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PREFACE

Editor of Techno Nusa Mandiri : Journal of Computing and Information Technology, said praise and gratitude to the presence of Allah S.W.T, creator of the universe who mastered knowledge as wide as heaven and earth, for the abundance of grace and gifts that have been given to TECHNO editors to publish TECHNO Vol. 20, No. 1 March 2023, which is used by lecturers, researching, and professionals as a medium or media to publish publications on the findings of research conducted in each semester.

TECHNO is published 1 (one) year for 2 (two) times at the end of each semester, TECHNO editors receive scientific articles from the results of research, reports / case studies, information technology studies, and information systems, which are oriented to the latest in science and information technology in order to be a source of scientific information that is able to contribute to the increasingly complex development of information technology.

The editor invited fellow researchers, scientists from various tertiary institutions to make scientific contributions, both in the form of research results and scientific studies in the fields of management, education, and information technology. The editors really expect input from readers, information technology professionals, or those related to publishing, for the sake of increasing the quality of journals as we all hope.

The editor hopes that the scientific articles contained in the TECHNO scientific journal will be useful for academics and professionals working in the world of management, education, and information technology

Chief Editor

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RECOGNITION OF REALTIME BASED PRIMITIVE GEOMETRY OBJECTS USING PERCEPTRON NETWORK

Cut Lika Mestika Sandy[1], Taufik Ismail Simanjuntak[2], Ajulio Padly Sembiring [3] , Reyhan Achmad Rizal[4], Ona Rizal Fahmi[5*)]

Sistem Informasi[1]
Universitas Islam Kebangsaan Indonesia[1]
www.uniki.ac.id[1]

Sistem Informasi[2]
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www.utnd.ac.id[2]

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Politeknik Negeri Medan[3]
www.polmed.ac.id[3]

Sistem Informasi[4]
Universitas Prima Indonesia[4]
www.unprimdn.ac.id[4]

Teknik Informatika[5]
Universitas Malikussaleh[5]
www.unimal.ac.id

likaclms@gmail.com[1], taufikismails@gmail.com[2], ajuliosembiring@polmed.ac.id[3],
reyhanachmadrizal@unprimdn.ac.id[4], onarizal148@gmail.com[5*]

Abstract— *The current problem in defining primitive geometric abstract concepts requires in-depth spatial knowledge. Where geometry is one of the fields of mathematics which is considered the most difficult to understand, so we need a pattern recognition system for primitive geometric objects in real time to make it easier to define abstract shapes on primitive geometric objects. In this study the system was built using the Delphi 7 programming language using the perceptron network. Measurement of system performance evaluation in this study uses two parameters, namely detection rate and false positive rate. The results of this research are that the primitive geometric object recognition system using the perceptron network model in this study is able to recognize an average of up to 80.00%. The detection rate percentage shows that this model can be used as a supportive approach for the recognition of geometric objects in video.*

Keywords: *Primitive Geometry, Real Time, Perceptron.*

Intisari—*Permasalahan saat ini didalam mendefinikan konsep abtrak geometri primitif dibutuhkan pengetahuan tentang keruangan yang mendalam. Dimana geometri merupakan salah satu bidang ilmu matematika yang dianggap paling sulit untuk dipahami, sehingga dibutuhkan suatu sistem pengenalan pola objek geometri primtif secara realtime untuk memudahkan mendefinisikan bentuk abstrak pada objek geometri primitif. Pada penelitian ini sistem dibangun menggunakan bahasa pemograman Delphi 7 dengan menggunakan jaringan perceptron. Pengukuran evaluasi unjuk kerja sistem pada penelitia ini menggunakan dua parameter yaitu detection rate dan false positive rate. Hasil penelitian ini sistem pengenalan objek geometri primitif menggunakan model jaringan perceptron pada penelitian ini mampu mengenali rata-rata hingga 80.00%. Persentase detection rate tersebut menunjukkan bahwa model ini dapat*

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digunakan sebagai salah satu pendekatan yang mendukung untuk pengenalan objek geometri pada video.

Kata Kunci*: Geometri Primitif, Real Time, Perceptron.*

INTRODUCTION

Geometry is a branch of mathematics that studies the relationship between points, lines, angles, planes and shapes and shapes(Jelatu, Lim, and Ngoe 2019). The concept of geometry is abstract but can be shown in a semi-real or semi-concrete way (Wulandari & Ishartono, 2022). Geometry with abstract shapes on these real objects is two-dimensional geometry (flat shapes) and three-dimensional geometries (spatial shapes) (Butar-Butar et al., 2022). When compared to other fields in mathematics, geometry is one of the fields in mathematics which is considered the most difficult to understand (Nur'aini et al., 2017). It is important to define abstract shapes on geometric objects to make it easier to formulate and solve problems in everyday life (Wulandari & Ishartono, 2022). The abstract object must be explained precisely so that it is understood by students. However, until now the media that are often used by educators are considered to be unable to describe properly, especially for three-dimensional geometry(Joko Suratno 2022)(Ikashaum et al. 2021), where in designing buildings one has to design and calculate very carefully everything in order to get a beautiful and stable building (Nurjanah & Juliana, 2020) . Achieve this, it requires thinking skills related to in-depth spatial knowledge (Mega Teguh Budiarto, 2019).

There are many realistic applications of geometry in the field of Mathematics, including determining the geometric shape of a computer network topology, determining the angle of inclination when placing stairs(Devi Eka Wardani Meganingtyas 2021), determining the angle formed at what time and how many minutes, the displacement of a figure (Agriyanto et al., 2021).Object recognition research has been put forward by several previous researchers such as: (Musthofa et al., 2017) analyzing objects in patterns: characters, symbols and Indonesian islands using the ANN method and the perceptron network model. The introduction test uses the VB programming language with the same accuracy as manual calculations using excel. Similar research was also reported by (Ramadhani et al., 2017) in their research to determine character and symbol patterns using the ANN method and the perceptron network model. Determination of recognition based on 5 inputs, namely the weight value (w) = 0, the

alpha value (α) = 1, and the threshold value (θ) = 0 for the initial stage analysis. Whereas for the second analysis using weight values (w) = 0, alpha values (α) = 0.25, 0.5, 0.75, and 1, and threshold values (θ) = 0. In 2022 similar research will also be found by (Purba et al., 2022) Using the perceptron method to detect photocopier damage, the results obtained are that the percepton method can be used to recognize patterns, especially patterns of damage symptoms. Where to get better accuracy results depends on the amount of data collected and trained on the system. Based on this description, we need a system that can be applied in learning media so that it makes it easier for educators and makes it easier for students to understand the abstract concepts that exist in primitive geometry. Based on this description, we need a system that can be applied in learning media so that it makes it easier for educators and makes it easier for students to understand the abstract concepts that exist in primitive geometry.

MATERIALS AND METHODS
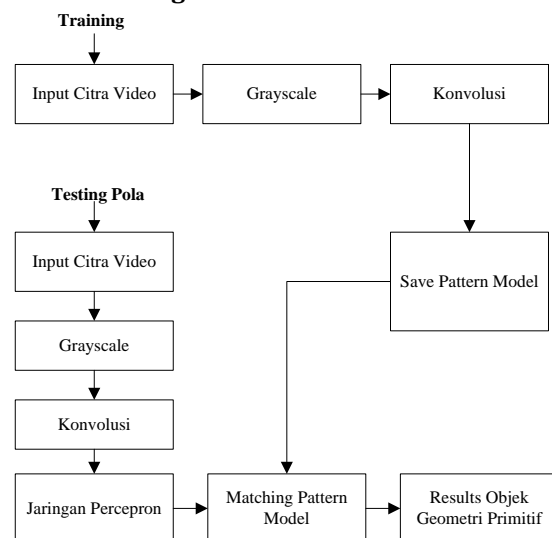
A. Research Stage

Figure 1. Research Stages.

In Figure 1 it can be seen the overall research steps in this study. Where in the training stage after the system receives the original video image input it will be pre-processing with grayscale and convolution then the pattern model will be stored to be used as a reference pattern at the testing stage. convolution and primitive geometry object pattern recognition tests using the Perceptron Network method then proceed to the pattern model matching stage if the pattern is similar or close to the training

pattern then the output of the recognition is the result of primitive geometry objects.

B. Data Collection

The dataset used in this study is image-based data taken directly (real-time). Video images for training and testing are obtained from various sources such as camera captures. The video image used is only limited to 24-bit video images with the AVI extension. The choice of the .AVI format is because the .AVI format is the default standard on the Windows operating system. The details are as follows :

Table 1 Samples of Primitive Geometry Objects (Real-Time)

Sampel Pelatihan Objek Geometri Primitif				
Kubus	Prisma	Tabung	Bola	Total Sampel
5	4	4	3	16

For real-time primitive geometric object samples captured directly by the camera. This real-time primitive geometry object sample is used as a comparison to see the accuracy of the primitive geometry object recognition system directly by carrying out the process of testing primitive geometry objects in real-time according to the conditions of the primitive geometry object during training.

