leprae* infection. Natural killer (NK) cells, cytotoxic T lymphocytes, and activated macrophages can destroy pathogens and then activate the adaptive immune system through the secretion of cytokines and antibodies. The innate immune response is modulated by the presence of antigen presenting dendritic cells, and the low virulence of *M. leprae* may preclude the development of the clinical manifestations of leprosy.

Regulation of inflammatory cytokines and chemokines can lead to the proliferation of T helper 1 (Th1) or T helper 2 (Th2) lymphocytes, which increase cellular or humoral immune responses against *M. leprae,* respectively. Cellular immunity is involved in the development of skin lesions, and humoral immunity is involved in the production of IgM antibodies to *phenolic glycolipids* (PGL-1), thus allowing bacillary spread.

In addition to being ineffective in preventing the development of the disease, the cellular immunity of individuals with tuberculoid disease also deteriorates, so that it is directly involved in the appearance of skin lesions. The humoral immunity of individuals who develop the lepromatous form of the disease, which is responsible for the production of IgM antibodies to PGL-1, provides no protection, allowing bacillary spread. The immunological response to *M. leprae* not only determines the course of the disease, but also determines the type of leprosy or leprosy that will manifest. Tuberculoid leprosy patients are able to limit the growth of the pathogen and have a strong T-cell response to *M. leprae.* It is characterized by the production of Th1 cell cytokines that form tuberculoid granulomas associated with the protective and destructive immunity of *M. leprae*. In contrast, lepromatous leprosy patients show a weak T-cell response *to M. leprae.* Lesions in lepromatous leprosy express Th2 cell cytokines (IL-4, IL-5, IL-6, IL-9, and IL-10), which play a role in antibody production, inhibition of macrophage function (macrophage granuloma formation), and suppression of SIS so that it allows intracellular bacteria to multiply [19]. The dynamics of the natural immune response in leprosy can be understood by knowing the relationship between *M. leprae* specific antibodies and the secretion of various cytokines (IFN-Υ, IL-2, IL-5, IL-10, IL-6, TNF-α, and granulocyte macrophage colony- stimulating factor [GM-CSF]) in leprosy or leprosy patients. IFN-γ and TNF-α cytokines are immunoprotective, while IL-2 and IL-10 are immunosuppressive against *M. leprae* [19].

In the initial protection stage, non-specific mechanisms are mainly carried out by monocytes which act as phagocytic cells. In addition to monocytes, the response to infection also increases the production of neutrophils from the bone marrow. Neutrophil production is induced by CSF cytokines. Neutrophils phagocytize circulating microbes as well as microbes in the extravascular tissue and produce partial lysis. Neutrophils survive only a few hours, while circulating monocytes survive for up to 5 days. However, monocyte cells can migrate to the connective tissue and survive for several months as histiocytes [19].

Some of the bacteria that escape will join the monocytes in the bloodstream. As long as they are in monocytes, these bacteria can even replicate (Troyan horse phenomenon) and enter various organs. These stimulated monocytes differentiate into macrophages with high energetic activity, and are able to form epithelioid cells in TT-type leprosy and leprosy cells (Virchow cells) in LL-type leprosy. Activated macrophages in TT leprosy are also capable of phagocytizing intraneural bacilli. Macrophages also act as antigen presenting cells (APC) in both cellular and humoral immune responses.

Bacteria that emerge from the dead and ruptured monocytes will invade Schwann cells and enter phagocytic vacuoles (phagosomes), so that they can multiply and be protected from antibodies and macrophages. However, *M. leprae* can also leave its hiding place and enter the perineural tissue, resulting in the formation of epithelioid granulomas. Schwann cells do not have lysosomal enzymes to destroy bacteria, so *M. leprae* bacilli can survive for a long time [19][20].

4. Conclusion

Cytokines that play a role in *M. leprae* infection are TNF-α, IFN-γ, IL-10, IL-2, IL-37, IL-17, IL-21. Each cytokine will produce a different immune response against pathogens so that it can be used to perform both vaccine and drug therapy for *M. leprae* infection.

5. References

[1] M. Hernandez, T. Oliveira Fulco, R. Olmo Pinheiro, R. de Meirelles Santos Pereira, P. Redner, E. Nunes Sarno, U. Gazos Lopes, E. Pereira Sampaio, "Thalidomide modulates Mycobacterium leprae-induced NF-κB pathway and lower cytokine response", European Journal of Pharmacology, vol. 670, Issue 1, 2011, p. 272-279,https://doi.org/10.1016/j.ejphar.2011.08.046.

[2] C. A. Madigan, C. J. Cambier, K. M. Kelly-Scumpia, P. O. Scumpia, T. Y. Cheng, J. Zailaa, B. R. Bloom, D. B. Moody, S. T. Smale, A. Sagasti, R. L. Modlin, L. A. Ramakrishnan. "A

Macrophage Response to Mycobacterium leprae Phenolic Glycolipid Initiates Nerve Damage in Leprosy", Cell, vol. 24; 170(5):973-985.e10, 2017. doi: 10.1016/j.cell.2017.07.030. PMID: 28841420; PMCID: PMC5848073.

[3] I. Gusti Nyoman Darmaputra., N. Nyoman Tri Priliawati., Juliyanti., I. A. Diah Purnama Sari., L. Made Mas Rusyadi. "A Retrospective Study of Erythemanodusum Leprosum In Dermatology and Benereology Outpatient Clinic of Sanglah General Horapital, Bali-Indonesia", Journal of Global Pharma Technology, vol. 10;12, 2018.

[4] O. Suwarsa., H. Gunawan., P. Aji Achdiat. "Imunitas Bawaan pada Kusta: Hubungan Ekspresi Kaspase-1 dengan Interleukin-18 pada Pasien Kusta", Bandung Medical Journal, vol. 48, no. 3, 2016.

[5] Ministry of Health Repulic of Indonesia. "Prevalensi Kusta Pada Anak Tinggi, Temukan Kasusnya, Periksa Kontak dan Obati Sampai Tuntas", Direktorat Jenderal Pencegahan dan Pengendalian Penyakit. Avaliable in http://p2p.kemkes.go.id/pravalensi-kusta-pada-anak-tinggi-temukan-kasusnya-periksa-kontak-dan-obati-sampai-tuntas/, acces in Aug 21, 2023.

[6] M. Goto. "Pathology and classification" in Makino M, Matsuoka M, Goto M, Hatano K, penyunting. Leprosy science working toward dignity. Kanagawa: Tokai University Press; p. 118–23, 2011.

[7] N. Van der Wel., D. Hava., D. Haouben., D. Fluitsma., M. Zon., J. Pierson. "M. tuberculosis and M. leprae translocate from phagolysosome to the cytosol in myeloid cells", Cell, vol. 129, no. 7, p. 1287–98, 2007

[8] L. Franchi., T. Eigenbrod., R. Munoz-Planillo., G. Nunez. "The inflammasome a caspase-1 activation platform regulating immune responses and disease path pathogenesis". Nat Immunol. Vol. 10, no. 3:1–15, 2009.

[9] M. Sahoo., I. Ceballos-Olvera., L. Del Barrio., R. Fabio. "Role of the inflammasome IL-1β and IL-18 in bacterial infections". Sci World J. vol. 11:2037–50, 2011.

[10] R. Yuniati., F. Firdaus Munita., B. Dayana., F. Amalia. "Difference of Tumir Necrosit Factor (TBF-α) levels in Multibacillary Leprosy between Reverse Reaction and Non-Reverse Reaction Patients", Pakistan jjournal of Medical and Health Sciences, vol. 12, no. 3, 2018.

[11] D. Mitra. "A randomized controlled trial of prednisolone vs TNF-alfa inhibitor Infliximab in the management of type 1 lepra reaction in leprosy patients", International Journal of Infectious Diseases, vol. 101(1), no. 454, 2020.

[12] A. L. Cogen., E. Lebas., B. De Barros., et al. "Biologics in Leprosy: A Systematic Review and Case Report". The American Journal of Tropical Medicine and Hygiene, vol. 102(5):1131-1136, 2020. doi:10.4269/ajtmh.19-0616

[13] A. Edson Queiroz., N. I. Medeiros., T. Rafael Mattos., B. F. Pinto., A. M. Paula Carvalho., W. O. Dutra., F. C. Félix-Lana., R. C. Oliveira., J. A. S. Gomes. "CCL2 and IFN-γ serum levels as biomarkers for subclinical infection in household contacts of leprosy patients", Microbial Pathogenesis, vol. 150, 104725, 2021. https://doi.org/10.1016/j.micpath.2020.104725

[14]M. Tarique., H. Naz., C. Saini., M. Suhail., H. Shankar., N. Khanna., A. Sharma. "Association of IL-10 Gene Polymorphism with IL-10 Secretion by CD4 and T Regulatory Cells in Human

Leprosy", Front Immunology, vol 6, no. 11: 1974, 2020. doi: 10.3389/fimmu.2020.01974.

[15] D. Oktariana., I. Saleh., Z. Hafy., I. A. Liberty., E. M. Salim., L. Legiran. "The role of IL-10 in Leprosy: A Review", Indian Journal og Leprosy, vol. 94. P. 321-334, 2022

[16] J. R. de Sousa., M. Nacagami Sotto., J. A. Simoes Quaresma, "Leprosy As a Complex Infection: Breakdown of the Th1 and Th2 Immune Paradigm in the Immunopathogenesis of the Disease",Front. Immunol, vol. 8, 2017. https://doi.org/10.3389/fimmu.2017.01635

[17] I. Gusti Nyoman Darmaputra., L. Mas Rusyati., W. Riawan., A. Endaryanto., C. Rosita., S. Prakoeswa. "The Correlation between Neutrophil CD64, Interleukin-17 (Il-17), Interleukin-10 (Il-10) in Skin Tissue and Neutrophil CD64, Il-17 and Il-10 in Blood Circulation in Erythema Nodosum Leprosum (ENL) Patients", Proceedings of the 23rd Regional Conference of Dermatology (RCD 2018), pages 286-290, 2021. DOI: 10.5220/0008155802860290

[18] A. G. A. Farag., A. Z. Labeeb., A. N. A. Gerges., M. E. Elshaib. "Interleukin-17A in Egyptian leprosy patients: a clinical, genetic, and biochemical study", An Bras Dermatol, Vol. 97(6):735-741, 2022. doi: 10.1016/j.abd.2021.09.016. Epub 2022 Sep 21. PMID: 36153175; PMCID: PMC9582869.

[19] Sari., Amiruddin., A. Adam., Djamaluddin., Vitayani. "Peran Interlukin -2 (IL-2), Interlukin-10 (IL-10) dan tumor necrosis factor-α (TNF-α) pada penyakit kusta". MDVI, vol 40 No. I : 35-40, 2013.

[20] X. Illarramendi., E. Rangel., A. M. Miranda., A. C. Castro., G. O. Magalhaes., S.L.G. "Antunes.. Cutaneous Lesion Sensory Impairment Recovery and Nerve Regeneration in Leprosy Patients". Mem Inst Oswaldo Cuz; vol. 107(1), p. 68-73, 2012.

[21] World Health Organization. Global leprosy (Hansen disease) update, 2019: time to step-up prevention initiatives. Wkly Epidemiol Rec. 2020;95(36):417–440. [Google Scholar].

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Antioxidant Activity Of Lemongrass (*Cympogon nardus* L.) Hydrosol With Various Extraction Time

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Abstract

Lemongrass are well known in the community as a cooking spice, cultivated for their essential oil, and used as raw material for perfume and medicine. Hydrosol is a by-product of essential oil extraction. The purpose of this study was to determine the antioxidant activity of the lemongrass hydrosol and to determine the effect or difference of extraction time on the antioxidant activity of the lemongrass hydrosol. The research method used is experimental. Determination of antioxidant activity using the DPPH (2,2-diphenyl-1-picrylhidrazil) method with a UV-Vis Spectrophotometer. Variations in extraction time were 1 hour, 2 hours and 3 hours. The results of the antioxidant activity test on lemongrass hydrosol were shown by the IC_{50} values at extraction times of 1 hour, 2 hours and 3 hours respectively 11.16 ± 2.51 ppm, 9.32 ± 1.63 ppm and 2.12 ± 0.72 ppm. It was concluded that there was no significant difference in the variation of distillation extraction time with the antioxidant activity of lemongrass hydrosols.

Key words: *antioxidant, extraction, hydrosol, lemongrass*

1. Introduction

The lemongrass plant (*Cymbopogon sp*.) is quite well known by the public, as a cooking spice. The lemongrass plant has more than one species, one of which is fragrant lemongrass. Traditionally lemongrass has been known to be efficacious in treating sore throat, colitis, stomach ulcers, diarrhea, mouthwash, stomach ache. Lemongrass extract also has properties as an antioxidant [1].

In this study conducted research onby-products or hydrosols from the extraction process on lemongrass (*Cymbopogon nardus* L.) stems. The method used was water distillation. The test method used to test antioxidant activity is the DPPH method. The samples used were distinguished by the collection time of 1, 2 and 3 hours after distillation.

The purpose of this study was to determine the antioxidant activity of lemongrass hydrosols and to determine the effect or difference of extraction time on the antioxidant activity of lemongrass hydrosols.

Lemongrass plants are cultivated for their essential oil, have high economic value, and are used as raw materials for perfumes and medicines [2]. The process of making essential oils / essential oils can be done by distillation / distillation method which is generally done by steam distillation method. From the results of steam distillation, two products will be produced, namely the main product is essential oil and a by-product is hydrosol [3].

Hydrosol is a by-product of essential oil extraction, where at the beginning of the extraction there are mixed essential oils, so the color that is formed is yellow to slightly clear [4]. Previous research providing information that the distillation residue of lemongrass (*Cymbopogon nardus*) contains antioxidant activity with an IC_{50} value of 189.905 ppm which can be categorized as moderate antioxidant intensity [1]. While the antioxidant activity of lemongrass essential oil is very strong with an IC_{50} result of 47.58 ppm [5].

One of the factors that can affect the IC_{50} value or the antioxidant activity of hydrosols is the length of extraction time. According to a study by Erminawati et al (2021), there were differences in antioxidant activity in lemongrass (*Cymbopogon citratus*) essential oil extracted by hydro-distillation (direct distillation) at 3, 4, and 5 hours.

Based on the background that has been described, the researcher is interested in conducting research on testing the antioxidant activity of lemongrass hydrosol (*Cymbopogon nardus* L.) with variations in extraction time using the DPPH (2,2-diphenyl-1-picrylhydrazyl) method. The DPPH method is a method for determining antioxidant activity in samples by looking at their ability to ward off free radicals of 2,2-diphenyl-1-picrylhydrazyl compound [6].

According to previous research about antioxidant potential of the ethanol extract of lemongrass distillation residue (*Cymbopogon nardus* L.), it is known that the total phenol and antioxidant activity (IC_{50}). In this study the antioxidant test used the DPPH method with ERD concentrations (ethanol extract of distillation residues of lemongrass leaves) 50 ppm, 100 pm, 150 ppm, 200 ppm, and 250 ppm using quercetin reference solution with concentrations of 10 pm, 20 ppm, 30 ppm, 40 ppm and 50 ppm showed good antioxidant activity because it was lower than 200 ppm [1].

The second comparative study was measured the antioxidant activity and inhibition of the three essential oils and their mixtures. In this study, the antioxidant activity test of the essential oils of the three samples used the DPPH method with concentrations of 20 ppm, 40 ppm, 60 ppm, 80 ppm and 100 ppm. Based on the antioxidant activity tests that have been carried out, the strongest IC_{50} values were obtained for lemongrass oil and nutmeg oil at 3.80 ppm and 3.34 ppm [5].

2. Method

2.1. Plant Material

The material studied was fragrant lemongrass (*Cymbopogon nardus* L.) the part studied is the stem. Samples were taken from Sambirambe Village, Kalijambe, Sragen, Central Java.

2.2. Tools & Materials

The equipment used in this study was a set of locally made steam distillation apparatus consisting of a distillation boiler, heater, condenser and condensation container to obtain essential oils and hydrosols, erlenmeyer and thermometer. While the analytical equipment used includes aluminum foil, stirring rod, 5 ml measuring cup, 10 ml measuring cup, 50 ml beaker glass, glassware, watch glass, cuvette, 5 ml measuring flask, 10 ml measuring flask, 50 ml measuring flask, 100 ml measuring flask, 1000 ml round bottom flask, analytical balance, volume pipette, dropper pipette, test tube rack, UV-VIS spectrophotometer, test tube, tissue, vortex.

The materials used in this study were distilled water and lemongrass (*Cymbopogon nardus* (L.) Rendle). The materials for analysis were ethanol pro-analyst and DPPH (2,2 diphenyl-1-pircrylhydrazil).

2.3. Distillation Extraction

Lemongrass hydrosol is obtained from the byproduct of the process of making lemongrass essential oil (*Cymbopogon nardus* (L.) Rendle). Fragrant lemongrass was reduced in size by ± 2 cm, then weighed as much as 200 grams. The lemongrass pieces are put into a 1000 ml round bottom flask, in the round bottom flask the lemongrass pieces are added with 750 ml distilled water or until all the simplicia is submerged. Distillation was carried out at 90^0C for 1 hour, 2 hours and 3 hours from the first drop. At the end of the distillation process, the distillate is separated to produce essential oil as the main product and hydrosol as a side product.

2.4. Research Procedures

The IC_{50} value was determined for DPPH (2,2 diphenyl-1-pircrylhydrazil) using the following procedure:

1) Preparation of test solutions

   A 100 ppm mains solution of lemongrass hydrosol was prepared by dissolving 1 ml of hydrosol with ethanol pa in a 10 ml volumetric flask. Then the 100 ppm mother liquor was made with various concentrations of 15, 20, 25, 30, 35, 40 ppm in a 5 ml volumetric flask diluted with ethanol solvent up to the boundary mark.

2) Preparation of DPPH solution

   A 100 ppm DPPH solution was prepared by weighing 0.01 g of DPPH, put it in a 100 ml volumetric flask and dissolved with ethanol pa up to the mark mark. Next, the absorption of the DPPH wavelength is measured. The wavelength range for measurements using the DPPH method is 400 nm - 700 nm [7].