C. Overall System Scheme
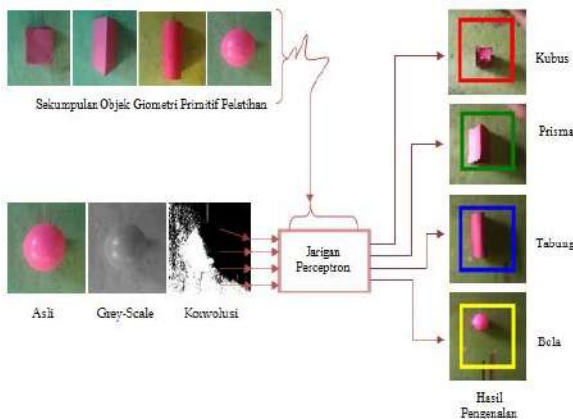
Figure 2. Overall System Scheme Overall System Scheme (Rizal, Purba, et al. 2020)(Rizal, Susanto, and Chandra 2020)

In Figure 2 you can see a schematic of the entire research system where after the system receives video image input it will be processed at the greyscale, convolution, and pattern recognition stages of primitive geometric objects using the Perceptron Network method. In the pre-processing stage, the original video as input will be resized first

to save time and the number of iterations. After resizing the video will be represented in the form of one channel and ends with edge detection through the convolution process. In the main process, computation uses the Perceptron Network method, where primitive geometric object patterns will be trained to obtain a weight matrix and then the weight matrix will be used as a testing matrix.

C. System Performance Evaluation Measurement Parameters

The evaluation measurement of the performance of this primitive geometric object recognition system uses two parameters, namely the detection rate and the false positive rate. The detection rate is a comparison or percentage of the number of primitive geometric object recognition that can be detected, while the false positive rate is the number of objects detected not as primitive geometric objects.

RESULTS AND DISCUSSION

A. System Analysis

The results discussed include the selection of basic primitive geometry object training samples where these samples will be recorded in real-time on the .AVI video available on the system. System training, the system training process includes the process of calculating matrix values from the original image, then the gray-scale process, and the edge detection process using convolution with a kernel, namely the sobel operator. And then the matrix results from the edge detection process are transformed using the perceptron network to get energy from the image of the object. And the energy resulting from the transformation is stored in the database as recognition energy for the image object.

System testing, the steps in the system testing process are the same as the training process, where the original image matrix values will be processed in the gray-scale process and then entered in the edge detection process using convolution with a kernel, namely the sobel operator and transformed using a perceptron network to obtain the energy of an image. Furthermore, the image energy in the testing process will be compared with the image energy in the training process which was previously stored in the database. The approach or similarity of the energy value is the reference for the introduction of primitive geometric objects, this is also known as the statistical approach. System performance measurement is an overview of the results of the entire training and testing process that has been carried out. Which is described directly in the form

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of a table containing the actual data from the research results.

B. User Interface

In this program there are two projects, namely the first project is for training video image objects of primitive geometric cubes, prisms, tubes and balls while the second project is for testing video images of primitive geometric objects of cubes, prisms, tubes and balls. Real-time video images that have been trained will be tested to see the accuracy of the system in recognizing cubes, prisms, tubes and spheres in real time. The Primitive Geometry Object Training Program Interface can be seen in Figure 2.

Figure 2. Primitive Geometry Object Training Program Interface

Figure 2 shows the overall Primitive Geometry Object Training Program interface. Where all primitive geometric objects with the shape of cubes, tubes, prisms and spheres must go through this training interface process to record the initial value as a reference for pattern recognition of the next primitive geometric object. Meanwhile, the Primitive Geometry Object Testing Program Interface can be seen in Figure 3.

Figure 3. Primitive Geometry Object Testing Program Interface

In Figure 3 you can see the video image testing program. Where primitive geometry objects are cubes, prisms, tubes and balls that have gone through the training process and will be tested to see the accuracy of the system in introducing primitive geometric objects. In this program there is a matrix threshold setting, to set the primitive geometric objects of cubes, prisms, tubes and balls when under certain conditions when objects are not immediately detected. If the object that has been tested belongs to the category of cubes, then there is a red template on the primitive geometry object of the cube. If the object that has been tested belongs to the category of prisms, there is a green template on the object of the primitive geometry of the prism. If the object being tested belongs to the tube category, then there is a blue template for the tube primitive geometry object, and if the tested object belongs to the spherical category, then the test program has a yellow template for the spherical primitive geometry object. The Primitive Geometry Object Training Process for Cube, Prism, Tube and Ball objects can be seen in Figure 4
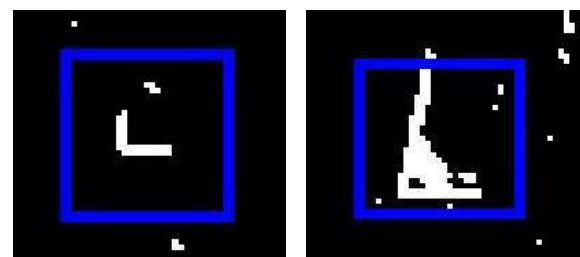
a. Cube Geometry Objects   b. Prism Geometry Object

c. Tube Geometry Object

d. Ball Geometry Object
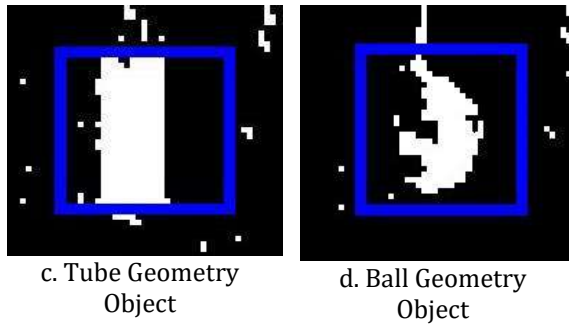
Figure 4. Geometry Object Training Sample (a) Cube (b) Prism (c) Tube (d) Ball

In Figure 4 it can be seen the training process of the geometric object is carried out. This training process is used for object recognition in the testing process, where training samples are taken via webcam.

C. Process of Testing Primitive Geometry Objects

The process of testing this primitive geometric object recognition system is processed after the process of recording image values in the previous training process. For the testing process the introduction of cube geometry objects is indicated by a red square box, while for the introduction of prism geometry objects it is indicated by a green square box, then for the introduction of tube geometry objects it is indicated by a blue square box, and for the introduction of spherical geometry objects it is indicated by a square box yellow. Can be seen in the image below.
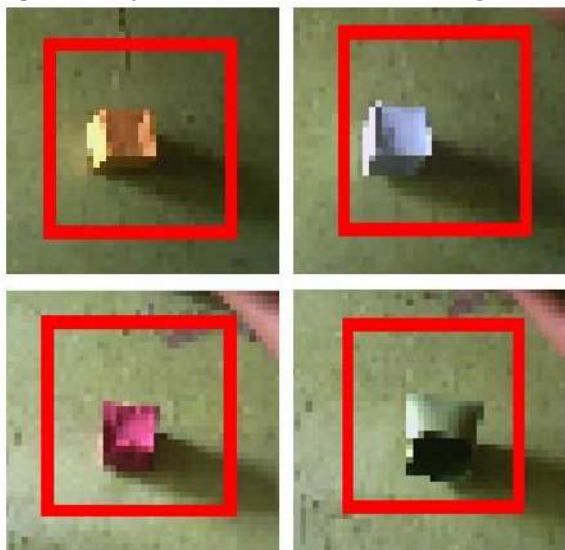
Figure 5. Sample Testing Cube Geometry Objects

Figure 5 shows the results of testing the recognition of the correct cube geometry object which was successfully identified as a cube. The recognition results are marked with a red box.
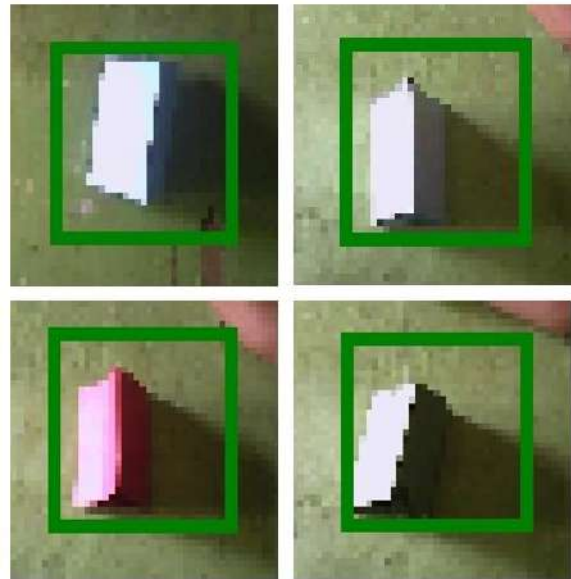
Figure 6. Samples of Prism Geometry Object Testing

Figure 6 shows the results of testing the recognition of the correct prism geometry object which was successfully identified as a prism. Recognition results are marked with a green box.
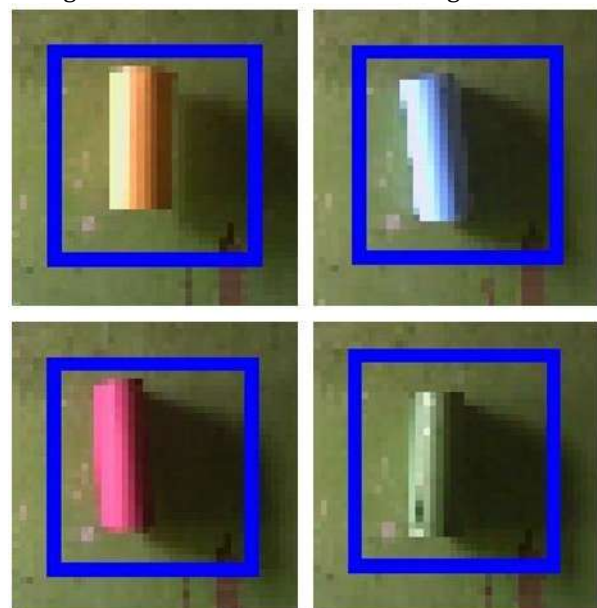
Figure 7. Testing Samples of Tube Geometry Objects

Figure 7 shows the results of testing the correct tube geometry object recognition which was successfully identified as a tube. Recognition results are marked with a blue box.