3) Determination of Operating Time

   Operating time (OT) aims to determine the time required for the test solution to completely reduce the DPPH free radical after it reacts. Measurement during operating time (OT) is intended to minimize errors in terms of measuring DPPH radicals with test compounds. The operating time (OT) is determined based on the time when the absorbance value starts to stabilize or the difference in the absorbance value at each time interval starts to be small. The operating time results obtained for the test solution were 105 minutes marked with a fixed absorbance value.

4) Antioxidant Activity Test

   The extract was dissolved in pa ethanol and prepared in various concentrations, namely 15, 20, 25, 30, 35, and 40 ppm of 2 ml each. Into each solution, 4 ml of 10 ppm DPPH was added and incubated in the dark for 105 minutes and vortexed for 3 minutes. Next, the absorption was measured with a UV-Vis spectrophotometer at a maximum wavelength of 513.3 nm DPPH. As a blank used ethanol pa Calculation of percent antioxidant activity of DPPH used the following formula

$$\boxed{\text{Radical inhibition (\%)} = (\text{A blank} - \text{A sample})/(\text{A blank}) \times 100\%}$$

A blank = 10 ppm DPPH radical absorption

A sample = 10 ppm DPPH radical absorption after being treated with the sample.

Antioxidant activity was determined using the IC_{50} value (50% Inhibition Concentration). IC_{50} is a number indicating the concentration of an extract that can inhibit the activity of a radical by 50%. The IC_{50} value of each sample concentration was calculated using the formula of the linear regression equation, which states the relationship between the concentration of the antioxidant fraction expressed as the x-axis and the % inhibition expressed as the y-axis from the measurement replication series.

3. Result and Discussion

3.1. Manufacture of lemongrass hydrosol

The manufacture of lemongrass hydrosol is carried out to separate the essential oil and lemongrass residue (Hydrosol) carried out in the distillation process where the hydrosol used is a solution mixed with simplicia in a round bottom flask. From the extraction results, the amount of solution obtained can be seen in Table 1.

Table1. Extraction Results

Extraction Time	Hydrosol & Essential Oil Mixture	Mix of Hydrosol & Plant
1 hour	115 mL	507 mL
2 hours	128 mL	420 mL
3 hours	197 mL	300 mL

3.2. Maximum Wavelength Determination

Maximum wavelength determination was carried out on DPPH and Ethanol pa solutions. Maximum wavelength is an important factor in analysis using UV-Vis spectrophotometry because optimum absorption is obtained in the form of the absorbance value of a compound being measured. Scanning is carried out at a wavelength of 400-700 nm. The maximum wavelength measurement results using 20 ppm DPPH, obtained an absorbance of 0.711 at a wavelength of 515 nm. The maximum wavelength value range of DPPH is 515 – 520 nm [7].

3.3. Determination of Operating Time

Operating Time (OT) aims to determine the optimum time in reducing free radicals with DPPH solution to react completely. Measurement during operating time is intended to minimize errors in terms of measuring DPPH radicals with test compounds. Operating time is determined by measuring the absorption of the DPPH solution that has been added to the test compound. The solution was vortexed for 3 minutes before being measured with the aim of homogenizing the mixture so that it reacts optimally. Absorbance scanning was carried out using a UV-Vis spectrophotometer for 2 hours with an interval of 5 minutes. The operating time is determined when a stable absorbance is obtained, that is, there is no visible decrease in absorbance. The results showed that at 120 minutes, the absorbance of DPPH was relatively constant, so the antioxidant activity test was carried out at 120 minutes (2 hours).

3.4. Test Results of Lemongrass Hydrosol Antioxidant Activity

Lemongrass hydrosol was tested for its antioxidant activity using the DPPH (1,1 diphenyl - 2-picrylhidrazyl) method. The DPPH method is a method that can measure antioxidant activity quickly, simply and relatively easily. The antioxidant activity test using this method can be seen qualitatively by the loss of the purple color to yellow, this occurs due to the reduction of DPPH by antioxidants [8].

The intensity of this missing purple color was measured using a UV-Vis spectrophotometer, the wavelength in this study corresponds to the maximum wavelength range stated by Karcidin et al in 2020, namely 400-700 nm. Tests were carried out at 6 series of concentrations and reacted with DPPH free radicals in a ratio of 2 : 1 then incubated for 2 hours. The blank solution used is ethanol pa because ethanol pa is the solvent used in diluting DPPH and samples so the absorbance is not measured.

At each time variation tested, the absorbance was obtained and the % inhibition was calculated at each concentration. Percent inhibition is obtained from the difference between the absorbance of the control and the absorbance of the sample. Furthermore, to determine the free radical scavenging activity of DPPH, the IC_{50} parameter was used. Determination of IC_{50} from the extracted sample aims to determine the amount of extract content that can reduce the absorption intensity of DPPH free radicals by 50% [9].

Calculation of the IC_{50} value for each concentration is calculated using a calibration curve to obtain a linear formula, namely $y = ax + b$. Calculations by linear regression where x is the concentration and y is the percent inhibition. The IC_{50} value was obtained from the x value after replacing $y = 50$. The IC_{50} value was calculated based on the percentage inhibition of the DPPH radicals from each replicated time variation. The IC_{50} values obtained indicate antioxidant activity in lemongrass hydrosols which can be seen in Table 2.

Table 2. Antioxidant Activity (IC_{50})

Time (hour)	IC_{50} value (ppm)			Average IC_{50} (ppm)
	I	II	III	
1	13.38	8.44	11.68	11.16 ± 2.51
2	7.57	9.597	10.79	9.32 ± 1.63
3	5.68	4.20	2.20	2.12 ± 0.72

The higher the concentration of the sample solution, the lower the absorbance. This is because the higher the concentration of the sample, the higher the content of antioxidants, so that the sample will inhibit more DPPH and the less DPPH remains, so the absorbance value gets smaller [10].

The presence of geraniol and mineral components contained in lemongrass essential oil is thought to act as an antioxidant and free radical scavenger. Based on variations in distillation time, it can be concluded that the length of distillation time can affect the antioxidant activity of lemongrass essential oil. This is because the longer the distillation time, the more heat received by the material to evaporate the oil cells and materials so that the amount of geraniol and minerals will be higher [11].

4. Conclusion

Based on the results of the research that has been done, it can be concluded that the antioxidant activity in lemongrass hydrosol in various extraction time (1, 2 and 3 hours) was very strong. The longer extraction time, the higher antioxidant activity of lemongrass hydrosol.

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6. References

[1] E. F. Ramadhan, E. Fachriyah, and D. Kusrini, "Potensi Antioksidan Ekstrak Etanol Residu Destilasi Sereh Wangi (Cymbopogon nardus)," *Greensph. J. Environ. Chem.*, vol. 2, no. 1, pp. 14–17, 2022, doi: 10.14710/gjec.2022.14793.

[2] N. Bialangi *et al.*, "Deskripsi dan Kedudukan Taksonomi Serai Wangi (Cymbopogon nardus)," *Iran. J. Microbiol.*, vol. 1, no. 1, pp. 1–8, 2018, [Online]. Available: http://dx.doi.org/10.1016/j.foodcont.2009.08.003%0Ahttps://jurnal.umj.ac.id%0Ahttp://jurnal.untirta.ac.id/index.php/jip%0Ahttp://dx.doi.org/10.1016/j.jep.2013.11.027.

[3] I. P. Siregar, "Studi Pemanfaatan Water Aromatic / Hidrosol Sereh Wangi Dalam Pembuatan Kosmetik Face Toner," *Pendidik. Tek. Boga Busana*, vol. 15, no. 1, pp. 1–8, 2020.

[4] A. Said, R. Harti, A. Dharmawan, and T. Rahmah, "Meningkatkan Rendemen Minyak," *Khazanah*, vol. 7, no. 2, pp. 82–94, 2015.

[5] A. Rachmatillah, D. Hasni, and Y. Aisyah, "Uji aktivitas Antioksidan Minyak Sereh Wangi (Cymbopogon nardus (L.) Rendle), Minyak Nilam (Pogostemon cablin Benth.) dan Minyak Pala (Myristica fragrans Houtt.)," *J. Ilm. Mhs. Pertan.*, vol. 6, no. 4, pp. 442–446, 2021, doi: 10.17969/jimfp.v6i4.18245.

[6] A. Amin, J. Wunas, and Y. M. Anin, "Uji Aktivitas Antioksidan Ekstrak Etanol Klika Faloak (Sterculia quadrifida R.Br)," *Fitofarmaka*, vol. 2, no. 2, pp. 111–114, 2013.

[7] K. Marxen, K. H. Vanselow, S. Lippemeier, R. Hintze, A. Ruser, and U. Hansen, "Determination of DPPH Radical Oxidation Caused by Linear Regression Analysis of Spectrophotometric Measurements," *Sensors*, vol. 7, pp. 2080–2095, 2007.

[8] M. P, "The use of the stable free radical diphenylpicryl-hydrazyl (DPPH) for estimating antioxidant activity," *Songklanakarin J. Sci. Technol.*, vol. 50, no. June 2003, pp. 211–219, 2004.

[9] F. A. Souhoka, N. Hattu, and M. Huliselan, "Uji Aktivitas Antioksidan Ekstrak Metanol Biji Kesumba Keling (Bixa orellana L)," *Indo. J. Chem. Res.*, vol. 7, no. 1, pp. 25–31, 2019, doi: 10.30598//ijcr.2019.7-fas.

[10] M. Kuddus, "Antioksidan Ekstrak Daun Sumpit (Brucea javanica (L). Merr) dengan Metode DPPH," vol. 2, no. 1, 2019.

[11] Erminawati, R. Naufalin, W. Sidik, and F. A. Rahman, "The role of pre-treatment in enhancing yield and antioxidant activity of lemongrass (Cymbopogun citratus) essential oil," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 653, no. 1, 2021, doi: 10.1088/1755-1315/653/1/012131.

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Investment Feasibility Analysis of Outpatient Electronic Medical Records in RSUP Surakarta Hospital

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Abstract

Advances in technology have an effect on the health sector, the use of information system technology in hospitals is a necessity in health services. One application of the use of information systems in services is the Electronic Medical Record (RME). This study aims to determine the feasibility study of the RME investment that has been carried out at Surakarta Hospital. This type of research is a quantitative descriptive study with a sample of RME on outpatient care. The method used to analyze the feasibility of outpatient RME investment is Cost Benefit Analysis (CBA). The results of the Net Benefit Cost Ratio (BCR) study were 1,010, where Net BCR > 1 and it was concluded that outpatient RME investment was feasible. The feasibility of this investment is supported by the results of other economic analyzes such as the IRR values indicating that they are feasible. Based on the evaluation of the feasibility of the project, only the NPV is not feasible with an NPV < 1.

Key words: *Cost Benefit Analysis, Information System Investment, Electronic Medical Record Development.*

1. Introduction

Advances in information technology affect various areas of human life, including the health sector. Information technology has an important role in today's health services, where the quality of information processing is an important factor for the success of health service institutions. Various information system applications have been created and developed to support health data management activities in health care facilities, one of which is in a hospital. Information systems in hospitals have an important role in increasing the sharing of health information. In addition, the information system will also increase hospital profits, improve service quality, and save hospital costs [1].

The development of technology and information systems is very beneficial for hospitals. One of the uses of information system technology in hospitals which is becoming a trend in global health services is the use of electronic medical records. The use of information technology in hospitals to manage medical records is known as Electronic Medical Records (EMR). EMR is very important for management to manage health problems because it provides integrity and accuracy, it can also be a solution to increase cost efficiency, increase access and quality of services in health care facilities [2].

Barriers to health services in the form of uncertainty in the process of patient care related to the complexity of the hospital itself, especially the linkage of services with hospital capacity that is not able to process information properly related to the patient's condition with all services in the hospital because the system is not integrated [3]. The Indonesian Ministry of Health has established an action strategy map for the Hospital Management Information System with policy regulations as the EMR development standard by the end of 2023 to integrate all service flows in the Hospital, thereby facilitating decision making and achieving efficiency in the Hospital. However, these policy regulations have not been realized optimally [4].

Challenges and implementation EMR face issues such as the high cost of first-time implementation, new technical and technological conditions, the readiness of human resources in computer use, and the development of security, privacy and confidentiality of the system itself. EMR development is currently being carried out partially considering the process also requires high costs and the availability of program developers in hospitals [3]. Therefore, the stages of system development starting from planning, analysis, design and implementation cannot be avoided. Planning is the first stage in designing this system, namely observing the company's business processes, then conducting interviews to identify the required system and continuing with the feasibility analysis of the system to be developed. System feasibility analysis includes technical, economic and operational aspects [5].

The slow development of EMR in health service facilities in Indonesia is shown by the government requiring fayankes to organize EMR according to PMK of the Republic of Indonesia number 24 of 2022 concerning medical records [6]. This shows that fayankes are still reluctant to invest in RME given the high costs. An investment feasibility analysis is needed to identify the RME development planning stage through a financial approach. Investment feasibility analysis using the cost benefit analysis (CBA) method is used as an organizational benchmark to determine project viability and the purpose of this study is to analyze the feasibility of outpatient RME investment in RSUP Surakarta Hospital.

2. Method

This study uses quantitative research by describing the feasibility of outpatient RME investment in RSUP Surakarta Hospital. This study used descriptive research methods and statistics. Primary data source is Head of Medical Records and IT department, while the secondary data source is Electronic Medical Record investment development report. Primary data collection techniques are carried out by interviews and observation. Secondary data collection techniques are carried out by means of documentation studies on financial reports and other documents.

Calculation of the feasibility of EMR investment using the Cost Benefit Analysis (CBA) method which has elements of NPV, IRR, BCR [7]. We used the cost-benefit method to analyze the feasibility of investing in Outpatient RME at Surakarta Hospital. Cost analysis is obtained by estimating the RME development costs including development costs, operating costs and maintenance costs. Benefit analysis includes tangible benefits and intangible benefits. The main outcome measure is the net financial profit or cost of the Outpatient RME investment at RSUP Surakarta for a 4 year period. Cost-Benefit Analysis method used, among others:

2.1. Net Present Value (NPV)

NPV is the net benefit that has been discounted using the Social Opportunity Cost of Capital (SOCC) as the discount factor.

$$NPV = \sum_{i=1}^{n} NB_i (1+i)^{-n}$$

Or

$$NPV = \sum_{i=1}^{n} \frac{NB_i}{(1+i)^n}$$

Or

$$NPV = \sum_{i=1}^{n} \overline{B_i} - \overline{C_i} = \sum_{i=1}^{n} N\overline{B_i}$$

Where:

NB = Net benefit = Benefit – Cost

C = Investment Cost + Operating Cost = Benefit that has been discounted = Cost that has been discounted

i = Discount Factor

n = year (time)

Criteria:

NPV > 0 (zero) → bussines/project is feasible

NPV < 0 (zero) → bussines/project is not feasible

NPV = 0 (zero) → business/project in a state where the BEP TR = TC in the form of present value

To calculate the required data on the estimated NPV of investment costs, operating costs, and maintenance as well as the estimated benefits of the planned project.

2.2. Internal Rate of Return (IRR)

IRR is a discount rate that results in NPV = 0

IF: IRR > SOCC so the project is feasible

IRR = SOCC means the project on BEP

IRR < SOCC said that the project is not feasible.

To determine the value of IRR should be calculated first NPV1 and NPV2 by trial and error. If discount factor of NPV1is positive so the second must be greater than SOCC, and otherwise.

From this experiment, it is, explained the IRR value is between positive NPVand negative NPV, so there is the NPV = 0.

$$IRR = i_1 + \frac{NPV_1}{(NPV_1 - NPV_2)}\left(i_2 - i_1\right)$$

Where:

i_1 = discount rate that produces NPV1

i_2 = discount rate that produces NPV2

2.3. Net Benefit Cost Ratio (BCR)

Net B / C is the ratio between the discounted net benefit is positive (+) with a net negative benefit, which has been discounted.

IF: Net B/C > 1 (one) means the bussines/project is feasible

Net B/C < 1 (one) means bussines/project is not feasible

Net B/C = 1 (one) means cash in flows = cash oput flows (BEP)

$$NetB/C = \frac{\sum_{i=1}^{n} N\overline{B_i}(+)}{\sum_{i=1}^{n} N\overline{B_i}(-)}$$

3. Result and Discussion

Results and discussion can be made as a whole that contains research findings and explanations.

3.1. Economic/Financial Approach

The economic feasibility of EMR development is used to analyze costs and benefits, providing an illustration of whether EMR has greater benefits than the costs incurred by RSUP Surakarta. This analysis only includes cost and benefit factors that can be expressed in terms of money. The following are the results of an analysis of the costs and benefits of developing an outpatient EMR at RSUP Surakarta:

Table 1. Cost of Development Electronic Medical Record (EMR)

COST	
Year 0	
Develop Outpatient EMR	IDR 230.400.000
Hardware additions	IDR 227.625.000
EMR Usage Workshop	IDR 36.000.000
EMR Installation Hardware and Software, Evaluation, Repair	IDR 150.000.000
Year 1	
Maintenance system	IDR 6.840.000
Year 2	
Maintenance system	IDR 6.840.000
Year 3	
Maintenance system	IDR 6.840.000

The total investment cost for the development of electronic medical records for 3 years is IDR 664,545,000, while year 0 shows an investment amount of IDR 494,025,000. The high investment value is because Surakarta Hospital is an investment that must be issued for the first time by providing hardware consisting of computers and equipment, communication networks such as routers, lan cables, and others [2].

Table 2. Benefit of Development Electronic Medical Record (EMR)

BENEFIT	
Year 1	
Outpatient Form Efficiency	IDR 24.300.000
Office Stationery Efficiency	IDR 5.255.000
Time and Labor Efficiency	IDR 52.228.704
Year 2	
Outpatient Form Efficiency	IDR 24.300.000
Office Stationery Efficiency	IDR 5.255.000
Time and Labor Efficiency	IDR 52.228.704
Year 3	
Outpatient Form Efficiency	IDR 24.300.000
Office Stationery Efficiency	IDR 5.255.000
Time and Labor Efficiency	IDR 52.228.704

The estimated benefit expressed in money is IDR 245,351,112 for 3 years. The benefit components included in this study have not been explored to the fullest because development at Surakarta Hospital is still at the outpatient stage, so the benefits of task efficiency from medical recorders cannot be felt to the fullest.