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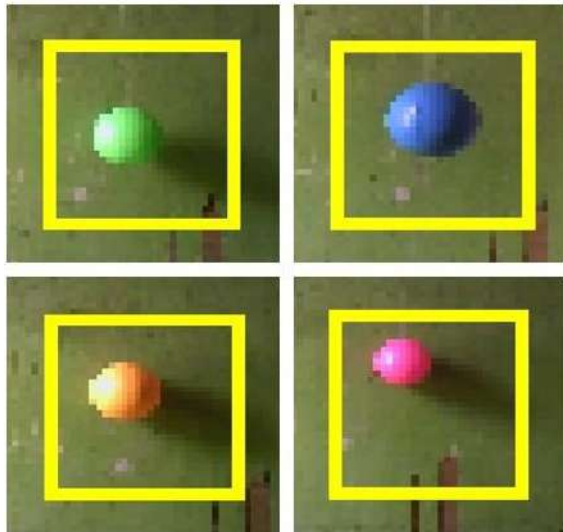
Figure 8. Ball Geometry Object Testing Samples

Figure 8 shows the results of testing the correct spherical geometry object recognition which was successfully identified as a ball. Recognition results are marked with a yellow box.

D. System Performance

In this study the measurement of system performance is based on all test data based on certain specifications or identification which is correlated with the number of training datasets used. The results of measuring system performance can be seen in table 2.

Table 2. Performance Results of Primitive Geometry Object Recognition Systems

Geometry Object Sample	Number of Training Images	Number of Testing Images	True detection	False detection	Persentase True detection	Persentase False detection
Cube	5	15	12	3	80.00%	20.00%
Prism	4	15	9	6	60.00%	40.00%
Tube	4	15	10	5	66.66%	33.34%
Ball	3	15	11	4	73.33%	26.67%

In table 2 it can be seen the trials that have been carried out in this study. In the cube object, the number of images used in training is 5 images and 15 images tested where the system can recognize 12 images and 3 images are not detected, while in the prism object the number of images used in training is 4 images and 15 images tested where the system can recognize 9 images and 6 images are not detected, then on tube objects the number of images used in training is 4 images and 15 images are tested where the system can recognize 10 images and 5 images are not detected and on ball objects the number of images used in training is 3 images and testing 15 images where the system can recognize 11 images and 4 images are not detected.

CONCLUSION

The results showed that the primitive geometric object recognition system using the Perceptron Network method has an average detection rate of 80.00%. The success rate of testing on this system is not only supported by the performance of sample geometric objects of cubes, prisms, tubes and ball but is also influenced by the light at the time the test is carried out, because the resolution of the video camera on this system is still relatively low. The detection rate percentage shows that this method can be used as a supportive approach for the recognition of geometric objects in video.

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SENTIMENT ANALYSIS WITH A CASE STUDY OF PRACTICE CARD ON TWITTER SOCIAL MEDIA USING NAIVE BAYES METHOD

Asthakhuroh[1*], Rachman Komarudin[2], Desiana Nur Kholifah[3]

Sistem Informasi[1,2,3]
Universitas Nusa Mandiri[1,2,3]
www.nusamadiri.ac.id
asthakhuroh1@gmail.com[1*], rachman.rck@nusamandiri.ac.id[2], desiana.dfh@nusamandiri.ac.id[3]

Abstract—*In early March 2022, Indonesia experienced a coronavirus pandemic which caused COVID-19 to enter for the first time. Since then, all sectors have been affected by the COVID-19 pandemic, not only health, the economic sector has also been seriously affected by this pandemic. In overcoming employment problems, the government makes a policy of the Pre-Employment Card program. The Pre-Employment Card Program is one of the government's efforts to expand job opportunities and to increase competitiveness which later became one of the social assistance for the community to overcome the Covid-19 pandemic. The implementation of the Pre-Employment Card program received pros and cons from the community, one of which was on Twitter social media. The results of the sentiment analysis of the pre-employment card program are mostly positive. The test results show that the Naïve Bayes Classifier method is successful in classifying sentiment with the highest accuracy value of 96%, the highest precision value of 98%, and the highest recall value of 96%, and AUC of 96%.*

Keywords: *Twitter, Naive Bayes Classifier, Sentiment Analysis, precision, recall*

Intisari— Pada awal Maret 2022 Indonesia mengalami pandemi virus corona yang menjadi penyebab COVID-19 masuk untuk pertama kalinya. Sejak itu seluruh sektor terdampak dari pandemi COVID-19 tak hanya kesehatan, sektor ekonomi juga mengalami dampak serius akibat pandemi ini. Dalam mengatasi masalah ketenagakerjaan pemerintah membuat kebijakan program Kartu Prakerja. Program Kartu Pra Kerja adalah salah satu bentuk upaya pemerintah dalam memperluas kesempatan kerja dan untuk peningkatan daya saing yang kemudian menjadi salah satu bantuan sosial bagi masyarakat guna penanggulangan pandemi Covid-19. Pelaksanaan program Kartu Prakerja mendapat pro dan kontra dari masyarakat salah satunya pada media sosial twitter. Hasil analisis sentimen program kartu prakerja kebanyakan bersifat positif. Hasil pengujian menunjukkan bahwa metode Naïve Bayes Classifier berhasil mengklasifikasi sentimen dengan nilai akurasi tertinggi sebesar 96%, nilai precision tertinggi sebesar 98%, dan nilai recall tertinggi sebesar 96%, serta AUC 96%.

INTRODUCTION

The government is trying to solve problems related to the number of employees who have been laid off, and the increasing unemployment rate which is now being discussed by the public. Participants of the Pre-Employment Card Program receive training fees from the government to improve their abilities so that they can be absorbed by the appropriate organization or create their own line of business as an example of efforts in this direction (Perekonomian, 2020). This program is designed to help people who are looking for work, as well as those who are currently employed but need to upgrade their skills because they have been laid off.

Targeting a workforce with the qualities and skills required to compete in the Indonesian labor market is the main objective of this initiative by the government. The Pre-Employment Card focuses on skills training needed in the current industrial era so that it can match the desired needs and be able to produce a workforce that is able to compete.

Although it has a constructive purpose, in some cases the Pre-Employment Card is considered a new problem by the general public. People use Twitter

as a means of communication and gathering information every day. Twitter is used for various information or tweets between users so that they can share information in real time.(Fikri, Sabrila, & Azhar, 2020)

The existence of Twitter social media makes netizens share information about the latest topics being discussed, for example about Pre-Employment Cards starting from the registration process to the implementation of training. Sentiment analysis on Twitter regarding the Pre-Employment Card is very important to analyze the opinions of netizens regarding the Pre-Employment Card in the form of tweets, re-tweets and existing comments. Tweet data about the Pre-Employment Card on Twitter will later be analyzed to find out positive and negative comments so that information about the sentiments of Twitter netizens regarding the Pre-Employment Card can be generated.

More or less inspired and references from previous research related to the background of the subject in this thesis were referred to during the making of this thesis. The following studies, among others, have relevance to this research:

Rachmawan Adi Laksono et al 2019 carried out research entitled "Sentiment Analysis of Restaurant CustomerReviews on TripAdvisor using Naive Bayes". This study tries to classify customer satisfaction in Surabaya restaurants using Naive Bayes. A sampling of crawled data using WebHarvy Tools. The results of this study indicate that both methods obtain accurate customer responses and the Naive Bayes method is more accurate than TextBlob sentiment analysis with an accuracy difference of 2.9% (Laksono, Sungkono, Sarno, & Wahyuni, 2019).