3.2. Evaluation Project

3.2.1. Net Present Value (NPV)

Table 3. Net Present Value Calculation of Development Electronic Medical Record (EMR)

	BENEFIT	COST	B/C	NB	DF (11%)	NPV (11%)	DF (15%)	NPV (15%)
Year 0	-	644.025.000	0	-644025000	1	-644025000	1	-644025000
Year 1	76.533.959	6.840.000	11,18917529	69693959	0,9009	62787287,66	0,8696	60605866,75
Year 2	76.533.959	6.840.000	11,18917529	69693959	0,8116	56563617,12	0,7561	52695602,4
Year 3	76.533.959	6.840.000	11,18917529	69693959	0,7312	50960222,82	0,6675	46520717,63
	229.601.877	**664.545.000**	**8,391881469**	**-434943123**		**-473713872,4**		**-484202813,2**

The result of NPV < 1, so investment in Electronic Medical Record is not feasible.

3.2.2. Internal Rate Return (IRR)

Table 4. Internal Rate Return of Development Electronic Medical Record

	NPV (11%)	NPV (15%)	IRR
Year 0	-644025000	-644025000	13
Year 1	62787287,66	60605866,75	13,04
Year 2	56563617,12	52695602,4	13,07
Year 3	50960222,82	46520717,63	13,09
	-473713872,4	**-484202813,2**	**13,05**

This analysis uses a discount factor level of 11% and 15%, so it can be seen that the IRR = 13.05 which explains that the IRR is greater than the social discount rate (11%). That is, the development of outpatient electronic medical records is feasible.

3.2.3. Net Benefit Cost Ratio (BCR)

Table 5. Net Benefit Cost Ratio of Development Electronic Medical Record

	NPV (11%)	NPV (15%)	BCR
Year 0	-644025000	-644025000	1
Year 1	62787287,66	60605866,75	1,04
Year 2	56563617,12	52695602,4	1,07
Year 3	50960222,82	46520717,63	1,10
	-473713872,4	**-484202813,2**	**4,20**

The result of the Net Benefit Cost Ratio (Net B/C) is 4.20, so the Net B/C is more than 1, thus explaining the development of electronic outpatient medical records is feasible.

4. Conclusion

4.1. Net Present Value (NPV) = -484.202 million It shows NPV < 1, so investment in Electronic Medical Record is not feasible

4.2. Internal Rate of Return (IRR = 13.05 explained IRR is bigger than sosial discount rate (11%), so investment in Electronic Medical Record is feasible

4.3. Net Benefit Cost Ratio (Net B/C) = 4,20 indicate that the BCR more than 1, so investment in Electronic Medical Record is feasible

Based on the results of the economic feasibility analysis above, the development of Electronic Medical Records is feasible by considering the FEASIBLE of IRR and BCR.

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6. References

[1] K. Puspita, S. Nugroho, F. Kesehatan, U. Jenderal, and A. Yani, "Analisis Kelayakan Pengembangan Sistem Informasi Pelaporan Standar Pelayanan Minimal Rumah Sakit Berbasis Web," vol. 5, no. 4, pp. 196–207, 2020.

[2] S. K. Pribadi, Yanuar; Dewi, "ANALISIS KESIAPAN PENERAPAN REKAM MEDIS ELEKTRONIK DI KARTINI HOSPITAL JAKARTA," *J. Bid. Ilmu Kesehat.*, vol. 8, 2018.

[3] N. M. Fadilla and W. Setyonugroho, "Sistem informasi manajemen rumah sakit dalam meningkatkan efisiensi: mini literature review," *J. Tek. Inform. dan Sist. Inf.*, vol. 8, no. 1, pp. 357–374, 2021.

[4] B. (Menteri K. R. I. Sadikin, "Peraturan Menteri Kesehatan Republik Indonesia Nomor 24 Tahun 2022," *Menteri Kesehatan Republik Indonesia*. Menteri Kesehatan Republik Indonesia, Jakarta, pp. 1–12, 2022.

[5] N. Syamsiyah and M. F. Sesunan, "Penerapan Metode System Life Cycle Development Dan Project Management Body of Knowledge Pada Pengembangan Sistem," *Ikraith-Informatika*, vol. 2, no. 2, pp. 1–9, 2018.

[6] H. A. Asih and Indrayadi, "Perkembangan Rekam Medis Elektronik di Indonesia: Literature Review," *J. Promot. Prev.*, vol. 6, no. 1, pp. 182–198, 2023, [Online]. Available: http://journal.unpacti.ac.id/index.php/JPP/article/view/736.

[7] E. Gravitiani, B. E. Rosalina W K, and A. P. B, "Cost and Benefit Analysis of Established Marine Conservation," *Proceeding Int. Conf. Clim. Chang. 2016*, vol. 1, pp. 85–92, 2016, doi: 10.15608/iccc.y2016.554.

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Revealing Interdisciplinary Trends and Collaborations in Bunga Telang Bibliometric Research Through VOS Viewer Analysis.

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Abstract

The purpose of this study is to analyze how the research trends of butterfly pea flowers and collaborations in various scientific fields are classified along with the trend models that occur. In addition, this study also aims to determine topics that can be used as research variables in the future. The research method used by the author is through a bibliometric approach with the initial stage of searching for keywords in the form of research "butterfly pea flower" through research from publish or perish with the choice of regional publications using Scopus as the database base within a period of 10 years from 2013 to 2023. The author conducted screening and filtering of the data and the researcher found 215 articles and obtained 207 articles related to the theme taken. After this, the authors compiled it using the VOS Viewer metadata program to visualize ongoing research trends and have research opportunities in the future. The results of this study showed and found that data analysis related to butterfly pea flowers was divided into 11 clusters with topics centered on agricultural and biological sciences with a proportion of 28% of the total interdisciplinary collaborative research. This research is limited to variations of the butterfly pea model from the research articles reviewed. It turns out that butterfly pea flowers are still rarely found in research journals, especially collaborations with the scientific field of tourism and tourism product innovation which of course includes the tourism trend of Wellness Tourism and the use of innovative butterfly pea processed products.

Keywords: *Bibliometric analysis; butterfly peas; agricultural and biological sciences; Publish or Perish; VOS Viewer.*

1. Introduction

Telang flower is a natural resource that can be utilized in various fields, such as food, medicine, and cosmetics. In recent years, interest in studying Telang Flowers from the perspective of product innovation has increased [1]. Butterfly Pea belongs to the Fabaceae family. The scientific name of the Butterfly Pea Flower is Clitoria ternatea. Traditionally the butterfly pea flower is an annual herbaceous plant that is widespread in many tropical and subtropical countries, especially in South and Central America, the East and West Indies, China, and India.

Telang flower is blue and is used to give green color to rice. The leaves are used as a food coloring or as a potted vegetable. The young fruit can be eaten like green beans, but information on cultivation and production is limited. are known to contain various bioactive compounds that have the potential to be applied in food, medicine, and cosmetics. Telang flower is also known as butterfly pea. The butterfly pea flower is used in Ayurveda, and its root is the most widely used and is bitter, cooling, and laxative, In its development, the butterfly pea flower is widely cultivated by the community in the front yard of residents' houses as a collection plant [2].

In Karanganyar the butterfly pea flower has been used in traditional pottery in Karanganyar, Indonesia, and is a symbol of local wisdom in the region [3]. Even in Another study found the use of eggplant can be a growth inhibitor against Staphylococcus epidermidis bacteria (bacteria in the skin) [4]. In his research [5] The butterfly pea flower was obtained from Purwomartani Village, Kalasan District, Sleman Regency, Special Region of Yogyakarta. The IC50 value of the butterfly pea flower extract (Clitoria ternatea L) was 41.36 ± 1.191 μg/mL, belonging to the category of very potential as an antioxidant. With the emergence of renewable innovations of butterfly pea flowers which are used as tea powder. research carried out [6] found that the interaction standard between temperature and drying time would affect the water content of pea flower extract, total phenols, flavonoids, anthocyanins, and antioxidant activity. Treatment with a drying temperature of 50ºC and a length of time of 4 hours was the best treatment which produced herbal tea with antioxidant activity (based on IC50 value) of 128.25 ppm, water content 10.18%, essence content 51.60%, total phenols 515.48 mg/100g, flavonoids 23.99 mg/100g, anthocyanins 249.69 mg/100g, liked color, slightly liked aroma, less astringent and liked taste, overall acceptance liked.

The works mentioned above focus on the feasibility and content values of the butterfly pea flower in many aspects and locations globally. Researchers have not found many works related to bibliometric analysis search data related to the use of butterfly pea innovations in tourism.

Motivated by this, this paper discusses a bibliometric analysis of models of trend identification and collaboration of interdisciplinary relationships in research related to the butterfly pea flower. The novelty of this work is that, unlike other works, the author explores the Vos viewer as a tool for bibliometric analysis of the potential for innovation in Telang flowers. In summary, this work makes the following contributions:

1.1. The researcher looked for previous research data related to butterfly peas through the Scopus database in publish or perish
1.2. Researchers describe the comparison matrix
1.3. The researcher presents data on the implementation of the year of publication
1.4. The researcher describes the type of document
1.5. Researchers describe Related Types of Source
1.6. Researchers formulate and sort the best 20-article citation data
1.7. The researcher formulates and sorts data on the top five publisher rankings
1.8. Researchers formulate and sort the top five data-related topics
1.9. Researchers presented topic visualization through the use of the VOS Viewer
1.10. Researchers formulate research location data

In terms of content research and development, BuSeaweed is considered very safe and has good antioxidant activity. In this case, the development of innovation in processed butterfly pea flowers is one of the potential things that can be developed in today's society. Where the butterfly pea flower itself has grown and cared for in every yard of the house.

This is an opportunity that can be explored more by other researchers. The results of this study can provide an overview of the current condition of Telang Flower research, as well as the potential for its development in the future. By identifying research gaps and collaboration opportunities, we can encourage interdisciplinary research and innovation in the field. In addition, by mapping research landscapes and collaborative networks, researchers can facilitate the transfer and exchange of knowledge among researchers, policymakers, and other stakeholder researchers.

Overall, The concept of this research tries to develop bibliometric analysis is a quantitative method used to analyze scientific literature and related citation patterns [7] By conducting a bibliometric analysis on the butterfly pea research, the authors can identify trends and patterns of collaboration as well as interdisciplinary relationships and research dynamics related to the butterfly pea flower.

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This information can be useful for researchers, policymakers, and stakeholders who are interested in the butterfly pea flower and its potential applications as well as forms of development innovation from the utilization of this butterfly pea flower. In conducting a bibliometric analysis of Bunga Telang, the authors collect relevant literature using the Scopus database and then use the bibliometric VOS viewer software, to analyze documents and visualize the results to create maps and networks that show trends, themes, and patterns of collaboration in Bunga Telang research.

Picture1. Butterfly flower photo

2. Method

In this paper, the researcher adopts a bibliometric analysis that consists of five stages, namely: determining keywords, initial search, and improving search results; Compile initial data statistics (before and after improvement) and saving in RIS format; Enter RIS data into Publish or Perish; Analysis of publication sources and citations; and finally visualize the results using Researcher's VoS Viewer.

The remainder of this article is organized as follows. In the second part, the researcher introduces the concept of innovative research opportunities in tourism, bibliometric analysis, and Scopus as a provider of research data. Followed by explaining the research methodology that the researchers propose. present the results of the Researcher and followed by a full discussion. Finally, the Researcher concludes the Researcher's work and highlights future work. Figure 1 below illustrates the flowchart of the method that the researcher proposes.

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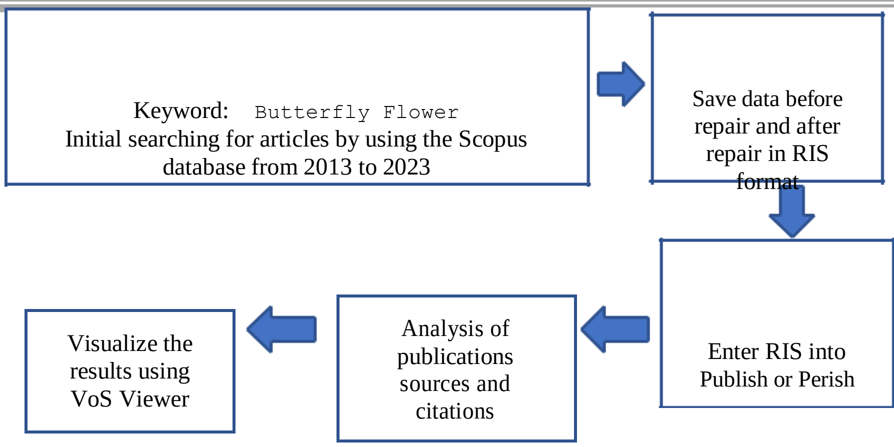


Picture2. Flow chart of the proposed method

2.1. Determining the keywords, initial searching, and repairing searching results

The phrase used in this research is Butterfly Pea with a search by title and conducted in June 2023. The data search used the Scopus database for the last 10 years, namely from 2013 to 2023. At the beginning of the search, researchers found articles in a total of 215 documents. The documents in the initial search results are used to compare matrix citations with the documents after the repair. Of the 215 articles obtained the search started from the Scopus database, then after filtering to get relevant results, and finally 207 documents were obtained for further analysis using Publish and Peris &; VOS Viewer.

2.2. Compiling and saving data in RIS format

The data has been updated and filtered above, then checked again for the completeness components of the journal articles and reviews including year of publication, volume, number/issue, and pages. Bibliographical data collection in this study was accessed via the Scopus database in May 2023.

2.3. Enter RIS data into Publish or Perish

Initial search data and data after repairs are stored in the form of RIS files and then the authors use Publish or Perish for further bibliometric analysis.

2.4. Analysis of publications sources and citations

In this section, the author uses Publish or Perish in presenting results on citation analysis, publication sources, document types, journal names and ratings, publisher names and ratings, topic trends, and author collaboration.

2.5. Visualizing the results using VoS Viewer Researcher

The researcher's Vos Viewer software was used to visualize topic areas using network visualization; topic areas using overlay visualizations; The topic area uses density visualization, authorship uses overlay visualization, and the researcher's country visualization. The following section presents the results that the researcher obtained in detail and is followed by a discussion.

3. Result and Discussion

This section explains the results obtained from this work, which includes publications and citations, visualizations, authors and networks, research locations, and research domains.

3.1. Publications and citations

For knowing compare the citation matrix with the data taken via Scopus, make the table containing the number of articles, number of citations, number of citations per year, number of authors per year, H index researcher, G index, normal hI, and hI yearly at the beginning search and on results repair. A comparison of the data matrix in result search start and result search after repair can be seen in Table 1.

Table1. Comparison Matrix

Data	Initial Search Results	Search Results Repair
Databases	Scopus	Scopus
Year published	(2013-2023)	(2013-2023)
Year citation	10	10
Number of Articles	215	207
Number citation	1812	1808
Number of Citations per Year	181.20	180.80
Number of Authors per Year	4.45	4.47
H Index	22	22
G index	37	37
hI Normal	10	10
hI Annual	1.00	1.00

An initial search was conducted on the Scopus database between 2013 and 2023, yielding a total of 215 articles. After going through the revision process, the number of articles was reduced to 207. Even so, the number of citations in both stages remained relatively high, namely 1812 in the initial results and 1808 after the revision. The average number of citations per year also shows a similar figure, which is around 181.20 at the initial stage and 180.80 after improvement.

The results of this study indicate that every year, on average, 4.45 authors contribute to articles published in the Scopus database. This reflects that collaborative work in research is quite significant and interrelated. In addition, the H index (H-index) and G index (G-index) which reach a value of 22 indicate that there is an impact from the works published in this butterfly pea study. The normal H index (H-index) and the annual H index (H-index), both have the same value of 10, indicating that the influence profile of research works is consistent each year.

Overall, this butterfly data collection illustrates an active and impactful research trend, in which the number of articles published, citations, and the H and G indices show significant success and contribution in scientific contributions in the period studied, namely the span of 10 years since 2013-2023. Table 2 as follows describes the statistics of related publications each year.

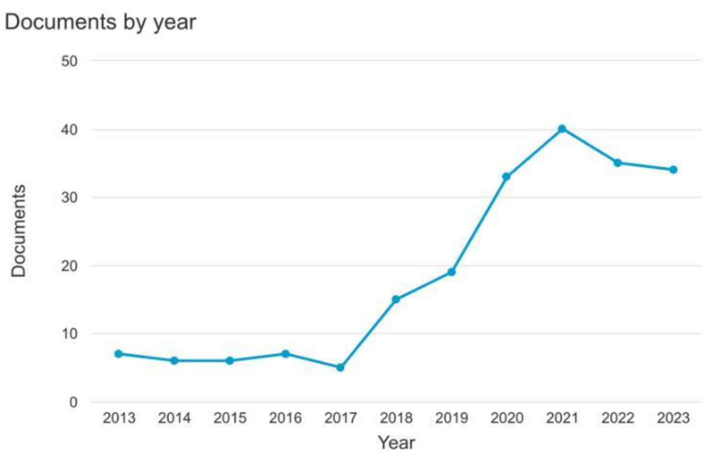
Table2. The statistics descriptive of publications

year	TP	% (N=207)	NCP	TC	C/P	C/CP
2013	7	0.03	4	64	9,14	16.00
2014	6	0.03	4	38	6,33	9.50
2015	6	0.03	6	138	23.00	23.00
2016	7	0.03	7	208	29,71	29,71
2017	5	0.02	5	131	26,20	26,20
2018	15	0.07	14	303	20,20	21.64
2019	19	0.09	15	257	13.53	17,13
2020	33	0.16	26	320	9.70	12.31
2021	40	0.19	32	218	5.45	6,81
2022	35	0.17	18	69	1.97	3.83
2023	34	0.16	7	10	0.29	1.43
	207	100%				

Note:

TP = total number of publications; NCP = number cited publications; TC=total quotes; C/P=average citations per publication; C/CP= average citations per publication cited

Figure 2 as follows depicts the bar chart of publications and citations.



Picture3. Publications from 2013-2023

The data in Table 2 and the graph in Figure 2 explain the analysis of research results based on the year of publication on a sample of 207 articles. In this analysis, the following parameters are described:

In 2013, there were 7 published articles, accounting for around 0.03% of the total sample of 207 articles. Of these, 4 articles constitute the number of articles cited, with a total of 64 citations. The average citation per article (C/P) this year is around 9.14, while the average citation per publication cited (C /CP) is 16.00.

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In 2014 it decreased because there were only 6 articles with a percentage of around 0.03%. Of these, 4 articles constitute the number of articles cited, with a total of 38 citations. The average citation per article (C/P) this year is around 6.33, while the average citation per publication cited (C /CP) was 9.50, but managed to increase in the following two years, namely in 2015 and 2016.

The year 2015 had 6 articles published, accounting for around 0.03% of the total sample. These six articles all constitute the number of articles cited, with a total of 138 citations. The average citations per article (C/P) and the average citations per publication cited (C/CP) this year were 23.00.

In 2016, there were 7 published articles, accounting for around 0.03% of the total sample. all of these articles are also the number of articles cited, with a total of 208 citations. The average citations per article (C/P) and the average citations per publication cited (C/CP) this year were 29.71.

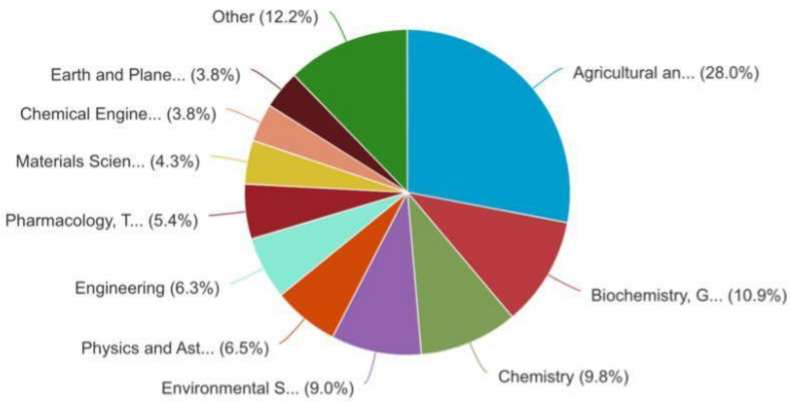
In subsequent years, a similar pattern was found with variations in the number of articles, percentage, collaboration of authors, total citations, as well as the average citations per article and the average citations per publication cited. Finally, in 2023, there are 34 articles with a percentage of 0.16%, of which 7 are citation articles with a total of 10 citations. The average citation per article (C/P) this year is around 0.29, and the average citation per publication cited (C/CP) was 1.43.

2017 has the lowest number of publications and citations in this analysis. In that year, there were 5 published articles, which accounted for about 0.02% of the total 207 articles in the sample. The total number of citations for 2017 is 131. Although the number of publications is low, the number of citations is not the lowest. The average citations per article (C/P) this year was 26.20, and the average citations per publication cited (C/CP) was 26.20. However, publication in 2017 has a significant citation impact per article.

Meanwhile, 2021 has the highest number of publications and citations in this analysis. In that year, there were 40 published articles, accounting for about 0.19% of the total sample. The total number of citations for 2021 is 218. Although the number of publications and citations is very high, the average citations per article (C/P) this year is 5.45, and the average citations per publication cited (C/CP) is 6.81. Even though the number of publications and citations is high, the impact of citations per article is still significant in describing the influence of the articles published in that year.

Overall, the data presented illustrates the trend in the number of articles, the degree of collaboration of authors, and the impact of citations in each year of publication in this butterfly pea study. This data provides a comprehensive picture of the contribution and influence of the articles in various years of research. There was a continuous increase in citations about the butterfly pea flower during the 6 years of the study period.

Figure 3 as follows depicts the documents by subject area.

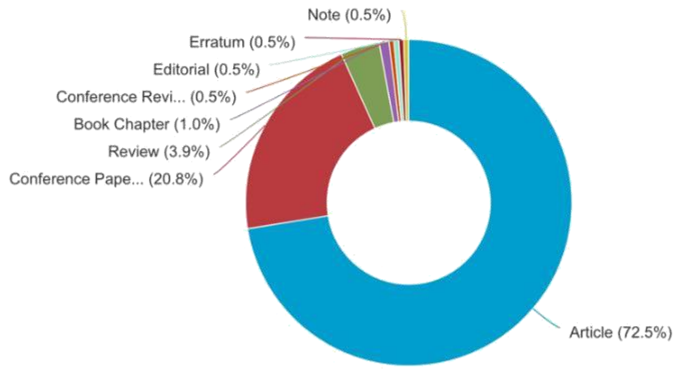


4Documents by subject area from 2013-2023

The diagram in Figure 3 above analyzes the proportion of subjects in indexed research in the Scopus database. The research data covers various fields of science and the period 2013-2023. The results of the study show that the field of Agricultural and Biological Sciences has the largest proportion with 28% of the total research. This indicates the significance and relevance of understanding plant growth, genetic breeding, and molecular biology in the context of modern agriculture. The fields of Chemistry (9.8%) and Biochemistry, genetics, and molecular biology (10.9%) also play an important role in this scientific research, supporting the development of new compounds and the understanding of the structure and function of biological molecules.

Then, Environmental science (9%) describes concern for environmental issues, including climate change and natural resource conservation. Physics and astronomy (6.5%) contribute to our knowledge of the laws of the universe and astronomical phenomena. Engineering (6.3%) represents an interdisciplinary effort in the development of technologies spanning renewable energy, advanced materials, and complex systems. Pharmacology, toxicology, and pharmaceutics (5.4%) explore the potential applications of pharmaceutical compounds and their toxic risks in the human body. While Materials science (4.3%) focuses on developing new materials with special properties. Earth and planetary science (3.8%) and chemical engineering (3.8%) reflect the exploration of geological and chemical aspects in scientific research. Furthermore,

In conclusion, the distribution of the proportion of science fields in Scopus-indexed research reflects the multidimensional nature of human knowledge. Research in this field contributes to understanding and innovation across sectors, from agriculture to materials technology, with a significant impact on the development of science and society as a whole. The field of science that has the biggest contribution to butterfly pea research is Agricultural and biological science with a total percentage of 28%.



Picture5. Documents by type area from 2013-2023

Table 3 as follows describes the type of documents.

Table3. Type Documents

type	number	Percentages
Articles	150	0.72
conference papers	43	0.21
Reviews	8	0.04
Book chapter	2	0.01
Note	1	0.00
Erratum	1	0.00
Editorial	1	0.00
Conference reviews	1	0.00
	207	100%

This study comprehensively analyzes the distribution of publication types in the relevant data set. The data analyzed were taken from various reliable sources, to provide a comprehensive picture of the scientific contribution in the relevant domain. A careful data collection methodology has been implemented to ensure the integrity and accuracy of the processed datasets.

In this analysis, a total of 207 published entries were investigated. The results show that the most common type of publication is "Article" with 150 (72%) of the total, confirming the dominance of this literary form in the exploration of the topic in question. Followed by "Conference papers" covering 43 (21%) of the dataset, providing insight into the important contribution of scientific events to knowledge dissemination. Furthermore, several other types of publications make a minor contribution to the overall total. "Review" and "Book chapter" account for 8 (4%) and 2 (1%) publications, respectively, highlighting the important role of critical review as well as contribution in the context of collective publications. In addition, other entries such as "Note," "Erratum".

The results of this analysis provide a comprehensive picture of the composition of publication types in the studied domain. The implications of this distribution can provide important insights regarding trends in the literature and research focus in relevant areas. By utilizing this analytical framework, this study makes a significant contribution to the understanding of the contribution of publications to scientific development on the subject in question.

Table4. Type Source

type	number	Percentages
Journals	162	0.78
Conference Proceedings	35	0.17
book series	8	0.04
book	2	0.01
	207	100%

In this analysis, the researcher reveals the comprehensive distribution of the various types of publications contained in the relevant data set. The data that the researcher reviewed has been carefully obtained from reliable sources, to provide an in-depth understanding of the contribution of the scientific literature in the domain studied. Rigorous data collection methodologies have been implemented to ensure the integrity and accuracy of the datasets that researchers analyze.

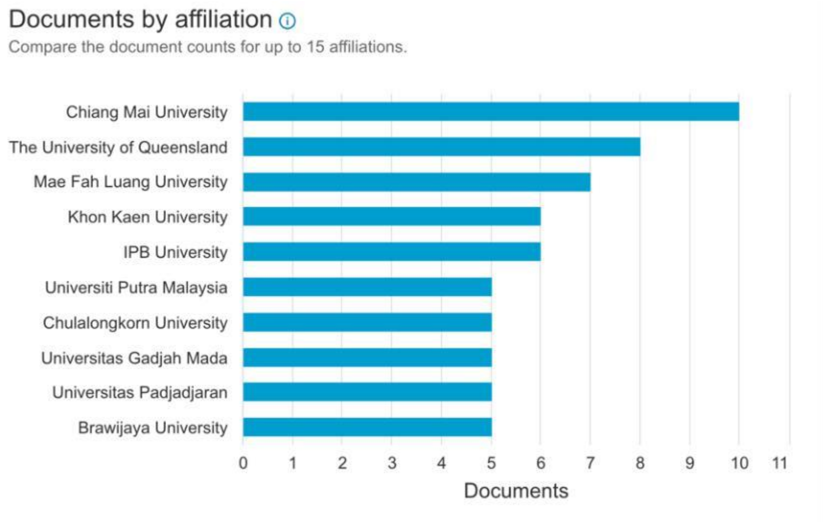
In this dataset, there are a total of 207 publication entries that the researchers reviewed in detail. The researchers' findings indicated that the most common type of publication was "Journal," accounting for 162 (78%) of the total. This fact highlights the significant dominance of scientific journals as the primary form of publication in the exploration and dissemination of knowledge in relevant domains.

Furthermore, researchers identified that "Conference proceedings" also have an important role in scientific contributions, with a total of 35 (17%) entries in the researcher's dataset. This shows that scientific events have a significant impact on shaping scientific literature and provide a platform for the exchange of valuable knowledge.

In addition, the researcher found that "Book series" and "Book" contributed 8 (4%) and 2 (1%) entries in the dataset, respectively. This reflects the diverse role of books and book series in supporting the dissemination of understanding and in-depth knowledge in relevant domains.

The results of this analysis provide valuable insight into the distribution of publication types in the context of this study. The implications of these findings refer to literature trends that can contribute to our understanding of the role of various forms of publication in scientific development in the field concerned. By making use of this analytical framework, this study makes an important contribution to our understanding of the contribution of publications to scientific development in the subject under study.

Figure 5 as follows depicts the documents by affiliation.



Picture6. Documents by affiliate area from 2013-2023

In this analysis, we describe the distribution of institutional affiliation concerning authors in the relevant data set. This institutional affiliation reflects the contribution and involvement of various educational and research institutions in writing scientific literature related to the domain studied. The institutional affiliation data has been carefully analyzed, taking into account the important role of each entity in knowledge sharing.

The results of our analysis show that "Chiang Mai University" is the most commonly appearing institution in the dataset, with a total of 10 (4.83%) affiliations. This institution has a significant contribution to supporting the writing of scientific literature in relevant domains. Furthermore, we identify "The University of Queensland" with a total of 8 (3.86%) affiliations, indicating the institution's important involvement in supporting scientific research and writing in the fields of study.

Likewise, "Mae Fah Luang University," "Khon Kaen University," "IPB University," "University Putra Malaysia," "Chulalongkorn University," "Gadjah Mada University," "Pajajaran University," and "Brawijaya University" respectively each contributed significantly with a total of 7 (3.38%), 6 (2.90%), 6 (2.90%), 6 (2.90%), 5 (2.42%), 5 (2) .42%), 5 (2.42%), 5 (2.42%), and 5 (2.42%) affiliates.

These findings reflect the diversity and diversity of inter-institutional collaboration in supporting research and scientific writing in relevant domains. The implications of this distribution can provide important insights into scientific networks and cross-institutional collaboration in the development of knowledge in the field under study. As such, this study makes a valuable contribution to our understanding of the role of various institutions in scientific and academic development in the relevant subject. Table 5 as follow describes the list of the top 20 cited articles in the related field.

Table 5. Top 20 cited articles of Butterfly Pea

No	Cites	Authors	title	year	JournalName	Publishers
1	174	CA Damalas, SD Koutroubas[8]	Current status and recent developments in biopesticide use	2018	Agriculture (Switzerland)	MDPI AG
2	95	N. Noda, S. Yoshioka, S. Kishimoto, M. Nakayama, M. Douzono, Y. Tanaka, R. Aida[9]	Generation of blue chrysanthemums by anthocyanin B-ring hydroxylation and glucosylation and its coloration mechanism	2017	Science Advances	American Association for the Advancement of Science
3	92	S. Rawdkuen, A. Fashaha, S. Benjakul, P. Kaewprachu[10]	Application of anthocyanins as a color indicator in gelatin films	2020	Food Bioscience	Elsevier Ltd
4	87	GKT Nguyen, Y. Qiu, Y. Cao, X. Hemu, C.-F. Liu, JP Tam[11]	Butelase-mediated cyclization and ligation of peptides and proteins	2016	Nature Protocols	Nature Publishing Group
5	76	A. Mehmood, M. Ishaq, L. Zhao, S. Yaqoob, B. Safdar, M. Nadeem, M. Munir, C. Wang[12]	Impact of ultrasound and conventional extraction techniques on bioactive compounds and biological activities of blue butterfly pea flower (Clitoria ternatea L.)	2019	Ultrasonics Sonochemistry	Elsevier BV
6	69	V. Nair, WY Bang, E. Schreckinger, N. Andarwulan, L. Cisneros-Zevallos[13]	Protective Role of Ternatin Anthocyanins and Quercetin Glycosides from Butterfly Pea (Clitoria ternatea Leguminosae) Blue Flower Petals against Lipopolysaccharide (LPS)-Induced Inflammation in Macrophage Cells	2015	Journal of Agricultural and Food Chemistry	American Chemical Society
7	68	GK Oguis, EK Gilding, MA Jackson, DJ Craik[14]	Butterfly pea (Clitoria ternatea), a cyclotide-bearing plant with applications in agriculture and medicine	2019	Frontiers in Plant Science	Frontiers Media SA
8	53	EK Gilding, MA Jackson, AG Poth, ST Henriques, PJ Prentis, T. Mahatmanto, DJ Craik[15]	Gene coevolution and regulation lock cyclic plant defense peptides to their targets	2016	New Phytologist	Blackwell Publishing Ltd

9	52	H. -J. Kim, S. Roy, J. -W. Rhim[16]	Gelatin/agar-based color-indicator film integrated with Clitoria ternatea flower anthocyanin and zinc oxide nanoparticles for monitoring the freshness of shrimp	2022	Food Hydrocolloids	Elsevier BV
10	47	KNT Nguyen, GKT Nguyen, PQT Nguyen, KH Ang, PC Dedon, JP Tam[17]	Immunostimulating and Gram-negative-specific antibacterial cyclotides from the butterfly pea (Clitoria ternatea)	2016	FEBS Journal	Blackwell Publishing Ltd
11	38	T. Hiromoto, E. Honjo, T. Tamada, N. Noda, K. Kazuma, M. Suzuki, R. Kuroki[18]	Crystal structure of UDP-glucose: anthocyanidin 3-O-glucosyltransferase from Clitoria ternatea	2013	Journal of Synchrotron Radiation	IUCr
12	34	GB Escher, M. Wen, L. Zhang, ND Rosso, D. Granato[19]	Phenolic composition by UHPLC-Q-TOF-MS/MS and stability of anthocyanins from Clitoria ternatea L. (butterfly pea) blue petal	2020	Food Chemistry	Elsevier Ltd
13	33	EJ Jeyaraj, YY Lim, WS Choo[20]	Extraction methods of butterfly pea (Clitoria ternatea) flower and biological activities of its phytochemicals	2021	Journal of Food Science and Technology	Springer
14	31	P. Jaikang, P. Paengnakorn, K. Grudpan[21]	Simple colorimetric ammonium assay employing well microplate with gas pervaporation and diffusion for natural indicator immobilized paper sensor via smartphone detection	2020	Microchemical Journal	Elsevier Inc.
15	30	SK Mary, RR Koshy, J. Daniel, JT Koshy, LA Pothen, S. Thomas[22]	Development of starch-based intelligent films by incorporating anthocyanins of butterfly pea flower and TiO2 and their applicability as freshness sensors for prawns during storage	2020	RSC Advances	Royal Society of Chemistry
16	30	W. Xu, A. Anderson[23]	Carbon dioxide receptor genes in cotton bollworm Helicoverpa armigera	2015	Science of Nature	Springer Verlag
17	27	MK Bowen, F. Chudleigh, S. Buck, K. Hopkins[24]	Productivity and profitability of forage options for beef production in the subtropics of northern Australia	2018	Animal production science	CSIRO
18	27	SBH Hashim, H. Elrasheid Tahir, L. Liu, J. Zhang, X. Zhai, A. Ali Mahdi, F. Nureldin Awad, MM Hassan, Z.	Intelligent colorimetric pH censoring packaging films based on sugarcane wax/agar integrated with butterfly pea flower extract for optical	2022	Food Chemistry	Elsevier Ltd

		Xiaobo, S. Jiyong[25]	tracking of shrimp freshness			
19	25	A. Boonsiriwit, M. Lee, M. Kim, P. Inthamat, U. Siripatrawan, YS Lee[26]	Hydroxypropyl methylcellulose/microcrystalline cellulose biocomposite film incorporated with butterfly pea anthocyanin as a sustainable pH-responsive indicator for intelligent food-packaging applications	2021	Food Bioscience	Elsevier Ltd
20	24	C. Chusak, JAY Ying, JL Zhien, P. Pasukamonset, CJ Henry, S. Ngamukote, S. Adisakwattana[27]	Impact of Clitoria ternatea (butterfly pea) flower on in vitro starch digestibility, texture, and sensory attributes of cooked rice using domestic cooking methods	2019	Food Chemistry	Elsevier Ltd

The data presented is a collection of the 20 most cited articles in the context of the butterfly pea flower (Clitoria ternatea). This analysis illustrates the contribution of scientific articles that are significant in expanding the understanding of various aspects related to the butterfly pea flower in the scientific literature. One of the top articles reviewed[28] is the current status and recent developments in the use of biopesticides, highlighting the importance of using environmentally friendly alternatives in agricultural pest control.