Pandhu & Diki in 2020 conducted a study entitled "Sentiment Analysis and Classification of Positive Comments on Twitter with Naive Bayes Classification" which discussed the analysis of positive and negative English sentiments classified using the Naive Bayes Classification which was downloaded from the Sentiment 140 site. (Pandhu & Diki, 2020)

In 2019, Ruhyana conducted a study entitled "Analysis of Sentiment Against the Application of Odd/Even Number Plate Systems on Twitter Using the Naive Bayes Classification Method." This study explores the application of odd/even techniques to sentiment analysis on Twitter to categorize public sentiment on Twitter social media. This research is modeled with Rapid Miner Studio and preprocessed the data by deleting URLs, replacing emoticons and negation. This study uses data mining methods for classification with the Naive Bayes Classifier algorithm to classify Twitter users into positive and negative attitudes towards odd-even policies. The Naive Bayes Classifier (NBC) is a method based on

Bayesian probability to solve data grouping.(Ruhyana, 2019)

This research conducted by Rosdiana in 2019 with the title "Analysis of Sentiment on Twitter towards Makassar City Government Services" discusses sentiment analysis regarding government services in Makassar City based on tweet data contained on Twitter. This study uses the Python programming language for data retrieval with the help of the tweepy library which produces json-shaped tweet data and then stored in a software called Elasticsearch. In this study, the k-fold cross validation test is divided into 3, 5 and 10 k subsets to obtain the desired accuracy results. This method uses Naive Bayes as a sentiment classification method and the output is sentiment with positive, negative, and neutral sentiments.(Rosdiana, Eddy, Zawiyah, & Muhammad, 2019)

Buntoro in 2017 carried out a research entitled "Analysis of Sentiments for the 2017 DKI Jakarta Governor Candidates on Twitter" discussing the analysis of sentiments of Twitter users related to the 2017 DKI Jakarta Pilkada with the keywords AHY, Ahok and Anies. This study performs several stages of analysis such as data preprocessing, tokenization, Part of Speech (POS) Tagger and classification using Naïve Bayes Classifier (NBC) and Support Vector Machine.(Buntoro, 2017)

In Rosit Sanusi et al's research, the data used was crawled using the help of the Twitter API which was taken from April 2020 to January 2021 as many as 4122 tweets. The research resulted in a system capable of classifying sentiments (positive, neutral, and negative) on a tweet. The accuracy level of the testing process is 64.48%. Some of the obstacles in the sentiment analysis process are the data making the model unbalanced, causing overfitting (Sanusi, Astuti, & Buryadi, 2021).

This study tried to use the Naive Bayes method which has a lower error rate when the dataset is large, besides that the accuracy and speed are higher when applied to a larger dataset using a balanced dataset.

Based on the background of the problems above, a research related to Sentiment Analysis With A Case Study Of Practice Card On Twitter Social Media Using Naive Bayes Method. Where it is necessary to do a research on sentiment analysis regarding the Pre-Employment Card on Twitter using the naive Bayes method to find out the positive and negative views of netizens regarding the Pre-Employment Card so that it helps in determining information about the Pre-Employment Card program so that it can be a separate consideration in the implementation of services.

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MATERIALS AND METHODS

I. Literary Studies

a. Text Mining

Text mining is an approach or can be said to be a computer-based algorithmic technique, while the main function is to obtain new knowledge hidden from a set of texts. Text mining can also be said to be part of scientific information retrieval that works on data. with text types that tend or are unstructured (Priyanto, 2018).

b. Sentiment Analysis

As a business intelligence tool, sentiment analysis has been used. Unstructured text containing public opinion on a particular topic, product or service can be extracted using sentiment analysis. Sentiment analysis is a method to understand, extract and process textual input automatically to obtain reliable information(Salim & Mayary, 2020)

c. Naive Bayes

Naïve Bayes Classifier is a classification technique based on the Bayes theorem discovered by British scientist Thomas Bayes. This theorem works based on the independent assumptions of predictors so that future opportunities can be identified based on previous experience. In the Naïve Bayes algorithm, a number of clues called attributes are needed to assist in forming the appropriate class for the sample being analyzed (Artha et al., 2018; Watrianthos, Suryadi, Irmayani, Nasution, & Simanjorang, 2019)

In determining the value of the Naïve Bayes equation, formula (1) can be used as follows:

$$(C|F1,...,Fn) = \frac{p(C)p(F1,...,Fn|C)}{P(F1,...Fn)}$$

After feature formation, the process is continued by calculating the probability of each class, which is done in equation (2):

$$p\ (ci) = \frac{fd\ (Ci)}{|D|}$$

Description of equation (2):
fd (ci) = the number of documents in the class
ci | D   = the amount of training data

When the probability of each class has been obtained, then the probability calculation of each feature in the sentiment class is done with equation (3) below:

$$p\ (wk|ci) = \frac{f(wki, ci) + i}{f(ci) + |W|}$$

Description of equation (3):
f (wk, ci) = value of occurrence of the word wk in ci class
f (ci)   = total number of words that appear in ci class
|W| = total number of wk

d. Evaluation Model & Classifier

The Confusion Matrix is a tabular representation of the predictive performance of a supervised learning algorithm. In the confusion matrix table, the data for each class shows the number of classification predictions made to classify the class as true or false . The confusion matrix has 4 terms as representations in classification or data modeling including "True Positive (TP), True Negative (TN), False Positive (FP) and False Negative (FN)." Negative data that is correctly identified as negative is called True Negative (TN), while data that is incorrectly identified as positive is called False Positive (FP).(Khalimi, 2020)

e. Twitter

Indonesian people often express themselves by using social media as a means of communication. One of the media that is often used by this group is Twitter. Twitter is a social media that provides a lot of information through tweets, from the information written there is data that can be processed. (Ananda & Pristyanto, 2021)

II. Research methods

The research method used is the following data sources:

a. Literature Study

Data collection method using the Naive Bayes Classification approach uses library sources such as journal articles and literature, books, and internet sites as library sources for writing materials.

b. Observation

By using the Naive Bayes Classification approach, both primary and secondary data were examined qualitatively.

c. Design

The design of the data retrieval flow and the measurement of the data flow are the two main aspects of this approach.

d. Training and Classification

At this stage, data training is carried out using the Naive Bayes method and classifying the data

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that will produce what percentage of quantitative data is positive and negative data.

e. Report Preparation

At this point, the report is being prepared as documentation to assist the education and development of others in the process.

III. Research Design

Python is a programming language that has a wide diversity. All you need is the right tools and libraries and you can become a true innovator. Python is extremely easy to read. As an interpreted language (a programming language that doesn't need to be compiled), Python doesn't modify its code to make it computer readable. This language is also a high-level general-purpose programming language. The developers designed it to be the chameleon of the programming world (Muis & Muhammad, 2023). Therefore, this study uses the Python programming language, Google Colab to retrieve data that will be displayed in Microsoft Office Excel and modeled with the help of a library in the Python programming language. The research path carried out in this study can be seen in Figure 1.
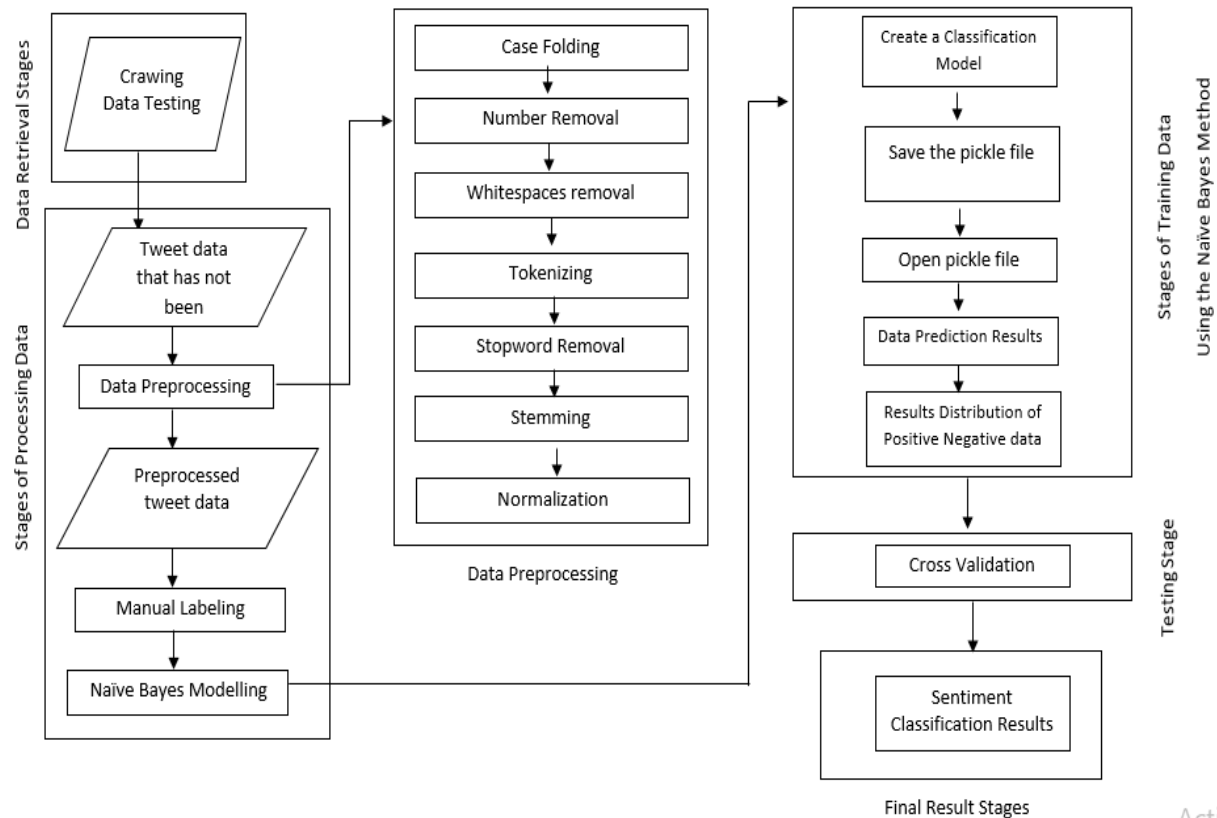
Figure 1 Flow Chart of Research Path

Description of Figure 1 are:

1. **Data Collection Stage**
   Tweet data collection is done by using several libraries available on Google Colab. csv which has a function to read data contained in files with csv format, pandas which has a function to manipulate and clean data and datetime has a function to call operations related to time.