Another article[29] discusses the manufacture of blue chrysanthemum through hydroxylation and glocalization of anthocyanins, as well as the coloring mechanism. These findings provide insight into the genetic and chemical modifications that make it possible to develop ornamental plants with different colors. Some articles describe[30] the application of anthocyanins as color indicators in gelatin films, with their potential use in food packaging. This highlights the potential of the butterfly pea flower in creating innovation in the food industry.

Other research[31] focuses on the butelase enzyme used in the cyclization and ligation of peptides and proteins. This study illustrates[32] innovative biotechnology applications in molecular manipulation. There is also research[33]regarding the biological activity of the butterfly pea flower, including its role in fighting inflammation and[34] cell protection in the body's immune response.

The results of this analysis reflect the contribution of various articles in developing an understanding of the butterfly pea flower, ranging from[35]agricultural applications and[36]biotechnology to potential use in the food industry and[37]packaging. These articles draw on in-depth research interdisciplinarities and make important contributions to our understanding of the potential of this plant in various contexts of scientific research and application.

Table 6 as follow describes the top five publishers in the related field. Table6.

Top five publishers in the related field

No	Publishers	Number of Articles	Percentages
1	Elsevier	31	0.39
2	Springer	14	0.18
3	MDPI	14	0.18
4	IOP Publishing Ltd	13	0.16
5	American Institute of Physics Inc.	8	0.10
		80	100%

The data above represents the distribution of publications (publishers) of relevant articles in the research context. The analysis provides an overview of the role and contribution of each publisher in publishing scientific literature related to the topic of butterfly peas. In this analysis, publisher Elsevier has the most dominant role with a total of 31 articles (0.39% of the total), reflecting a significant contribution in presenting and disseminating scientific knowledge related to research. Publications from Elsevier publishers illustrate a wide range of viewpoints and approaches to topics.

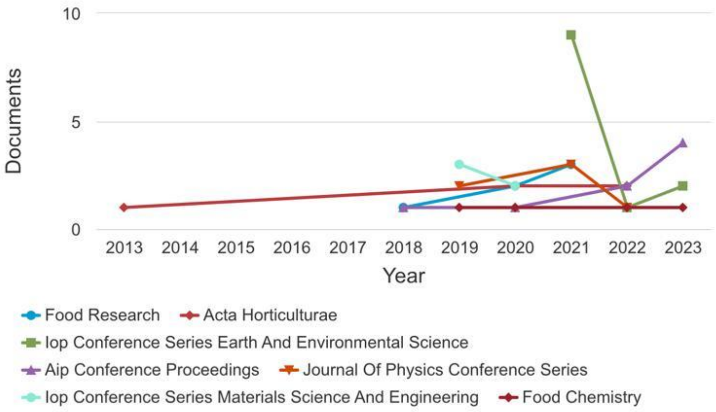
Springer Publishers and MDPI have equivalent contributions of 14 articles each (0.18% of the total). The two publishers also have an important role to play in supporting scientific research on this topic by providing a diverse and relevant publication platform. Furthermore, IOP Publishing Ltd and the American Institute of Physics Inc. each contributed 13 (0.16%) and 8 (0.10%) articles. The contributions of these publishers also add multiple dimensions to the existing scholarly literature, highlighting a focus on aspects of the physical sciences and related fields.

Overall, the results of the analysis provide an understanding of the distribution of publications in this domain, by illustrating the role of various publishers in supporting scientific research on the topics studied. The implications of this distribution can provide insight into trends in scientific publications and collaborations in related literature. Thus, this analysis makes a valuable contribution to the understanding of the contribution of publications from various publishers in the scientific development of this subject. Table 7 as follow describes the top five journals in the related field.

Table7. Top five journals ranking

No	JournalName	Number of Articles	Percentages
1	IOP Conference Series Earth and Environmental Science	12	0.32
2	AIP Conference Proceedings	8	0.22
3	IOP Conference Series: Earth and Environmental Science	6	0.16
4	FoodResearch	6	0.16
5	Acta Horticulture	5	0.14
		37	100%

Figure 6 as follows depicts the documents per year by source.



Picture7. Documents by source area from 2013-2023

The data describes the distribution of journals or series of journals that have published scientific articles relevant to the scope of this research. This analysis provides an overview of the contributions of each journal in publishing scientific literature related to the topic under investigation. In this analysis, "IOP Conference Series Earth and Environmental Science" has the most dominant role with a total of 12 articles

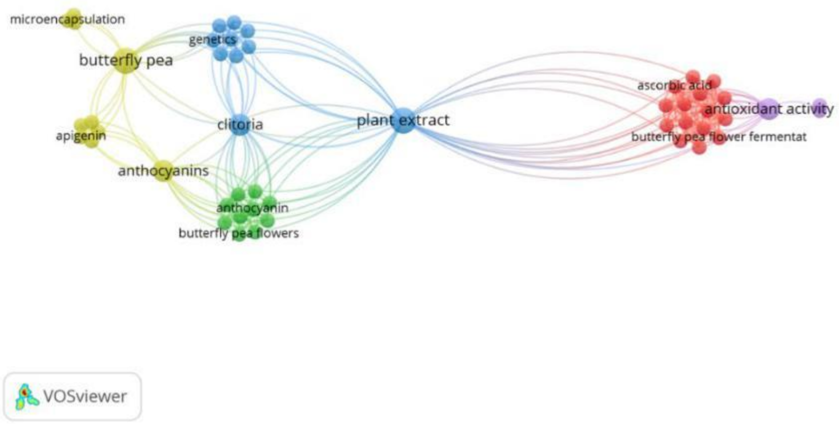
(0.32% of the total), illustrating the important role of this journal in supporting and presenting scientific knowledge in the field of earth and environmental sciences.

The journal series "AIP Conference Proceedings" also has a significant contribution with 8 articles (0.22% of the total). The journal also plays an important role in supporting research and presenting scientific results from related scientific conferences and events. Furthermore, "Food Research" and "Acta Horticulture" published 6 (0.16%) and 5 (0.14%) articles respectively. The contributions of these journals reflect a focus on the scientific aspects of food and horticulture and the important role they play in providing scientific understanding in this context.

Overall, this analysis provides an understanding of the distribution of publications in this domain, by highlighting the contribution of various journals in supporting scientific research on the topic investigated. The implications of this distribution can provide insight into publication trends in relevant fields and the role of each journal in scientific development. Thus, this analysis makes a valuable contribution to our understanding of the contribution of publications from various journals in the scientific development of this subject.

3.2. Visualization topics use VoS Viewer

Figure 7 below shows a visualization of topic areas using network visualization from VoS Viewer.



Picture8. Visualization of topic areas using network visualization

The network visualization of the data above illustrates the clustering (grouping) of keywords that appear in scientific articles relevant to this research topic. This visualization helps identify patterns and relationships between keywords that have thematic linkages.

The "Red" cluster consists of 15 items related to the process of fermenting butterfly pea flowers, increasing ascorbic acid, and fermentation as a method. This cluster highlights the focus on the application of fermentation technology for the processing of butterfly pea flowers and its potential to increase ascorbic acid content.

The "Green" cluster consists of 10 items related to the flower of the butterfly pea, anthocyanins, and floral characteristics. This cluster emphasizes the importance of anthocyanins contained in the flower of the butterfly pea flower and its potential in terms of the characteristics and properties of the flower itself.

The "Blue" cluster consists of 10 items related to plant extracts, studies on Clitoria plants, and genetics. This cluster demonstrates an interest in genetic research and the extraction of compounds from Clitoria plants.

The "Yellow" cluster consists of 10 items related to the anthocyanin in the butterfly pea flower, the compound content of the butterfly pea, and the apigenin compound. This cluster underscores the importance of anthocyanins and related compounds in the pea flower and their potential in chemical and functional studies.

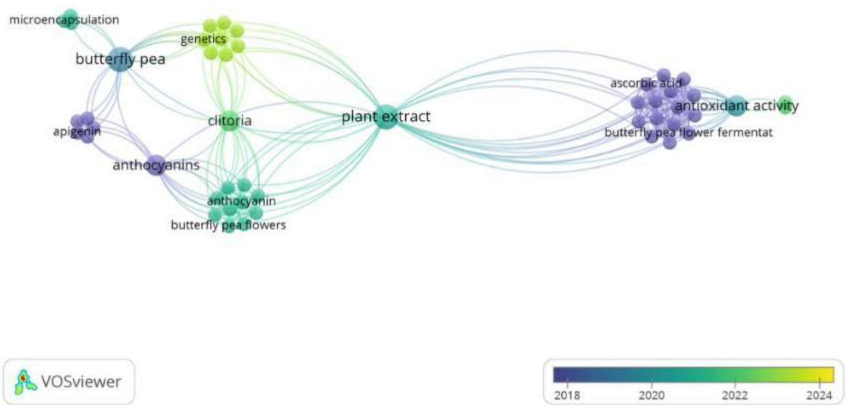
The "Purple" cluster consists of 3 items that focus on antioxidant activity and the effect of modified atmosphere on storage. This cluster highlights the role of butterfly pea flowers in the development of products with antioxidant properties and the role of modified atmosphere in maintaining quality.

Table8. Item number in clusters

Clusters	color	Number of Items	Representative keywords
1	red	15	Butterfly pea flower fermentation, ascorbic acid, fermentation
2	Green	10	Butterfly pea flower, anthocyanin, flower
3	Blue	10	Plant extract, clitoria, genetics
4	Yellow	10	Anthocyanins, butterfly pea, apigenin
5	purple	3	Antioxidant activity, modified atmosphere

This network visualization helps to understand the pattern of associations between keywords in the scientific literature, identify relevant topic groups, and provide a more comprehensive view of various aspects of research related to the butterfly pea flower in various scientific contexts.

Figure 8, as follows, describes the visualization of the topic area using overlay visualization from VoS Viewer.



Picture9. Visualization of topic areas using overlay visualization

The overlay visualization of the data above illustrates the relationship between keywords that appear in scientific articles at different timeframes. Overlay visualization helps identify trends and changes in research focus from year to year. Keywords that have lighter nodes are keywords used in younger years.

In the 2018-2019 timeframe, the research focus involved keywords such as "Apigenin," "Anthocyanins," "Butterfly pea flower fermented," and "Ascorbic acid." This shows the attention to research on apigenin and anthocyanin compounds in butterfly pea flowers, as well as the application of fermentation and its effect on ascorbic acid content.

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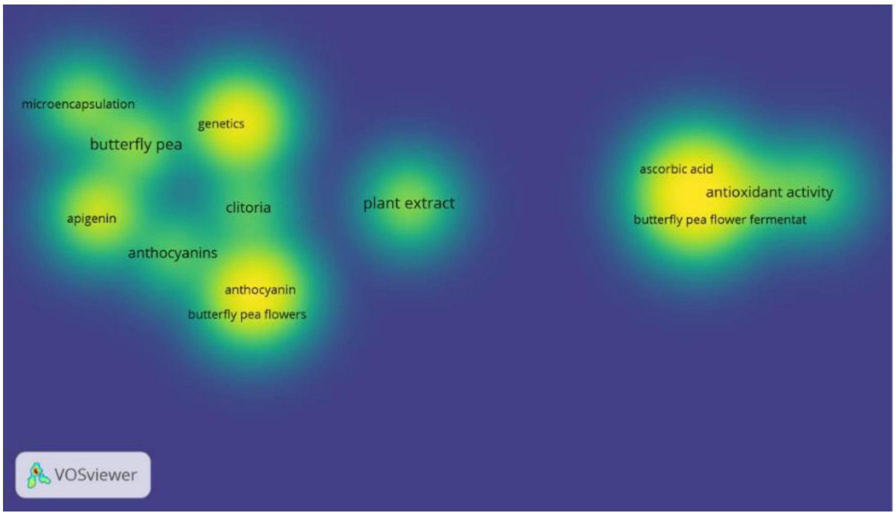
In the 2020-2021 period, the keywords that appeared were "Butterfly pea," "Antioxidant activity," "Plant extract," "Anthocyanins," "Butterfly pea flowers," and "Microencapsulation." This visualization illustrates a shift in research focus towards research on the potential of antioxidants in butterfly pea flowers, and plant extracts, as well as microencapsulating techniques for product development.

In 2022-2023, attention shifts to the buzzwords "Genetics," "Clitoria," and "Modified atmosphere." This shows an emphasis on the genetic aspects of Clitoria plants, as well as research on modified atmospheres in product storage involving the butterfly pea flower.

This overlay visualization helps us understand how the research focus has evolved, and identify trends, and changes in research areas related to the telang flower. This provides insight into the evolution of scientific knowledge and interest over different timescales

Figure 9, as follows, describes the visualization of the topic area using density visualization from VoS Viewer.



Picture10. Visualization of topic areas using density visualization

Lighter-colored nodes indicate that the keyword has a more significant presence and appears more frequently in scholarly articles. In the context of the data provided, keywords that have lighter node colors, such as "Butterfly pea flowers," "Anthocyanins," "Ascorbic acid," "Butterfly pea flower fermented," and "Genetics," indicate that these topics have stronger focus and attention in the scientific literature. The existence and distribution of these keywords are denser than other keywords.

This density visualization provides an intuitive view of the distribution of keywords in the scientific literature and helps identify the most salient and important topic areas in research related to the butterfly pea flower. This helps to understand the level of attention and significance of each topic in the scientific literature and its potential contribution to knowledge development and research in this field.

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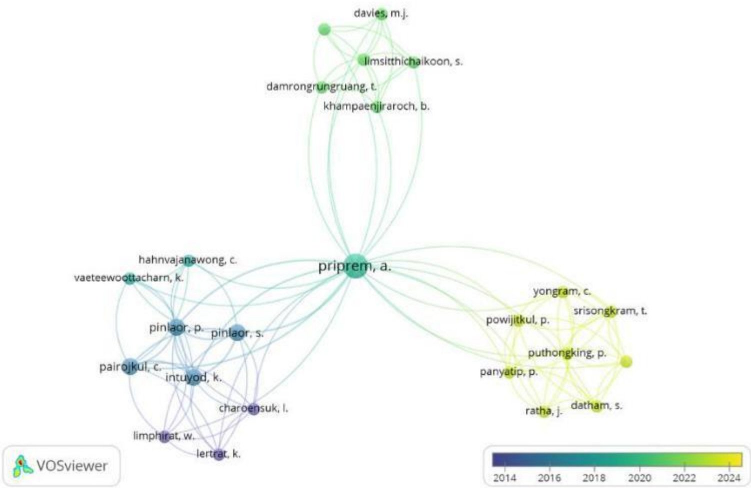
3.3. Author and Relationship between Writers

Figure 10 below depicts an overlay visualization of the author and co-author using the VoS Viewer.



Picture11. Visualization of the author and co-author overlay

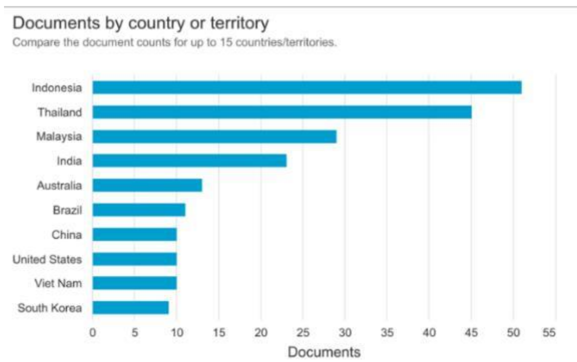
In this analysis, several authors have contributed significantly to publications related to the topic under study. The author with the most contributions is Priprem, A., who has a total of 4 published documents. This author demonstrates a high level of productivity in creating scientific content, with a total strength link of 27. The publication average of Priprem, A in 2019 marks its main focus in this period, which may reflect a significant increase in research and scientific contributions.

Furthermore, there is a group of writers who have the second most publications, namely Pinlaor, P, Pinlaor, S, Intuyod, K, and Pairojkul. Each author in this group has 2 published documents, with a total link strength of 13. The average year of publication for this group is 2016. This indicates that this group of authors has contributed simultaneously to several publications in the same year, indicating collaboration and close scientific cooperation. In addition, there are other authors who each have 1 publication document. Although their contributions were limited in several publications, they remained important in enriching the scientific literature on this topic.

This analysis reflects the structure of the collaboration and contribution of the authors in the scientific literature regarding the topics studied. The authors with the most contributions demonstrated their commitment and dedication to advancing scientific understanding in this field. In addition, the collaboration between the authors in the second group of publications signifies a valuable collaborative relationship in the pursuit of enriching knowledge on this topic. All of these contributions collectively help broaden and deepen our understanding of the topic under study.

3.4. Research Locations and Research Domains

Figure 11 below depicts the author's country of origin.



Picture12. Country of origin

Figure 12 below depicts the map of the author's country of origin.

Picture13. Map of country of origin (Please use https://mapchart.net/)

Based on Figure 12 above, shows that Indonesia is leading in research contributions with a total of 51 publications, confirming a significant role in producing scientific literature related to this topic. This reflects the strong level of involvement of Indonesian researchers in advancing scientific understanding in the domain investigated. Furthermore, Thailand and Malaysia also made important contributions with 45 and 29 publications respectively. The contributions from these two countries show significant involvement in this field of research, with collaborations between researchers from various institutions inside and outside the country.

India, Australia, Brazil, China, the United States of America, Vietnam, and South Korea also contributed to this scientific literature. The contributions of these countries reflect the rich and diverse aspects of international collaboration in the investigation of relevant topics. In this context, the research connects researchers from various cultural and scientific backgrounds, enriching insights and cross-border understanding of the topics studied.

The importance of these contributions from various countries is a reflection of global efforts in developing and disseminating scientific knowledge. Cooperation between these countries has had a positive impact on research developments in this domain, helping to broaden the scope and depth of scientific knowledge relevant to the topics investigated.

Table 9 below presents the country of research location and their respective research domain.

Table9. Top 10 Countries of location research and research Domain

No	Country	Number of Articles	Research Domains
1	Indonesia	51	Clitoria Ternatea, butterfly pea, Anthocyanins, flavonoids, antioxidants, Plant Extracts, Flowers
2	Thailand	45	Clitoria Ternatea, Anthocyanin, butterfly pea, antioxidants, plant extract, color, Unclassified Drug
3	Malaysia	29	Clitoria Ternatea, butterfly pea, extract, Anthocyanin, Unclassified Drug, plant extract, antioxidants, flower
4	India	23	Clitoria Ternatea, Unclassified Drug, plant extract, Clitoria Ternatea Extract, Methanol, Flavonoids, color
5	Australia	13	Clitoria Ternatea, Legume, Centrosema, Hexapoda, Grass, Suppressive Plants, Biomass, Plant Proteins
6	Brazil	11	Clitoria Ternatea, Clitoria, Chemistry, Seeds, Plant Seed, plant extract, Pennisetum Purpureum, color
7	China	10	Clitoria Ternatea, color, plant extract, Anthocyanins, antioxidants, flower
8	united states	10	Clitoria Ternatea, plant extract, Medicinal, Flavonoids, Butterfly Pea, Sugars
9	Viet Nam	10	Clitoria Ternatea, Extraction, Anthocyanins, Butterfly Pea Flowers, Butterfly Pea
10	South Korea	9	Clitoria Ternatea, Anthocyanins, Plant Extract, Flower, Butterfly Pea

This research has involved contributions from ten countries with diverse research locations, which collectively form a rich and diverse scientific landscape in the investigation of the topics described. The following describes the top ten countries in research locations and relevant research domains:

3.4.1. Indonesia (51 articles): Indonesia stands out in research related to Clitoria Ternatea, butterfly peas, Anthocyanins, flavonoids, antioxidants, Plant Extracts, and Flowers. Research from Indonesia has contributed significantly to deepening the understanding of the chemical characteristics and functionality of the butterfly pea flower plant and its potential use in various contexts.

3.4.2. Thailand (45 articles): Thailand has also played an important role in the investigation of Clitoria Ternatea, Anthocyanin, butterfly pea, antioxidants, plant extract, color, and Unclassified Drugs. Research from Thailand has focused on the analysis of chemical compounds and the potential application of butterfly pea flowers in the context of phytotherapy and nutraceuticals.

3.4.3. Malaysia (29 articles): Malaysia contributed to the study of Clitoria Ternatea, butterfly pea, extract, Anthocyanin, Unclassified Drug, plant extract, antioxidants, and flower. Research from Malaysia explored the nutritional properties and bioactive potential of the butterfly pea flower plant, with a focus on the extraction of important compounds.

3.4.4. India (23 articles): India focuses its research on Clitoria Ternatea, Unclassified Drugs, plant extract, Clitoria Ternatea Extract, Methanol, Flavonoids, and color. Research from India has been in-depth in the analysis of active compounds in butterfly pea flowers and their potential applications in medicine and industry.

3.4.5. Australia (13 articles): Australia has contributed to research on Clitoria Ternatea, Legume, Centrosema, Hexapoda, Grass, Suppressive Plants, Biomass, and Plant Proteins. Research from Australia tends to be related to the analysis of the ecology and physiology of the butterfly pea flower and its role in ecosystems and agriculture.

3.4.6. Brazil (11 articles): Research from Brazil focuses on Clitoria Ternatea, Clitoria, Chemistry, Seeds, Plant Seed, plant extract, Pennisetum purpureum, and color. This research includes the analysis of chemical compounds and the potential use of the butterfly pea flower in a chemical and industrial context.

3.4.7. China (10 articles): China focuses on Clitoria Ternatea, color, plant extract, Anthocyanins, antioxidants, and flowers. Research from China highlights the properties of natural dyes and antioxidant compounds in butterfly pea flowers.

3.4.8. United States (10 articles): Research from the United States focused on Clitoria Ternatea, plant extract, Medicinal, Flavonoids, Butterfly peas, and Sugars. This research involves an analysis of the active compounds in the butterfly pea flower and its potential application in medicine.

3.4.9. Viet Nam (10 articles): Vietnam plays a role in research on Extraction, Anthocyanins, Butterfly Pea Flowers, and Butterfly Pea. Research from Vietnam tends to be related to the extraction of bioactive compounds from butterfly pea flowers and their potential use in health applications.

3.4.10. South Korea (9 articles): South Korea focuses on Clitoria Ternatea, Anthocyanins, Plant Extract, Flower, and Butterfly Pea. Research from South Korea explored the biochemical properties and potential applications of butterfly pea flowers in various contexts.

Taken together, these contributions from various countries provide a comprehensive and diverse view of research topics relevant to Clitoria Ternatea. Cross-country cooperation in this investigation makes an important contribution to developing global knowledge and understanding of the butterfly pea flower and its potential application in various scientific fields.

4. Conclusion

The use and utilization of the Telang Flower innovation have not been widely studied before on an international scale. This paper has succeeded in presenting a bibliometric analysis related to butterfly pea research trends and collaborations in various classified scientific fields along with the trend models that occur. The researcher obtained the result that the majority of related articles were published in scientific journals, compared to other venues. Related articles published in scientific journals have obtained the highest citations compared to others.

The advice given is that in subsequent research it is necessary to study more broadly the use of butterfly pea flowers and sustainable innovation by communities based on micro, small, and medium enterprises (MSMEs) in tourist village areas. This research is also expected to be used as a basic reference to see how data visualization is in finding research trends that are being developed. Of course, by implementing the use of a complete bibliometric method and with more elements used, learning and using software tools can produce more compressed data.

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6. References

[1] AMMarpaung, "An overview of the benefits of butterfly pea flower (Clitoria ternatea l.) for human health," Journal of Functional Food and Nutraceutical, vol. 1, no. 2, pp. 63–85, Feb. 2020, doi: 10.33555/jffn.v1i2.30.

[2] RAImayanti, Z. Rochmah, SN Aisyah, and MR Alfaris, "National Seminar on Results of Prefix-PHP Community Empowerment in Processing TELANG FLOWER IN PANGGREH VILLAGE, JABON DISTRICT, SIDOARJO DISTRICT, [Online]. Available: https://sayurankita.com/2017/05/0/bunga-telang/

[3] RAImayanti, Z. Rochmah, SN Aisyah, and MR Alfaris, "National Seminar on Results of Prefix-PHP Community Empowerment in Processing TELANG FLOWER IN PANGGREH VILLAGE, JABON DISTRICT, SIDOARJO DISTRICT, [Online]. Available: https://sayurankita.com/2017/05/0/bunga-telang/

[4] FD Pertiwi, F. Rezaldi, and R. Puspitasari, "Antibacterial Activity Test of Ethanol Extract of Butterfly Pea Flower (Clitoria ternatea L.) Against Staphylococcus epidermidis Bacteria," BIOSAINTROPIS (BIOSCIENCE-TROPIC), vol. 7, no. 2, pp. 57–68, Jan. 2022, doi: 10.33474/e-jbst.v7i2.471.

[5] D. Andriani and L.Murtisiwi, "Antioxidant Activity Test of 70% Ethanol Extract of Telang Flower (Clitoria ternatea L) from Sleman Area with the DPPH Antioxidant Activity Test of 70% Ethanol Extract of Telang Flower (Clitoria ternatea L) from Sleman Area with DPPH Method," 2020. [On line]. Available: http://journals.ums.ac.id/index.php/pharmacon

[6] N. Ketut Ayu Martini*et al.*, "EFFECT OF TEMPERATURE AND DRYING TIME ON THE CHARACTERISTICS OF TELANG FLOWER TEA (Clitoria ternatea L.) The Effect of Drying Temperature and Time on The Characteristics of Blue Pea Flower Tea (Clitoria ternatea L.)," 2020.

[7] Official Citra Prasiwi, Wahyu Indro Widodo,Asep Syaiful Bahri, Robert La Are, John JOI Ihalauw, and Dwiyono Rudi Susanto, "A Bibliometric Analysis on Pentahelix Tourism Researches," International Journal of Advanced Management and Business Intelligence, vol. 3, no. 3, Dec. 2022.

[8] C. Damalas and S.Koutroubas, "Current Status and Recent Developments in Biopesticide Use," Agriculture, vol. 8, no. 1, p. 13, Jan. 2018, doi: 10.3390/agriculture8010013.

[9] N. Noda*et al.*, "Generation of blue chrysanthemums by anthocyanin B-ring hydroxylation and glucosylation and its coloration mechanism," Sci Adv, vol. 3, no. 7, Jul. 2017, doi: 10.1126/sciadv.1602785.

[10] S.Rawdkuen, A. Faceha, S. Benjakul, and P. Kaewprachu, "Application of anthocyanin as a color indicator in gelatin films," Food Biosci, vol. 36, p. 100603, Aug. 2020, doi: 10.1016/j.fbio.2020.100603.

[11] GKT Nguyen, Y. Qiu, Y. Cao, X. Hemu, C.-F. Liu, and JP Tam, "Butelase-mediated cyclization and ligation of peptides and proteins," Nat Protoc, vol. 11, no. 10, p. 1977–1988, Oct. 2016, doi: 10.1038/nprot.2016.118.

[12] A. Mehmood*et al.*, "Impact of ultrasound and conventional extraction techniques on bioactive compounds and biological activities of blue butterfly pea flower (Clitoria ternatea L.)," Ultrason Sonochem, vol. 51, pp. 12–19, Mar. 2019, doi: 10.1016/j.ultsonch.2018.10.013.

[13] V. Nair, WY Bang, E.Schreckinger, N. Andarwulan, and L. Cisneros-Zevallos, "Protective Role of Ternatin Anthocyanins and Quercetin Glycosides from Butterfly Pea (Clitoria ternatea Leguminosae) Blue Flower Petals against Lipopolysaccharide (LPS)-Induced Inflammation in Macrophage Cells," J Agric Food Chem , vol. 63, no. 28, pp. 6355–6365, Jul. 2015, doi: 10.1021/acs.jafc.5b00928.

[14] NOOguis, EK Gilding, MA Jackson, and DJ Craik, "Butterfly Pea (Clitoria ternatea), a Cyclotide-Bearing Plant With Applications in Agriculture and Medicine," Front Plant Sci, vol. 10, May 2019, doi: 10.3389/fpls.2019.00645.

[15] EK Gilding*et al.*, "Gene coevolution and regulation lock cyclic plant defense peptides to their targets," New Phytologist, vol. 210, no. 2, pp. 717–730, Apr. 2016, doi: 10.1111/nph.13789.

[16] H. -J. Kim, S. Roy, and J. -W. Rhim, "Gelatin/agar-based color-indicator film integrated with Clitoriaternatea flower anthocyanins and zinc oxide nanoparticles for monitoring the freshness of shrimp," Food Hydrocoll, vol. 124, p. 107294, Mar. 2022, doi: 10.1016/j.foodhyd.2021.107294.

[17] KNT Nguyen, GKT Nguyen, PQT Nguyen, KH Ang, PC Dedon, and JP Tam, "Immunostimulating and Gram-negative-specific antibacterial cyclotides from the butterfly pea (Clitoria ternatea)," FEBS J, vol. 283, no. 11, p. 2067–2090, Jun. 2016, doi: 10.1111/febs.13720.
[18] T. Hiromotoet *al.*, "Crystal structure of UDP-glucose:anthocyanidin 3- O -glucosyltransferase from Clitoria ternatea," J Synchrotron Radiat, vol. 20, no. 6, pp. 894–898, Nov. 2013, doi: 10.1107/S0909049513020712.
[19] GB Escher, M. Wen, L. Zhang, ND Rosso, and D. Granato, "Phenolic composition by UHPLC-Q-TOF-MS/MS and stability of anthocyanins from Clitoriaternatea L. (butterfly pea) blue petals," Food Chem, vol. 331, p. 127341, Nov. 2020, doi: 10.1016/j.foodchem.2020.127341.
[20] EJ Jeyaraj, YY Lim, and WS Choo, "Extraction methods of butterfly pea (Clitoriaternatea) flower and biological activities of its phytochemicals," J Food Sci Technol, vol. 58, no. 6, pp. 2054–2067, Jun. 2021, doi: 10.1007/s13197-020-04745-3.
[21] PJaikang, P. Paengnakorn, and K. Grudpan, "Simple colorimetric ammonium assay employing well microplate with gas pervaporation and diffusion for natural indicator immobilized paper sensor via smartphone detection," Microchemical Journal, vol. 152, p. 104283, Jan. 2020, doi: 10.1016/j.microc.2019.104283.
[22] SK Mary, RR Koshy, J. Daniel, JT Koshy, LA Pothen, and S. Thomas, "Development of starch based intelligent films by incorporating anthocyanins of butterfly pea flower andTiO 2 and their applicability as freshness sensors for prawns during storage," RSC Adv, vol. 10, no. 65, pp. 39822–39830, 2020, doi: 10.1039/D0RA05986B.
[23] W. Xu and A. Anderson, "Carbon dioxide receptor genes in cotton bollwormHelicoverpa armigera," The Science of Nature, vol. 102, no. 3–4, p. 11, Apr. 2015, doi: 10.1007/s00114-015-1260-0.
[24] MK Bowen, F. Chudleigh, S. Buck, and K. Hopkins, "Productivity and profitability of forage options for beef production in the subtropics of northern Australia,"*Anim Prod Sci*, vol. 58, no. 2, p. 332, 2018, doi: 10.1071/AN16180.
[25] SBH Hashim*et al.*, "Intelligent colorimetric pH sensoring packaging films based on sugarcane wax/agar integrated with butterfly pea flower extract for optical tracking of shrimp freshness," Food Chem, vol. 373, p. 131514, Mar. 2022, doi: 10.1016/j.foodchem.2021.131514.
[26] ABoonsiriwit, M. Lee, M. Kim, P. Inthamat, U. Siripatrawan, and YS Lee, "Hydroxypropyl methylcellulose/microcrystalline cellulose biocomposite film incorporated with butterfly pea anthocyanin as a sustainable pH-responsive indicator for intelligent food-packaging applications," Food Biosci, vol. 44, p. 101392, Dec. 2021, doi: 10.1016/j.fbio.2021.101392.
[27] C.Chusak et al., "Impact of Clitoria ternatea (butterfly pea) flower on in vitro starch digestibility, texture and sensory attributes of cooked rice using domestic cooking methods," Food Chem, vol. 295, pp. 646–652, Oct. 2019, doi: 10.1016/j.foodchem.2019.05.157.
[28] JB Morris, "Multivariate Analysis of Butterfly Peas(Clitoria ternatea L.) Genotypes With Potentially Healthy Nutraceuticals and Uses," J Diet Suppl, vol. 20, no. 3, pp. 475–484, May 2023, doi: 10.1080/19390211.2021.2022821.
[29] NM Thuy, VQ Minh, TC Ben, MTThi Nguyen, HTN Ha, and N. Van Tai, "Identification of Anthocyanin Compounds in Butterfly Pea Flowers (Clitoria ternatea L.) by Ultra Performance Liquid Chromatography/Ultraviolet Coupled to Mass Spectrometry," Molecules, vol. 26, no. 15, p. 4539, Jul. 2021, doi: 10.3390/molecules26154539.
[30] A AHarahap, K. Letare S., and N. Hendrianie, "The effect of solvents and extraction time on anthocyanin extraction from butterfly pea (Clitoria ternatea L.)," 2023, p. 020003. doi: 10.1063/5.0112770.
[31] Musdalifa, M. Chairany, N. Haliza, and F. Bastian, "Microencapsulation of three natural dyes from butterfly pea, Sappan wood, and turmeric extracts and their mixture base oncyan, magenta, yellow (CMY) color concept," Canrea Journal: Food Technology, Nutrition, and Culinary Journal, pp. 91–101, Nov. 2021, doi: 10.20956/canrea.v4i2.496.
[32] Y.Shen*et al.*, "Butterfly pea (Clitoria ternatea) seed and petal extracts decreased HEp-2 carcinoma cell viability," Int J Food Sci Technol, vol. 51, no. 8, pp. 1860–1868, Aug. 2016, doi: 10.1111/ijfs.13158.
[33] AE Setiawati and J. Kusnadi, "Optimization of fermentation time and grain concentration for water kefir production from butterfly pea flower (Clitoriaternatea)," IOP Conf Ser Earth Environ Sci, vol. 924, no. 1, p. 012081, Nov. 2021, doi: 10.1088/1755-1315/924/1/012081.
[34] N.Suntipabvivattana, K. Ratchaun, W. Tongdeesuntorn, and P. Suthiluk, "Changing of antioxidant activity of butterfly pea flower in modified atmosphere packaging," Acta Hortic, no. 1336, pp. 357–362, Mar. 2022, doi: 10.17660/ActaHortic.2022.1336.47.
[35] ND Hassan, II Muhamad, and MRSarmidi, "The Effect of Copigmentation on the Stability of Butterfly Pea Anthocyanins," Key Eng Mater, vol. 594–595, pp. 245–249, Dec. 2013, doi: 10.4028/www.scientific.net/KEM.594-595.245.
[36] L. Chen, I. Chen, P. Chen, and P. Huang, "Application of Butterfly Pea Flower Extract in Mask Development,"*Sci Pharm*, vol. 86, no. 4, p. 53, Dec. 2018, doi: 10.3390/scipharm86040053.
[37] D. Saputra, Jamilah, and N. Lahay, "Antibacterial inhibition test of butterfly pea (Clitoriaternatea L.) as an alternative feed additive for broilers," 2023, p. 140005. doi: 10.1063/5.0144073.