2. **Data Processing Stage**
   Processing data is the process of processing text data that is already available by performing steps to improve text data that has not been repaired.

3. **Data Preprocessing Stage**
   Preprocessing data requires several libraries in Python to help with some tasks. The libraries used for data preprocessing are numpy to support numerical computations or calculations, pandas to prepare data for cleaning, nltk to support natural

4. **Data Training Phase of the Naive Bayes Method**
   Data training is a training process on data using the Naive Bayes Classification method.
   a. Classification Model Making

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Followed by making a classification model using variables X and y with available training data.

b. Save File Pickle
The model named pipeline is then saved in the form of a .pickle file so that it can be reopened and used again.

5. Testing stage
Testing is a stage to determine the level of validity of the model built at the training stage which is used to predict the label or class from the available test data.

6. Final Result Stage
At this stage, sentiment classification results will be carried out in the Classification Report Data Testing.

RESULTS AND DISCUSSION

The tweet data taken is tweets related to the keyword "Kartu Pra Kerja" during the period 01 June 2022 to 05 June 2022 with a total of 6,658 tweets and re-tweet data. To evaluate the categorization model, we used 1000 tweets, 500 of which were categorized as positive or negative. To determine the correctness of the application, it is important to run a confusion matrix test to determine the real and projected values in the data. As can be seen in Table 1, the training data were used to calculate the Confusion Matrix.

Table 1 Confusion Matrix Data Training Results

Actual Class	Prediction Class	
	Positif	Negatif
Positif	90	14
Negatif	13	83

The results of the confusion matrix in Table 1 are TP = 90, TN = 14, FP = 13 and FN = 83. After getting the results from the confusion matrix, it is followed by cross-validation calculations to determine the correctness of the model. Ten repetitions of k-fold cross validation are used to arrive at the correct number. Each fold in k-fold cross validation has its own accuracy value, and the results differ from each other in this regard. The results of the calculation of cross validation 10 fold. The results of the ten rounds of cross validation resulted in an average accuracy score of 0.86 as shown in Table 2.

Table 2. Results of Cross Validation Data Training

Fold	Accuracy
Fold 1	81,2 %
Fold 2	85,0 %
Fold 3	81,2 %
Fold 4	91,2 %
Fold 5	87,5 %
Fold 6	82,5 %
Fold 7	90,0 %
Fold 8	86,2 %
Fold 9	88,8 %
Fold 10	87,5 %

Based on table 2. The classification evaluation stage uses testing data as many as 200 new tweets with a positive label of 100 data and a negative label of 100 data. The new data that has been labeled is then calculated for its accuracy value to determine the difference between training data and testing data. From the results of the classification calculation, the average accuracy is quite good, namely 0.874. The results of the classification calculations on the testing data can be seen in Table 3.

Tabel 3. Results of Classification Report Data Testing

Type	Precision	Recall	FI-Score
Negatif	0,94	0,79	0,86
Positif	0,83	0,95	0,89
Accuracy	0,89	0,89	0,88
Macro Average	0,89	0,87	0,87
Weighted Average	0,88	0,88	0,87

And the following are the percentage results of the Accuracy Precision Recall and AUC values as a whole which can be seen in Table 4

Table 4. Percentage Result

Algoritma	Sentimen	Accuracy	Precision	Recall	ACU
Metode Naïve Bayes Classification	Positif		98%	96%	
	Negatif	96 %	92%	96%	96%

CONCLUSION

Several conclusions can be drawn from the results and debates on sentiment analysis on Twitter social media with the Pre-Employment Card case study is the test results show that the Naïve Bayes Classifier method is successful in classifying sentiment with the highest accuracy value of 96%, the highest precision value of 98%, and the highest recall value of 96%, and AUC of 96%.

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Pre-Employment Cards have proven to be highly accepted by Twitter users, according to this study, who look at feelings such as "the benefits, effectiveness, and budget increase of Pre-Employment Cards" in tweets and calculations based on tweet models and data.

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DIGITAL IMAGE IDENTIFICATION OF PLANKTON USING REGIONPROPS AND BAGGING DECISION TREE ALGORITHM

Hikmatulloh[1*]; Yan Rianto[2]; Anton[3]

[1,3]Informatika, [2]Ilmu Komputer
Universitas Nusa Mandiri
http://www.nusamandiri.ac.id/
hikmatulloh.hkl@nusamandiri.ac.id[1*]; yan.rianto@lipi.go.id[2]; anton@nusamandiri.ac.id[3]

Abstract - *The role of plankton is very important for the life of the surrounding organisms, so research on plankton is needed because of its relationship with the survival of other living things. The obstacles that are often encountered in plankton research, especially in the identification of plankton, are the inefficiency in the aspect of time and these organisms have a very small average size. In this case, a better alternative is needed in identifying this type of plankton by digitally processing the image on the plankton image or commonly referred to as "Digital Image Processing". This study aims to process 144 digital plankton images which were acquired to be 75% as training data and 25% as testing data, and these images were obtained from research at the Kanopi Indonesia foundation. In the process, the shape of this image is analyzed using the Regionprops function to obtain the distinguishing features of each type of plankton. After the feature extracted image, the data processing is then carried out by classifying each type of plankton. To produce a better data classification, this study uses the Bagging Decision Tree algorithm in processing the data and produces an accuracy of 92.59%. The Bagging Decision Tree algorithm is quite good and easy to implement into a plankton type identification program, as evidenced by testing the test image data resulting in 33 correctly identified images from a total of 36 tests.*

Keyword : *Plankton, Regionprops, Bagging, Decision Tree.*

Intisari - Peranan plankton sangat penting bagi kehidupan organisme disekitarnya, sehingga penelitian prihal plankton sangatlah dibutuhkan karena kaitannya dengan kelangsungan kehidupan mahluk hidup lainnya. Kendala yang sering didapatkan dalam hal penelitian plankton khususnya dalam hal pengidentifikasian plankton yaitu tidak efisiennya dalam aspek waktu dan organisme ini memiliki ukuran rata-rata yang sangat kecil. Dalam hal ini diperlukan alternatif yang lebih baik dalam pengidentifikasian jenis plankton ini dengan cara pemrosesan gambar pada citra plankton secara digital atau biasa disebut dengan istilah *"Digital Image Processing"*. Penelitian ini bertujuan untuk melakukan pengolahan citra digital plankton sebanyak 144 citra yang yang dibagi menjadi 75% sebagai data pelatihan dan 25% sebagai data pengujian, dan citra tersebut didapatkan dari riset pada yayasan Kanopi Indonesia. Dalam prosesnya citra ini dianalisa bentuk menggunakan fungsi *Regionprops* sehingga didapatkan fitur pembeda dari masing-masing jenis plankton. Setelah citra terekstraksi fitur nya selanjutnya dilakukan pengolahan data dengan mengklasifikasikan setiap jenis plankton tersebut. Untuk menghasilkan sebuah klasifikasi data yang lebih baik, dalam penelitian ini menggunakan algoritma *Bagging Decision Tree* dalam pengolahan data nya dan menghasilkan akurasi sebesar 92.59%. Algoritma *Bagging Decision Tree* ini cukup baik dan mudah untuk di implemntasikan kedalam sebuah program identifikasi jenis plankton, terbukti dengan pengujian pada data citra pengujian menghasilkan 33 citra teridentifikasi dengan benar dari total pengujian sebanyak 36 citra.

Keyword : Plankton, *Regionprops*, *Bagging*, *Decision Tree*.

INTRODUCTION

Plankton are micro-organisms that are found living in the waters of rivers, lakes, reservoirs, brackish and sea (Saputra et al. 2017). The movement of plankton is strongly influenced by water currents because these organisms live by floating or floating in the water. In the waters, the existence of plankton has a very important role and is needed by other living things. Because considering this organism has an important role as a primary producer in the waters, knowing the level of fertility of the waters and as an indicator in determining a fishing area (Eramma et al. 2022).

Basically, plankton is divided into two types, namely phytoplankton and zooplankton. Phytoplankton is a group of plankton that has chlorophyll in its body (Pommerening, Zhang, and Zhang 2021). So that this type of plankton can produce its own food through the process of photosynthesis. While zooplankton are herbivores, i.e. eat producers (phytoplankton) (Noviani, Rahman, and Sofarini 2021). In this case the existence of zooplankton becomes a controller for phytoplankton as producers in a waters, resulting in an abundance relationship between these two types of organisms, where phytoplankton will develop rapidly when the zooplankton population decreases.

The development of research on plankton is very important because of its relation to the survival of other living things. However, the problem that occurs in conducting plankton research, especially to identify plankton species, is inefficiency from a time perspective (Bandara et al. 2021). In research (Aytan, Esensoy, and Senturk 2022) mentioned that the identification of these organisms is often hampered because these organisms have a very small size (mostly <20 mm for their total length), so that in every study of this plankton, accuracy is needed in analyzing its shape.

Based on these problems, a better alternative is needed in identifying plankton types, so that the authors in this study have the goal of segmenting digital plankton images so that the shape of the plankton can be known so that shape analysis can be carried out, looking for image shape characteristic values of plankton so that it can be analyzed using the regionprops function, classifying data on the value of plankton shape analysis using the Bagging Decision Tree method, and implementing a program to identify the type of plankton.

This research will propose a way that will certainly be more effective and efficient in identifying these types of plankton, namely by processing images on plankton images digitally or commonly referred to as "Digital Image Processing". Digital Image Processing is a field of science that studies how an image is formed, processed, and analyzed so as to produce information that can be understood by humans (Rafiq, Yusuf, and Pujono 2019). The processing results of the plankton image are in the form of feature extraction output results which will later be processed to produce a data classification model.

Image processing is carried out to extract these plankton features based on the different shapes each type of plankton has, so the function of regionprops will be very suitable in analyzing each type of plankton. Region properties (regionprops) is a function that belongs to matlab to measure a set of properties of each region that has been labeled in the label matrix L (Sariningsih et al. 2017). This property will be used between *Area, ConvexArea, MajorAxisLength, MinorAxisLength, EquivDiameter, Perimeter, Eccentricity, Solidity,* dan *Extent.*

After all the image features have been extracted, then the image feature data will be classified, and in classifying this study using plankton imagery generated from research conducted at the Kanopi Indonesia Yogyakarta foundation, and the targeted variables have been obtained from each group of images. This research will be implemented into a program that can be used especially by ecologists in analyzing plankton types, so the Bagging Decision Tree algorithm will be used as a method for classifying the plankton images. Bagging Decision Tree is a method in Machine Learning that can be visualized and easy to understand and implement (Pamungkas, Adiwijaya, and Utama 2020). This method is expected to produce a more accurate analysis of plankton species.

MATERIALS AND METHODS

The model in this study in general can be described as follows.
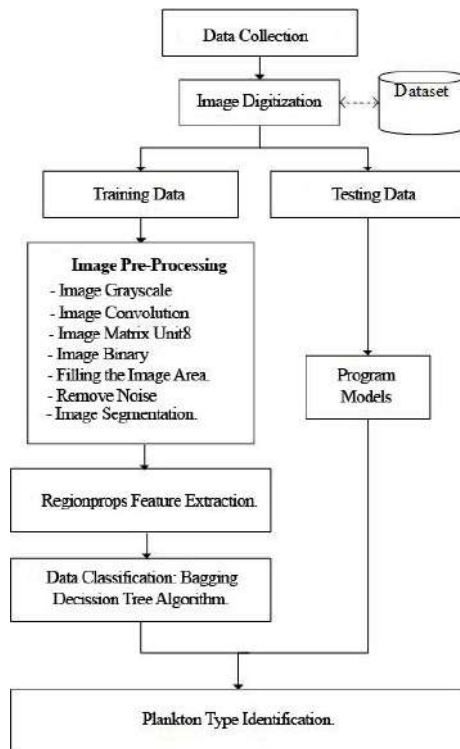
Source: research results (2020).
Figure 1. Research Model

The source of the data was obtained from survey activities to collect data on the diversity of species and abundance of plankton in the Opak Sunyai Watershed area which includes the upper reaches of the Kuning River in Cangkringan and Wedomartani, Sleman Regency, the middle part in Wukirsari Village, Imogiri District and the confluence between the Opak River and the Oyo River District. Pundong, and the downstream part, namely the estuary in the Baros Mangrove area, Tirtohargo Village, Kretek District, Bantul Regency. The easiest technique for taking plankton samples from waters can generally be done by filtering a large mass of water with a fine net (plankton net). Plankton sampling was carried out by filtering water near the surface using 10 liters of plankton net water, then the sample was treated with 4% formalin preservative. Plankton sampling was carried out in 3 repetitions at each sampling point at each research station.

The data analysis process is assisted by several tools including electron microscopes, counting cells, dropper pipettes, and cameras. The water sample is taken using a dropper pipette of 1 ml and input into the counting cell

and then observed under an electron microscope. After getting a fairly clear picture, it is then analyzed based on the name of the plankton species that is matched to the plankton identification book and recorded on the observation table sheet. After the process of observation and analysis of plankton species then enters the image digitization process, by means of plankton images from the electron microscope documented using a camera and each image is cropped image with the same dimensions 459x459 pixel format (*.jpg), so that an image is obtained. ready to be used as a dataset.

In this process, 144 images of plankton were obtained from 6 (six) types of plankton, including 24 images of the appendicularia, 24 images brachiolaria, 24 images chaetognath, 24 images copepod, 24 images detritus, and 24 images of the diatoms. The 144 plankton image data will be acquired, 75% will be used as training image data and 25% will be used as test image data, of which 108 images will be used as training data and 36 images will be used as test data. And the following shows the types of several plankton images resulting from the image digitization process, the images displayed are 6 (six) images used for training data.
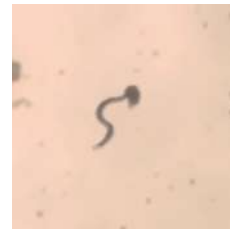
Source: research results (2020).
Figure 2. *Appendicularia* type plankton

Source: research results (2020).
Figure 3. *Brachiolaria* type plankton

Source: research results (2020).
Figure 4. *Chaetognath* type plankton

Source: research results (2020).
Figure 5. *Copepod* type plankton
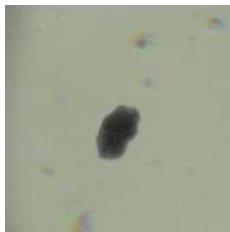
Source: research results (2020).
Figure 6. *Detritus* type plankton

Source: research results (2020).
Figure 7. *Diatom* type plankton

Figure 2 shows the type of Appendicularia, Appendicularia or known as tadpole larvae because they look like frog tadpoles (Matsuo et al. 2020). Figure 3 is the type of Brachiolaria, Brachiolaria lives as plankton, depends on seawater and moves with coordinated movements of external cilia. The larvae are bilaterally symmetrical and have distinct left and right sides (Middleton et al. 2021). Figure 4 is the type of Chaetognath, Chaetognaths are an exclusive marine phylum known as arrow worms. The bear's body is transparent, with a maximum body length of: 105 mm; tail: 10-18% of body length (Vinther and Parry 2019). Figure 5 is the type of Copepod, Copepod is the largest and most diverse group of plankton, they are everywhere and are very abundant in waters, ecologically copepods have the most important

relationship with phytoplankton and are higher in food webs in waters (Pitois et al. 2021). Figure 6, namely the type of Detritus, Detritus consists mostly of silt particles and fine sand around it and is an organic material that attaches and forms aggregates (Siano et al. 2021). And figure 7, namely the type of Diatom, Diatom is a unicellular phytoplankton, but is often found in the form of colonies. Diatom in terms means 2 parts that can not be divided again which reflects the structure of the diatom cell (Behrenfeld et al. 2021).

RESULTS AND DISCUSSION

In this study, image segmentation was carried out. Image segmentation is an image processing that aims to separate the object region from the background area so that objects are easily analyzed in order to recognize objects that involve a lot of visual perception (Huang et al. 2020). The method used in segmenting images using several operators in MatLab includes: (taken as an example of an image of the chaetognath type) (Vinther and Parry 2019).

a. Changing the original RGB type image *(Red, Green, Blue)* which has 3 (three) dimensions into a 2 (two) dimensional image that has a gray color scale.

Source: research results (2020).
Figure 8. The Result of Changing the RGB Image to a Gray Image

b. Then apply a convolutional filter with input horizontally and vertically on the image that has been converted to gray scale.
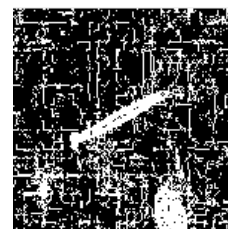
Source: research results (2020).
Figure 9. The Result of Changing the Gray Image to a Convolutional Image

c. After converting the object array into a uint8 matrix, the image is then converted into a binary image with a scale of 0 and 1 according to the specified threshold so that the object's edges are obtained.
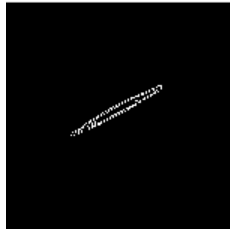
Source: research results (2020).
Figure 10. The results of changing the convolutional image into a binary image

d. After the edge of the image object is selected, fill in the image hole region.