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The Phenomenon of Using Korean Pop Culture as a Marketing Strategy of Indonesian Product Advertisement

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Abstract

Currently, many product advertisements in Indonesia use Korean cultural trends by using Korean artists as brand ambassadors. Indonesia is a country with quite a lot of K-Pop fans in the world. This is an opportunity to carry out marketing activities by approaching consumers through the use of Korean cultural elements. One of them is by using Korean artists in product advertisements in Indonesia. This research focuses on the phenomenon of product advertising in Indonesia which uses brand ambassadors from Korea with Pop culture as a marketing strategy. Data collection methods use observation, interviews and literature study methods. Data analysis in this research uses the AIDA model marketing communication variables which are linked to the role and function of the Korean brand ambassador in product advertising. The conclusion of this research shows that the use of brand ambassadors in product advertising in Indonesia is the right marketing strategy to reach the target market in Indonesia. Brand ambassadors are a key element in every stage of the AIDA concept. Choosing a Korean brand ambassador can help to direct attention, generate interest, strengthen desire, and encourage consumer action regarding the product or service being promoted.

Key words: *Korean Pop Culture, Marketing Strategy, Product Advertisement*

1. Introduction

The advertising industry is a sector that is always transforming along with changes in culture, trends and consumer preferences. The current trend in the world of advertising is the use of Korean artists in product and brand promotions. This phenomenon cannot be separated from the interest in Korean pop culture, especially K-pop, among global society, including in Indonesia. K-pop has become a cultural force that inspires, entertains and connects millions of people around the world. The aim of this research is to observe and analyze the phenomenon of using Korean artists in product advertising in Indonesia. In recent years, there has been a significant increase in the use of Korean artists as brand ambassadors or influencers in product advertising campaigns in

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the Indonesian market. This is due to various factors, including the rapidly increasing popularity of K-pop, K-drama, and Korean pop culture in general among Indonesian people.

The important of understanding the dynamics of using Korean artists in advertising in Indonesia is not only related to consumer trends, but also to significant economic impacts as the K-pop industry continues to grow, Korean artist have become global icons who have a major influence on consumer preferences. That's why, companies in Indonesia are more careful in choosing the right Korean artist to communicate their brands and products to a wide and diverse market.

Korean culture is currently quite popular in various countries, including Indonesia. Data obtained from GoodStats (https://goodstats.id/) shows that in 2021 Indonesia was in first place out of 20 countries with the largest number of K-Pop fans. From this data, the Philippines is in second place. Meanwhile, South Korea, as a country that has a K-Pop culture, is actually in third place. This has become a concern for several brands to look for opportunities in marketing activities related to their market segmentation. In marketing activities, understanding the target market is a very important thing to do.

Figure 1. Data on countries with the largest number of K-pop fans in the world 2021

Jin (Amri, 2020) describe that the beinning of the development popularity Korean wave or Hallyu began in East Asian countries. After that, the Korean wave or Hallyu became popular throughout the world and even to Indonesia. Korean culture is not only popular among women, but also men aged up to thirties. Hallyu was first used by "The South Korean Ministry of Culture and Tourism" when planning, producing and distributing music CD from Korean musicians to neighboring countries in 1999.

Samra and Wos argue that regular and repeated consumption is an important indicator of certain emotional investments from fans (Perbawani & Nuralin, 2021). Fuschillo argued that fandom is an expression of a larger phenomenon related to consumption-related and brand-related fanaticism in modern society. Fans who consume because of fanatic are fans who have a form of loyalty to a particular brand.

However, beyond the obvious benefits, there are still questions that need to be answered in the context of this research. What is the role of Korean brand ambassadors in help to achieve the AIDA stages in product advertising in Indonesia? This research will answer this question and provide a deeper understanding of the role of Korean brand ambassadors in product advertising in Indonesia. The results of this research will provide insight for companies wishing to use this strategy, as well as contribute to our understanding of the relationship between pop culture and advertising in the era of globalization.

2. Method

This research used a qualitative research approach. Depends Moleong, qualitative research to understand the phenomena experienced by research subjects, for example behavior, methods of description in the form of words and language in a special natural context using natural methods (Panuju & Mochammad Arkansyah, 2020). The research method used descriptive qualitative research methods. This research to describe research related to advertising video content analysis within the scope of marketing communication strategies. The purpose of qualitative research is to understand the conditions of a context by directing a detailed and in depth description of the portrait of conditions in a natural context (natural setting) regarding what actually happens according to what is in the field of study (Fadli, 2021) .

Data collection techniques use observation techniques, literature studies and interviews. Observation in this research were carried out by directly observing the advertising content taken as sampling. Literature study was carried out by looking for references from relevant scientific journal articles. Depends Zed, There are four stages of library study, namely preparing the necessary equipment, preparing a working bibliography, organizing time, and reading and recording research materials (Fadli, 2021). From that, interviews were conducted with two sources. The process begins by observing the three selected advertising videos. Then, data from observations, interviews and literature studies are presented narratively using the AIDA marketing communication model to draw conclusions.

3. Result and Discussion

3.1. Presenting the Results

One form of cross-cultural and business collaboration in the current era of globalization is the use of Korean brand ambassadors for original Indonesian products. The product try to combine elements of Indonesian culture by using the popularity of Korean celebrities to create greater appeal in the international market.

Collaborations on beauty products are intended to get the global recognition and increase appeal. Several food and beverage products collaborate with K-POP stars or Korean actors to expand their market. This helps food products in Indonesia gain popularity among K-POP fans.

Figure 2. Y.O.U. Product Advertisement “Radiance Up!”

Y.O.U Long Lasting Beauty is the closing statement made by Kim So Hyun as the brand ambassador in the Radiance Up! Quoted from the YouTube Channel YOU Beauty Indonesia, Y.O.U is a famous beauty brand which was launched in 2018. From to data obtained from Lintasbabel.inews.id, Y.O.U. is an abbreviation for Youthful Outstanding Unique. Apart from

Indonesia, this product has spread to several countries such as Malaysia, Thailand, the Philippines and other countries.

Figure 3. Mie Sedaap Product Advertisement “Korean Spicy Soup”

Mie Sedaap is an instant noodle brand that is quite well known in Indonesia. Choi Siwon is a South Korean artist who is the advertising star for this product. This strategy is a way for the company to attract the attention of Indonesian consumers by taking advantage of Choi Siwon's popularity as a South Korean artist. The presence of famous artists in marketing advertisements aims to help improve the brand image and increase the product's attractiveness in the market.

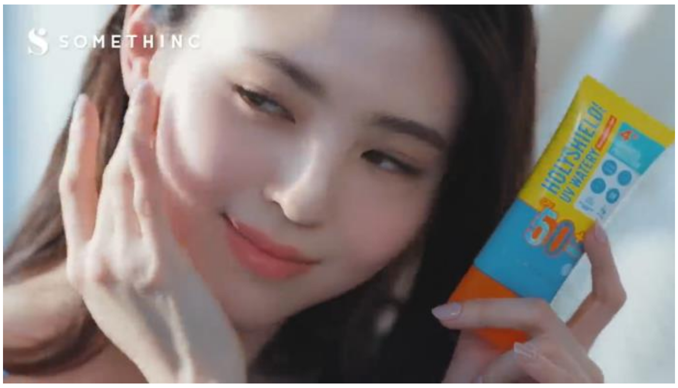

Figure 4. Somethinc Product Advertisement

Depends detik.com, Somehinc is a local brand from Indonesia that product beauty using high quality ingredients. Somethinc products have also had a halal certificate since 2019. This brand has collaborated with local and foreign artists. Han So Hee is an artist from South Korea

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who is the brand ambassador of the beauty product Somethinc. Han So Hee is admired for her courage to explore roles with various strong characters. Likewise, Somethinc is aggressively innovating in presenting a variety of beauty products.

Figure 5. Sasa Product Advertisement

Dikutip dari Liputan6.com, Choi Siwon is the brand ambassador for seasoning products from Indonesia, namely the Sasa brand. Hastag SiwonxSasa it became the first trending topic on Twitter on Tuesday, February 15 2022 with more than 9,000 tweets. Siwon is a global idol and legendary second generation K-Pop Star. Siwon is known for his worldwide popularity. Siwon's charm is in line with Sasa's main mission, which is the reason this brand invited Siwon to introduce Indonesian spices overseas.

3.2. Create a Discussion

One element of marketing are mix which is a variable in marketing in order to meet sales targets. The elements in the marketing mix are known as 7p, namely : product, price, place, promotion, physical evidence, process dan people (Hariyanti & Wirapraja, 2018).

Article from a scientific journal explains that promotion in any form is an attempt to influence other parties. Promotion is one element of the marketing mix in a company. On the other, Kinnear and Kenneth define promotion as a marketing communication mechanism, the exchange of information between buyers and sellers. Promotion has a role: to inform, to persuade, to remind consumers so that the company gets feedback regarding the products or services offered (Puspitasari et al., 2023)

Firmansyah explained that a brand ambassador is someone who has a passion for a brand and can influence or invite consumers to buy or use a product. The results of previous research by Bhara and Syahida stated that a positive and significant influence was found from the Shopee brand ambassador starring Blackpink. Another research conducted by Brilliani et al., stated that brand ambassadors and sales promotions influence buying interest in the LG G7 Thinq cellphone. (Hendayana & Afifah, 2021).

The four advertising products above show that the products from Indonesia use brand ambassadors from Korea. Kim So Hyun is the brand ambassador in the Radiance Up! From Y.O.U Beauty. Choi Siwon was chosen as the brand ambassador for the Mie Sedaap advertising product and also the Sasa brand of food seasoning products. Meanwhile, the Somethinc beauty product uses a Korean artist named Han So Hee as its brand ambassador.

Advertising means of marketing goods or services must be able to appear attractive and persuasive. To produce good advertising, apart from get attention to the ad structure, you also apply the AIDA advertising formula (Arianto, 2017). AIDA resume from *Attention, Interest, Desire,* dan *Action* (Auliasari et al., 2021).

The AIDA model is a step to process that is often used in marketing communications. In one scientific journal article, it is explained that in marketing communication science, the AIDA concept is a reference in creating communication campaign programs. From that, the AIDA concept is often the initial foundation for creating marketing programs (Oktavianti & Hasrina, 2020). AIDA is a model used to understand how consumers react to marketing messages. The following is an analysis of the AIDA model in marketing communications with the functions and roles of brand ambassadors.

1) Attention
   a. AIDA : First, AIDA is attracting the target market's attention to the product or service.
   b. Brand Ambassador : As a well-known and respected figure in industry or society, brand ambassadors have the power to attract public attention to the brand or product they are promoting. The existence of a brand ambassador can be a focal point that attracts attention to certain products or services.

2) Interest
   a. AIDA : After get attention, the next step is to generate interest in the product or service.
   b. Brand Ambassador : knowledge of a brand and the trust they have from their fans or followers, brand ambassadors can generate strong interest in a product or service in a more personal and convincing way.

3) Desire
   a. AIDA : After interest appear, the next stage is to create a desire in consumers to own or use the product or service.
   b. Brand Ambassador : recording the emotional relationships they build with their fans, brand ambassadors are able to strengthen consumers' desire to own the product or service they are promoting. Their testimonials and personal experiences can strengthen the product's appeal.
4) Action
   a. AIDA : The final stage is push consumers to take action, such as purchasing or taking certain steps after being inspired, influenced and desired by the product or service.
   b. Brand Ambassador : With their strong influence, brand ambassadors are able to drive consumer action. Their loyal followers may be motivated to follow the brand ambassador's lead or recommendations, such as purchasing a product or service they endorse.

The results from interview conducted with Nuha Zahirah explained that of the four advertisements, Choi Siwon was the brand ambassador who was easiest to recognize. The Mie Sedaap advertisement is an advertisement that is considered interesting because of its unique advertising packaging and the use of Indonesian in the advertisement. The Korean Spicy Soup variant attracts spicy taste fans to try it.

The second source, namely Putri Rahmadani, said that she recognized Choi Siwon and Kim Soo Hyun as brand ambassadors for the advertising product. According to her, the brand ambassador for the advertising product is an artist who has high value. Until now, Putri still uses the Y.O.U cosmetics brand advertised by Kim Soo Hyun.

4. Conclusion

AIDA is a model used to understand how consumers react to marketing messages. The AIDA model can help in planning effective marketing messages. By understanding the AIDA model, companies can design appropriate communication strategies according to consumers psychological stages, helping to build brand awareness, maintain interest, and encourage desired consumer actions. From the research that has been carried out, it shows that brand ambassadors can be a key element in every stage of the AIDA concept. Brand ambassadors can also help to direct attention, generate interest, strengthen desire, and encourage consumer action regarding the product or service being promoted. From that, packaging advertising strategies with an attractive concept can make consumers continue to remember the product. This is something important in product marketing activities.

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6. References

[1] L. Augusto Horta Nogueira and R. Silva Capaz, "Biofuels in Brazil: Evolution, achievements and perspectives on food security," *Global Food Security*, vol. 2, no. 2, pp. 117–125, 2013.

[2] A. Pradhan and C. Mbohwa, "Development of biofuels in South Africa: Challenges and opportunities," *Renewable and Sustainable Energy Reviews*, vol. 39, no. 2014, pp. 1089–1100, 2014.

[3] M. Messagie, K. Lebeau, T. Coosemans, C. Macharis, and J. Van Mierlo, "Environmental and financial evaluation of passenger vehicle technologies in Belgium," *Sustainability*, vol. 5, no. 12, pp. 5020–5033, 2013.

[4] Amri, W. A. (2020). Kpop fans fanatism in social media instagram. *Ijcss*, *1*(1), 25–34.

[5] Arianto, N. (2017). Pengaruh Iklan Berdasarkan Konsep AIDA Terhadap Keputusan Pembelian Sabun Mandi Lifeboy (Studi Kasus Pada Warga Depok-Jawa Barat). *Liquidity*, *6*(1), 72–80. https://doi.org/10.32546/lq.v6i1.42

[6] Auliasari, K., Kertaningtyas, M., & Willis, D. (2021). Penerapan Model AIDA pada Pembuatan Konten Digital Marketing Kreasi Kayu IMMUX. *Suluah Bendang: Jurnal Ilmiah Pengabdian Kepada Masyarakat*, *21*(3), 341. https://doi.org/10.24036/sb.01730

[7] Fadli, M. R. (2021). Memahami desain metode penelitian kualitatif. *Humanika*, *21*(1), 33–54. https://doi.org/10.21831/hum.v21i1.38075

[8] Hariyanti, N. T., & Wirapraja, A. (2018). Pengaruh Influencer Marketing Sebagai Strategi Pemasaran Digital Era Moderen (Sebuah Studi Literatur). *Jurnal Eksekutif*, *15*(1), 133–146.

[9] Hendayana, Y., & Afifah, N. (2021). Pengaruh Brand Ambassador Dan Korean Wave Terhadap Minat Belanja Online Melalui Marketplace Tokopedia. *Kinerja*, *3*(1), 32–46. https://doi.org/10.34005/kinerja.v3i1.1285

[10] Oktavianti, S., & Hasrina, Y. (2020). Pengaruh Strategi Pemasaran Dengan Konsep Aida Terhadap Keputusan Pembelian Produk Pt.Wings Food Di Kecamatan Alang-Alang Lebar. *Jurnal Ilmiah Manajemen*, *09.03.2020*(1), 63–80.

[11] Panuju, R., & Mochammad Arkansyah. (2020). Penggunaan Saluran Komunikasi Dan Minat Wisatawan Berkunjung Ke Wisata Kota Surabaya. *Jurnal Heritage*, *8*(1), 76–91. https://doi.org/10.35891/heritage.v8i1.1867

[12] Perbawani, P. S., & Nuralin, A. J. (2021). Hubungan Parasosial dan Perilaku Loyalitas Fans dalam Fandom KPop di Indonesia. *LONTAR: Jurnal Ilmu Komunikasi*, *9*(1), 42–54. https://doi.org/10.30656/lontar.v9i1.3056

[13] Puspitasari, N., Aphrodite, N., & Sulaeman, E. (2023). Pengaruh Promosi, Brand Ambassador Dan Korean Wave Terhadap Minat Beli Produk Somethinc. *Warta Dharmawangsa*, *17*(1), 302–314. https://doi.org/10.46576/wdw.v17i1.2943

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Innovation and Technology Based on Research on the Influence of Lead Toxicology towards Health to Create an Eco-Friendly Batik Industry in Achieving Sustainable Development Goals

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Abstract

Community welfare in Society 5.0 is the goal of sustainable development, so innovation and technology are expected to help humans without causing environmental damage. Batik is one of the original Indonesian cultural heritage arts recognized by UNESCO. However, the production process in the batik industry still poses some risks of contamination from dyeing waste. This pollution negatively impacts health, such as stunting, neurotoxins, and genetic mutations. Considering the risks posed to craftsmen and the surrounding environment, batik industries need to create innovation and technology to support a safer and environmentally-friendly batik production process. Thus, this effort will contribute to responsible production as well as maintain a healthy and prosperous life for the community. Innovation and technology are based on research results related to lead toxicology in batik dye waste. Some innovations are tea made of Meniran (Gale of the wind) leaves used as an antioxidant against lead-free radicals, a simple biofilter made of Oyong (Chinese okra) sponges, and hand soap made of used cooking oil as a cleanser for residual wax that sticks to hands. These innovations are expected to maintain clean water and proper sanitation in the batik industry. In addition, it is necessary to create appropriate technology like an innovative batik brush, a batik coloring tool with minimal spills and splashes, which can save ink containers and production costs. The results of the activities have been educated to the target villages with a batik industry community forum in Surakarta. Product innovation has been written in a pocketbook and easily applied by the community.

Keywords: neurotoxin, antioxidant, biofilter, sanitation, technology

1. Introduction

Community welfare in Society 5.0 is the goal of sustainable development, so innovation and technology are expected to help humans without causing environmental damage. Batik is one of the original Indonesian cultural heritage arts recognized by UNESCO. However, the production process in the batik industry still poses some risks of contamination from dyeing waste. This pollution negatively impacts health, such as stunting, neurotoxins, and genetic mutations.