Source: research results (2020).
Figure 11. Results of Binary Image Changes by Filling in Hole Regions

e. The last step to produce better image segmentation is to remove small pixels with a certain scale in the form of noise contained in the image.
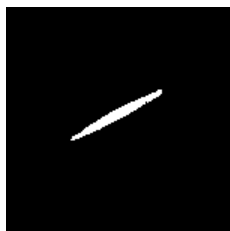
Source: research results (2020).
Figure 12. Result of Image Change After Removing Noise

Measurement of some of the properties of each object region that has been segmented in this case using a Matlab function, namely regionprops. Some of the properties used in analyzing the features of the image in this case include: *Area, ConvexArea, MajorAxisLength, MinorAxisLength, EquivDiameter, Perimeter, Eccentricity, Solidity,* dan *Extent* (MathWorks 2020)*.*

The results of the classification model on plankton data were carried out using the Bagging Decision Tree algorithm to produce several decision tree models, the resulting decision trees will be used to determine an implementation of an identification program. The following are the results of the decision tree from the research conducted.
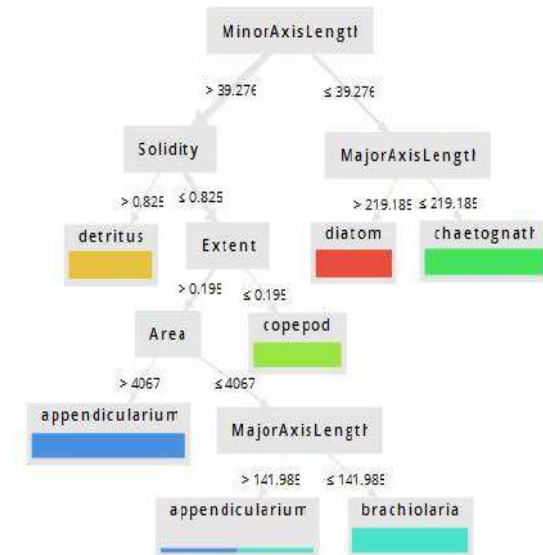
Source: research results (2020).
Figure 13. Decision Tree

After the research rules from the classification model are obtained, then the model will be used as an algorithm for implementation into an identification program. The resulting program algorithm that races on a decision tree is as follows.

```
MinorAxisLength > 39.276
|   Solidity > 0.825: detritus
|   Solidity ≤ 0.825
|   |    Extent > 0.195
|   |   |   Area > 4067:
appendicularium
|   |   |   Area ≤ 4067:
brachiolaria
|   |    Extent ≤ 0.195: copepod
MinorAxisLength ≤ 39.276
|   MajorAxisLength > 219.185:
diatom
|       MajorAxisLength  ≤  219.185:
chaetognath
```

The quality of a data classification model in plankton imagery can be calculated through the resulting confusion matrix table. The following is the confusion matrix table generated in the Bagging Decision Tree algorithm.

Table 1. *Confusion Matrix* Algoritma *Bagging Decision Tree*

	true app	True bra	True cha	True cop	True det	True dia	Class precision
pred. app	17	2	0	0	0	0	89.74%
pred. bra	1	14	0	2	0	0	82.35%
pred. cha	0	0	18	0	0	1	94.74%
pred. cop	0	2	0	16	0	0	88.89%
pred. det	0	0	0	0	18	0	100.00%
pred. dia	0	0	0	0	0	17	100.00%
Class recall	94.44%	77.78%	100.00%	88.89%	100.00%	94.44%	

From table 1 above, it is known:

$$Accuracy \quad = \frac{\sum TP}{Total\ Data} \times 100\%$$

$$= \frac{TP(app)+TP(bra)+TP(cha)+TP(cop)+TP(det)+TP(dia)}{Total\ Data} \times 100\%$$

$$= \frac{17+14+18+16+18+17}{108} \times 100\%$$

$$= \frac{100}{108} \times 100\%$$

$$= 92{,}59\%$$

$$All\ Precision \quad = \sum \frac{TP}{(TP+FP)}$$

$$= \frac{TP(app)}{(TP(app)+FP(app))} + \frac{TP(bra)}{(TP(bra)+FP(bra))} + \frac{TP(cha)}{(TP(cha)+FP(cha))} + \frac{TP(cop)}{(TP(cop)+FP(cop))} + \frac{TP(det)}{(TP(det)+FP(det))} + \frac{TP(dia)}{(TP(dia)+FP(dia))}$$

$$= \frac{17}{(17+1)} + \frac{14}{(14+4)} + \frac{18}{(18+0)} + \frac{16}{(16+2)} + \frac{18}{(18+0)} + \frac{17}{(17+1)}$$

$$= 0.94 + 0.78 + +0.89 + 1 + 0.94$$

$$= 4{,}55$$

$$Precision \quad = \frac{all\ precision}{total\ class} \times 100\%$$

$$= \frac{4.55}{6} \times 100\%$$

$$= 75.83\%$$

$$All\ Recall \quad = \sum \frac{TP}{(TP+FN)}$$

$$= \frac{TP(app)}{(TP(app)+FN(app))} + \frac{TP(bra)}{(TP(bra)+FN(bra))} + \frac{TP(cha)}{(TP(cha)+FN(cha))} + \frac{TP(cop)}{(TP(cop)+FN(cop))} + \frac{TP(det)}{(TP(det)+FN(det))} + \frac{TP(dia)}{(TP(dia)+FN(dia))}$$

$$= \frac{17}{(17+2)} + \frac{14}{(14+3)} + \frac{18}{(18+1)} + \frac{16}{(16+2)} + \frac{18}{(18+0)} + \frac{17}{(17+0)}$$

$$= 0.89 + 0.82 + 0.95 + 0.89 + 1 + 1$$

$$= 5.55$$

$$Recall \quad = \frac{all\ precision}{total\ class} \times 100\%$$

$$= \frac{5.55}{6} \times 100\%$$

$$= 92.50\%$$

The design of the application built is divided into process sectors, the first sector is the process of selecting and displaying digital plankton images to be processed, the second sector is the process of segmenting digital plankton images and displaying the results of image segmentation, and the third sector is the feature extraction process regionprops to image segmentation results and displays the results of the digital image identification of the plankton. The following shows the program design along with an explanation of each component.
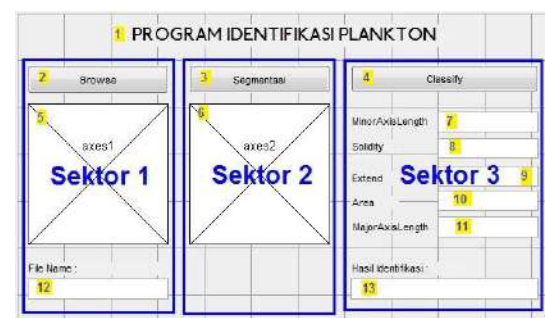
Source: research results (2020).
Figure 14. Program Design

Based on Figure 14, the resulting application program is executed sequentially according to the sector sequence that has been described, regardless of the procedure for using the application and displaying the results of the application made are as follows.

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1. The user presses the "Browse" button to retrieve image data which will be displayed on the axes component below and the file name of the captured image will also be displayed in the edit text column below.
2. After the image data image appears, the user presses the "Segmentation" button to carry out the segmentation process and the results of the segmentation will be displayed on the axes component below.
3. The final step is that the user presses the "Classify" button to find out the results of the identification after the feature value appears in the text edit for each column of the regionprops property, and the results of the identification will appear in the text edit component below.
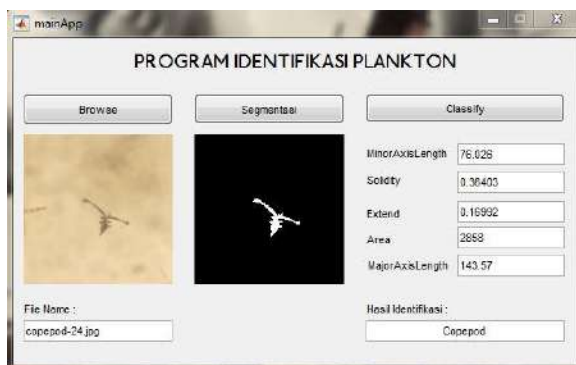
Source: research results (2020).
Figure 15. Display of Program Implementation Results

From the program implementation results, a testing process was carried out on the available test data, from the 36 test data it produced test results with 33 correctly identified data and 3 incorrectly identified data.

CONCLUSION

The conclusions obtained from the results of research on the classification of plankton species with image processing techniques on digital plankton images are 144 images, 108 images as training data and 36 image data as test data.

The plankton image segmentation process was successfully carried out with several functional stages from Matlab including, changing the RGB image to greyscale, then converting it into a convolutional image, then making the uint8 matrix image, then converting it into a binary image, after the image becomes binary then fill in the image hole area and the last

step to perfect the segmentation is done by removing the noise.

The regionprops function can be used to analyze the shape of each type of plankton, the regionprops properties include Area, ConvexArea, MajorAxisLength, MinorAxisLength, EquivDiameter, Perimeter, Eccentricity, Solidity, and Extent. But in this case only a few properties that influence classifying this plankton include *MinorAxisLength, MajorAxisLength, Solidity, Extent,* dan *Area*.