Research discussing the dangers of lead in brain damage was previously conducted by Susilowati et al (2022). In that study, it was proven that the accumulation of lead exposure due to motor vehicle pollution had a neurotoxin effect, including decreased cognitive function. This problem should be taken seriously, especially in industrial areas prone to it, which will lead to a dire situation if the area is close to settlements.

Batik cloth is famous throughout Indonesia, and each region has unique motifs inspired by local cultural characteristics depicting creativity and spirituality. The process of coloring batik is one of the stages in batik production. Batik coloring can use natural or synthetic materials. Synthetic dyes are widely used because of their affordable prices and more color choices to develop batik motifs and patterns. However, the use of synthetic dyes becomes a potential source of exposure to heavy metals such as lead (Pb) and chromium (Cr), found in batik dyes, particularly to workers in the dyeing (Hastuti, et al, 2018).

It can cause health problems. It can cause behavioral changes, hyperactivity, impaired concentration, and decreased IQ in children. Meanwhile, adults may experience hypertension, headaches, anemia, and other minor health problems (Needelman, 2004).

Considering the risks posed to workers and the environment around the batik industry, it is necessary to innovate products and technologies that make batik production safer and more environmentally friendly for responsible production and healthy life.

2. Method

The checking method includes examining the water quality. At the location of the batik home industry, the clean water quality testing, which is based on the criteria of the Regulation of the Ministry of Health No. 32 of 2017, showed that the results, physically, chemically, and inorganic chemically, still meet the standards but do not meet the requirements for clean water quality in microbiological tests, which is one indicator of water pollution.

Figure 1. Sampling of water sources around the location

The next method is public health checks around the batik industry. This health check includes an examination of exposure to lead in the blood of batik craftsmen and an examination of haemoglobin levels in women of reproductive age. This examination was carried out in response to information that the incidence of stunting in children has increased in areas of the batik industry, which are vulnerable to lead exposure.

(a) (b)

Figure 2(a) Examination of batik craftsmen, 2(b) Examination of women

Health education was carried out to provide education and knowledge for SME entrepreneurs in the batik home industry and batik craftsmen who work in the dyeing and washing department, and the PKK (Family Welfare Program) meeting forum for women at the RW

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(Citizens Association) level. The community was given health education and training in making products to anticipate the impact of exposure to lead from synthetic batik dyes.

Figure 3. Pocketbook for making Meniran tea and soap

One of the methods to create eco-green batik is to collaborate with batik community forums. It is hoped that it become a form of responsible and sustainable production and consumption activities. Collaboration between academia and industry will produce appropriate technology. This appropriate technology is expected to be one of the solutions to the problem of environmental pollution due to the batik industry.

Figure 4. Establish collaboration with and accommodate the aspirations of the Village and Batik Community Forum

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Before being marketed, the appropriate technology was tested in an institutional-level competition (Krenovanas STIKES Nasional). Based on the judges' suggestions, it was later modified and perfected, then contested in the Surakarta City Krenova competition.

Figure 5. Appropriate Technology Expo for Batik Dyeing Tools at the Krenova Surakarta Event

With the support of the Surakarta City Government, the team was then invited to participate in a competition at the Central Java Province level. Currently, the product has been registered through the Balitbangkesda Surakarta based on community suggestions via the website http://moving.jatengprov.go.id/.

3. Result and Discussion

Innovation and technology are based on research results related to lead toxicology in batik dye waste. Examination of the quality of well and river water shows that the quality of well water does not meet the standard of clean water; based on the results of the questionnaire distributed, it is shown that 65% of the questionnaire results obtained still use well water for daily needs. The results of the health examination of batik dye workers from 21 samples show that there were 6 (28.57%) batik workers having blood lead levels exceeding the normal limit of (<10μg/dL) and 7 (33.33%) workers experiencing irritation after contact with batik dye. Anemia examination shows that 11% of respondents have the symptoms of anemia.

Lead is highly toxic to humans and potentially causes irreversible health effects. This is characterized by disturbances in several body functions, especially in the central nervous, hematopoietic, liver, and kidneys (Kalia & Flora, 2005).

Contact with synthetic dyes, as experienced by workers in the batik industry, can cause various skin disorders. One of the skin problems due to exposure to chemicals is skin irritation. The prevalence of skin irritation is 33.33% (7 people), with the most age characteristics being 40-70 years, the working period of more than 5 years, and the length of contact exposure of 0-3 hours/day. The most common symptom is itching on the palms, back of the hands, forearms, between the fingers, and the backs of the feet (Saroh et al., 2022).

Lead has adverse effects, including decreased intelligence, impaired hearing, impaired growth, and decreased hemoglobin levels, leading to danger for children (Dewi et al., 2023).

Low hemoglobin level in women of childbearing age causes a risk factor for stunting. According to Dewi et al. (2022), Family 4.0 needs to be carefully planned and educated, starting from teenagers, and prospective brides, to couples of childbearing ages. This is to support the formation of Indonesia Gold in 2045 with a generation free from stunting and ready to face global competition.

Exposure to lead is one of the free radicals that can cause ROS. Reactive Oxygen Species (ROS) in red blood cells is one of the main causes of anemia. Increased ROS on red blood cells can occur either by ROS activation or suppression of the antioxidant system. When red blood cells increase and cause excessive ROS, it will lead to oxidative stress (Luchi, 2012). Iron balance is very important to maintain normal erythropoiesis. Optimal balance is needed by pregnant women.

Stunting is a chronic nutritional problem caused by multi-factorial, which is intergenerational. Risk factors for stunting include problems with nutrient intake, growth hormone, and the occurrence of recurrent infectious diseases in toddlers (Harningsih et al., 2023).

According to Nurjazuli et al. (2021), exposure to lead sourced from the environment can cause stunting in toddlers due to the nature of the heavy metal that inhibits the absorption of nutrients from food and decreases cognitive scores in children.

Exposure to lead is a free radical that must be overcome to prevent ROS. According to Dhiya et al. (2023), in conditions with more free radicals and endogenous antioxidants that cannot fight back, exogenous antioxidants are needed, which can be obtained from food and drink intake. Antioxidants can absorb or neutralize free radicals.

Considering the risks posed to workers and the environment around the batik industry, it is necessary to innovate products and technologies that make batik production safer and more environmentally friendly for responsible production and healthy life. Product innovation and technology are made based on research results on lead toxicology in batik dye waste.

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The first innovative product includes tea from Meniran leaves as an antioxidant in counteracting free radicals of lead. Meniran (Phyllanthus niruri L.) has many benefits for health used as an antioxidant, antibiotic, hepatoprotection, antipyretic, antitussive, antiplatelet, anti-inflammatory, antiviral, diuretic, expectorant, antidiabetic, antibacterial, anti-urolithiasis, anti-hyperuricemia, antineoplastic, anti-amnestic, and immunostimulants (Adnan, M et al., 2016). The mechanism of flavonoids and vitamin C as antioxidants in Meniran is different but will complement each other to reduce the impact of cell damage. The mechanism of flavonoids is by capturing free radicals, breaking free radical chains, binding metals, inhibiting oxidase enzymes, releasing oxygen molecules, and donating electrons. Meanwhile, vitamin C acts as a secondary antioxidant, functioning as a superoxide destroyer (O2 -), peroxyl radical scavenger, and lipid peroxidation inhibitor (Winarsi, 2011).

Figure 6. Meniran Tea

Making the Meniran (Gale of the wind) tea begins with making the Meniran leaves simplicia. First, wash the leaves under running water, then drain and cut them into pieces to speed up the drying process. After being cut into pieces, they were stored at room temperature for one week, then dried in the sun for an hour as the final drying step. Finally, the dried leaves are stored in a jar at room temperature. A way to make the tea is by brewing one teaspoon of gale-of-the-wind with 240 ml of warm water and then adding sugar or honey according to taste.

The first appropriate technology is a simple biofilter from a natural Oyong sponge (Chinese okra). Biofilter is a process of treating leftover batik dyeing wastewater into water suitable for use with a method carried out systematically. Biofilters use a particular container to maintain environmental quality (Filliazati, 2013). This biofilter is used before the waste is discharged into water bodies; it is processed first to reduce heavy metal levels.

Research by Ashari (2016) shows that the combination of Gracilaria sp biofilter, Zeolite, and activated charcoal significantly reduces the concentration of the heavy metal lead. The combination of Gracilaria sp biofilter, Zeolite, and activated charcoal was recorded to have a value range of 0.0002-0.945 ppm. Natural ingredients other than Gracilaria sp, which can also reduce Pb levels, are Oyong (Luffa acutangula). This plant belongs to the Curcubitaceae family (Margareta, 2013). Fiber from Oyong comprises 60% cellulose, 30% hemicellulose, and 10% lignin (Mazali & Alves, 2005). This cellulose content influences metal absorption (Yoseva et al., 2015). Research by Susilowati et al. (2018) and Oboh et al. (2011) proved that Oyong sponge can be used as an effective natural adsorbent for several metals.

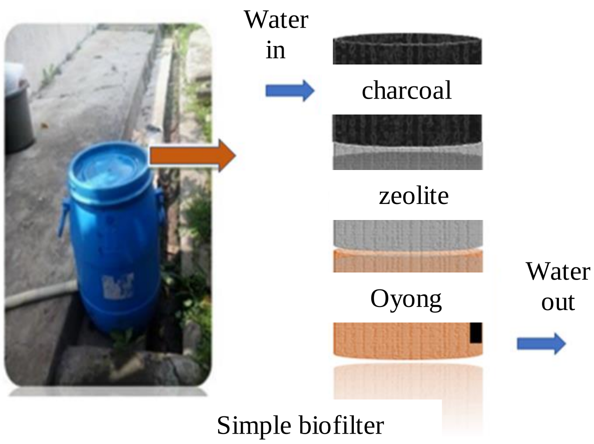

Figure 7. Biofilter made from sponge of Chinese okra

This condition motivates the second innovative product: making soap from used cooking oil to clean wax residue and dyes that stick to hands. This soap is made using economical materials that are easy to obtain. The method of preparation is to pour 60 ml of water into a container, then pour 30 gr of NaOH into the water, then stir until it dissolves, then pour 250 ml of oil and stir again until the texture is like mush, then add grated orange peel to taste, then stir again, then put it in the mold, and wait a few days until it hardens.

Figure 8. Soaps from used cooking oil to clean craftsmen's hands from wax

There is also an appropriate technology, such as a batik brush, an innovation of a batik coloring tool that minimizes spills and splashes and is more efficient in terms of space and production costs.

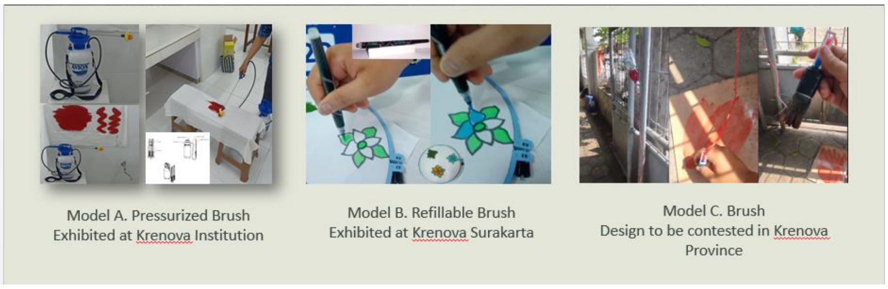

Figure 9. Innovation of environmental-friendly tools for coloring batik

The activity results have been educated to the sub-districts under guidance which have a batik industry community forum in Surakarta. Innovative products have been made in the form of pocketbooks that the community applies. The technology has been contested at the regional level of Surakarta and is currently continuing to perfect innovation at the provincial level of Central Java.

4. Conclusion

UNESCO has acknowledged batik as Indonesia's cultural heritage. Hopefully, the production of batik cloth will become a sustainable activity. A sustainable production must consider environmental continuity, the welfare of its workers, and the people who live in the vicinity. Eco-green batik is a step toward making the art of batik sustainable. The embodiment of eco-green batik is carried out by producing appropriate technology and innovative products to minimize the toxicological risk of the heavy metal lead from dyeing and washing waste in the production of batik cloth. The implementation in the post-educated society is in the form of pocketbooks distributed to them as partners, so it is hoped that this will continue.

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6. References

Adnan M. A, Fernandez AR, Jeevaratnam K, Mahalingam TP, Lee YSN, Khoo WKS. (2016) The Pharmalogical potential of Phyllanthus niruri, *Journal Pharmacy and Pharmalogical, 68, pp. 953-969*

Dewi, N., Semartini, A., & Rosita, R. (2022). Edukasi Siaga Family 4.0 dan Pentingnya Kesehatan Reproduksi pada Kader Kesehatan dan Tim Penggerak KB. Jurnal Peduli Masyarakat, 4(2), 339-346. https://doi.org/10.37287/jpm.v4i2.1179

Dewi, N., Susilowati, I.T., & Widhiyastuti, E. (2023). Edukasi Bahaya Timbal pada Sekolah Rentan Polusi terhadap Prestasi Akademik dan Kesehatan Siswa. Jurnal Surya Masyarakat, 5(2), 201-207. https://doi.org/10.26714/jsm.5.2.2023.201-207

Dhiya, S., Ramadhan, I., Qurrohman, M., Dewi, N., & Ariyanti, A. (2023). Pencegahan Kerusakan Hati dan Penyakit Alzheimer Akibat Konsumsi Alkohol Terselubung dengan Pola Hidup Sehat. Jurnal Peduli Masyarakat, 5(2), 409-416. https://doi.org/10.37287/jpm.v5i2.1821

Filliazati, M et al. (2013). Pengolahan Limbah Cair Domestik Dengan Biofilter Aerob Menggunakan Media Bioball dan Tanaman Kiambang. Jurnal Teknologi Lingkungan Basah

Vol 1, No. 1

Harningsih, T., Dewi, N., Harini, S., Suryo, D., Choirunisa, D., & Damayanti, E. (2023). Penyuluhan Stunting dan Pemberian Makanan Tambahan bagi Keluarga yang Berhak di Kelurahan Pucangsawit, Jebres, Surakarta. Jurnal Peduli Masyarakat, 5(1), 13-16. https://doi.org/10.37287/jpm.v5i1.1509

Hastuti, P, et al. (2018). Hubungan timbal dan krom pada pemakaian pewarna batik dengan kadar hemoglobin dan packed cell volume pada pengrajin batik di Kecamatan Lendah Kulon Progo. Journal of Community Empowerment for Health, Vol 1(1) November 2018 DOI: 10.22146/jcoemph.39156

Kalia K, Flora SJ. (2005). Strategies for safe and effective therapeutic measures for chronic arsenic and lead poisoning. J Occup Health 47: 1–21.

Luchi, Yoshihito. (2012). Anemia Caused by Oxidative Stress. In Tech:Croatia.

Margareta, Defira. (2013). Pengaruh Dosis Pupuk NPK Nature Dan Dosis Pupuk Npk Organik Mashitam Terhadap Pertumbuhan Dan Produksi Tanaman Gambas (Luffa acutangula) Varietas Prima. Skripsi. Fakultas Pertanian. Universitas Islam Kediri. Kediri.

Mazali, I. O., & Alves, O. L. (2005). Morphosynthesis: high fidelity inorganic replica of the fibrous network of loofa sponge (*Luffa cylindrica*). Anais Da Academia Brasileira de Ciências, 77(1), 25– 31. https://doi.org/https://doi.org/10.1590 /S0001-37652005000100003

Needleman, H. (2004). Lead Poisoning. *Annual Reviews Med, 55:209-222, doi: 10.1146/annurev.med.55.091902.103653*

Nurjazuli., Darundiati, Y.H., Wardoyo, S. (2021). Paparan Plumbum (Pb) sebagai Pemicu Stunting pada Balita. Poltekita: Jurnal Ilmu Kesehatan, 15 (3), 37-43 https://doi.org/10.33860/jik.v15i3.508

Oboh Innocent, Emmanuel O. Aluyor dan Thomas O. K. Audu. (2011). Application of Luffa Cylindrica in Natural form as Biosorbent to Removal of Divalent Metals from Aqueous Solutions. Kinetic and EquilibriumStudy, Waste Water - Treatment and Reutilization. Nigeria.

Saroh, D., Purwati, P., & Harningsih, T. (2022). Description of the Event of Irritant Contact Dermatitis in Employees of the Home Industry Batik. *Indonesian Journal of Global Health Research*, *4*(3), 535-542. https://doi.org/10.37287/ijghr.v4i3.1200

Susilowati, I. T., & Susilowati, S. (2018). Pemanfaatan Handsanitizer Dan Biofilter Biji Kelor Serta Spons Oyong Sebagai Solusi Preventif Pencemaran Air Dan Peningkatan Prilaku Hidup Bersih Dan Sehat Di Kismosari Desa Gadingan Kecamatan Mojolaban Kabupaten Sukoharjo. Jurnal Pengabdian Kepada Masyarakat, 24(3), 755–761. https://doi.org/https://doi.org/10.2411

4/jpkm.v24i3.11590

Susilowati, I., Dewi, N., Trikusumaadi, S., & Saputri, D. (2022). The Impact of Exposure to Blood Lead Levels on Online Ojek Driver Students on Intelligence and Communication Anxiety. Indonesian Journal of Global Health Research, 4(2), 309-314. https://doi.org/10.37287/ijghr.v4i2.1043

Susilowati, I., Dewi, N., Widhiyastuti, E. (2023). Edukasi Bahaya Timbal pada Sekolah Rentan Polusi terhadap Prestasi Akademik dan Kesehatan Siswa. Jurnal Surya Masyarakat, 5(2), 201-207. https://doi.org/10.26714/jsm.5.2.2023.201-207

Winarsi, H. (2011). Antioksidan Alami dan Radikal Bebas. Yogyakarta: Kanisius.

Yoseva, P. L. dan M. Akmal, S. Halida. 2015. Pemanfaatan Limbah Ampas Tebu Sebagai Adsorben untuk Peningkatan Kuliatas Air Gambut. Jurnal Online Mahasiswa Fakultas Matematikan dan Ilmu Pengetahuan Alam Universitas Riau 2 (1), 56-62.