The results of this plankton type classification using the Bagging Decision Tree algorithm yield an accuracy of 92.59%, a precision of 75.83%, and a recall of 92.50%. The implementation of the plankton identification program is carried out by referring to the resulting decision tree model algorithm. The program was tested with test data of 36 images where 33 images were identified correctly and 3 images were identified incorrectly.

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AUDIT OF THE REGIONAL DEVELOPMENT PLANNING INFORMATION SYSTEM (SIPD) USING COBIT 5.0 FRAMEWORK

Marliana Rahmawati Nurhanifah[1*]; Ganda Wijaya[2]; Jajang Jaya Purnama[3]

[1,2,3]Information System
Universitas Nusa Mandiri
www.nusamandiri.ac.id
11212539@nusamandiri.ac.id[1*]; ganda.gws@nusamandiri.ac.id[2]; jajang.jjp@nusamandiri.ac.id[3];

Abstract— *Tasikmalaya Regional Representative Council's is one of the legislative institutions that runs the local government. In carrying out the duties and functions of the Leadership and Members of the Regional People's Representative Council in the regional development planning sector, the Secretariat of the Regional People's Representative Council of Tasikmalaya City has implemented information technology in the regional development planning process, namely the Regional Development Information System. This information system is inseparable from problems that can hinder the regional planning process. This study aims to find out how effective and efficient the use of this information system is based on the maturity level of COBIT 5. This research only focuses on the domains EDM05, APO03, APO07, BAI09, DSS01, and MEA03. Data collection techniques are carried out through observation, interviews, and the dissemination of questionnaires. Tasikmalaya Regional Representative Council's has implemented IT governance at level 3, namely the Established Process. The results of the questionnaire processing obtained an average value of 3. 04 from a value scale of 0 to 5. The results showed weaknesses in the governance of the regional development planning information system found in the APO07 sub-domain which has the lowest maturity level value from other sub-domains, namely 1. 86.*

Keywords: Capability Level, COBIT 5.0, SIPD

Intisari— Dewan Perwakilan Rakyat Daerah Kota Tasikmalaya merupakan salah satu lembaga legislatif yang menjalankan pemerintah daerah. Dalam menjalankan tugas dan fungsi Pimpinan dan Anggota DPRD pada sektor perencanaan pembangunan daerah, Sekretariat DPRD Kota Tasikmalaya telah mengimplementasikan teknologi informasi pada proses perencanaan pembangunan daerah yaitu Sistem Informasi Pembangunan Daerah. Sistem informasi ini tidak terlepas dari masalah yang dapat menghambat proses perencanaan daerah. Penelitian ini bertujuan untuk mengetahui seberapa efektif dan efisien penggunaan sistem informasi ini berdasarkan tingkat kematangan COBIT 5. Penelitian ini hanya berfokus pada domain EDM05, APO03, APO07, BAI09, DSS01, dan MEA03. Teknik pengumpulan data dilakukan melalui observasi, wawancara, dan penyebaran kuesioner. DPRD Kota Tasikmalaya telah menjalankan tata kelola TI pada level 3 yaitu *Established Process.* Hasil pengolahan kuesioner didapatkan nilai rata-rata 3,04 dari skala nilai 0 sampai 5. Hasil penelitian menunjukan kelemahan dalam tata kelola sistem infomasi perencanaan pembangunan daerah terdapat pada sub domain APO07 yang memiliki nilai *maturity level* paling rendah dari sub domain lainnya yakni 1,86.

Keywords: Capability Level, **COBIT 5.0, SIPD**

INTRODUCTION

DPRD is a legislative institution that is included in the elements of local government administration. According to Law Number 23 of 2014 concerning Regional Government, the DPRD as a legislative institution has 3 important functions, namely: a. as an agent for the formulation and formation of regional regulations, b. budgeting, and c. supervision. In addition to these three functions, the DPRD has an obligation to collect and follow up on the aspirations of the community as a form of public service. The aspirations of the accommodated community will be followed up by the leadership and members of the DPRD as a Local Government Work Plan (RKPD) and become a priority list of community needs. This is specifically regulated in Permendagri Number 86 of 2017 (Tristiani, 2017)(Dio Lavarino, 2017).

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Tasikmalaya Regional Representative Council's implements information technology in the regional development planning process, namely the Regional Development Information System or SIPD which is an innovation of the Ministry of Home Affairs of the Republic of Indonesia which aims to facilitate input, monitoring and evaluation as well as assist the process of processing regional development planning data. (*Permendagri-No-70-Tahun-2019-Sistem Informasi-Pemerintah-Daerah*, n.d.)

Regional development planning is the process of determining future policies, through a series of options, by involving various stakeholders, for the use and allocation of existing resources within a certain period of time in the regions.(Mahi & Trigunarso, 2017)

In general, SIPD is an integrated data collection network at the regional and national levels by utilizing information technology, to support regional development planning and assessment. (Prasetya, 2019)

In the implementation of this information system, it is still not optimally realized, this is because Tasikmalaya Regional Representative Council's has experienced several obstacles such as changing procedures and policies resulting in a lack of understanding of human resources towards the management of the running system so that it needs to be adjusted to the current development of information technology, the system is only fixated on the initial input process by SKPD and has not been integrated in the OPD network so that OPD must do re-inputting with the same data, data collisions during the input process, and slow access during the *log in* process.

Based on these problems, an evaluation of the regional development information system is needed so that the system can run in accordance with user expectations. Evaluation or audit of an information system is very useful for evaluating agencies and seeing the level of maturity of organizational IT governance. IT governance reviews should be conducted to improve agency performance, improve information dissemination, and improve public services.

The audit process collects and evaluates a fact data regarding data that is tested using an economic entity by an expert and independent to be able to determine and report the suitability of data belonging to the criteria in it that have been determined.(Winarto, 2022)

One form of operational audit is in the form of an information system audit. The implementation of information system audits can be done with *framework* guidelines that will become scientific guidelines in actualizing the audit process. *Commonly applied frameworks* are COBIT 2019, COBIT 5.0, COBIT 4.1, ITIL, COSO, CICA, ISO, BSBS, FIPS, TOGAF, and the like. (Driya et al., 2022)

COBIT (*Control Objectives for Information and Related Technology*) is a framework that summarizes information technology management best practices to help understand and manage risks and realize the benefits associated with information technology(Az-zahra, 2021) .

COBIT is the best part of IT governance that helps auditors, administrators, and users connect IT business, control, and technical needs. Because COBIT provides business-oriented policies, business process owners and administrators, including managers and audit users, are expected to implement these policies well. In principle, the (Eva Zuraidah, 2020) COBIT 5 framework makes a clear distinction between governance and management. COBIT 5 is also the fifth edition of the IT framework developed by ISACA to manage the management and control of information technology. (Wahyuni, 2022)(ISACA, 2018a)

In detail COBIT 5 describes several management and operational processes that provide a framework to support organizations in achieving organizational goals in terms of governance and management of business information and technology (IT) assets (ISACA, 2018b)

In COBIT 5 framework, there are six levels of capability that must be taken. The capabilities of each process are expressed in process levels of *0-incomplete*, *1-performed*, *2-managed*, *3-established*, 4-predictable, and 5-optimizing processes. (Ramdhan, 2021) The advantages of COBIT 5 are that the principles used are more concise so as to make it easier for auditors, and all domains used in COBIT 5 are based on the process, the calculation of the COBIT 5 performance level is with the capability level because it adjusts to ISO 15504 / ISO 33000, in COBIT 5 there are 7 *enablers.* The disadvantage of COBIT 5 is that COBIT 5 is not adaptive so it cannot adapt to technological developments, the domain used still shows that the process is not focused on results and there is no design factor, so there is no alignment standard for organizations (Syuhada, 2021).

According to a scientific journal entitled Evaluation of Information technology governance using the COBIT 5 Framework, based on the results of the calculation of the level of capability that has been achieved with the process domains EDM01, EDM02, EDM03, EDM05, the level of IT implementation capacity in the Baturraden sub-district office is currently level 1 (sustainable) with a value of 1.75. This shows that the implementation of IT in the Baturraden sub-district office is running and achieving its goals, but there is no process that

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guarantees the benefits of the identified risk distribution and optimization process, as well as achieving the desired results.(Fajarwati et al., 2018).

Table1. COBIT Capability Model Rounding Scale 5

Index Rounding Scale	
Rounding Scale	Capability Model Level
4,51 - 5	*5-Optimizing*
3,51 – 4,5	*4- Predictable*
2,51 – 3,5	*3- Established*
1,51 – 2,5	*2- Managed*
0,51 – 1,5	*1-Performed*
0 - 0,5	*0-Incomplete*

The purpose of this study is to find out how effective and efficient the use of the regional development information system that has been running in Tasikmalaya Regional Representative Council's based on the results of the maturity level assessment, help solve problems that occur in the management of this regional development information system based on the results of recommendations, and as a reference for the development of information systems in the future based on the results of recommendations.

MATERIALS AND METHODS

In this study, the author uses a type of descriptive research with a quantitative approach where descriptive research is research with methods that visualize or provide an overview of research results and the quantitative approach is research by collecting data that can be measured mathematically or with statistical techniques. (Ramdhan, 2021) The research conducted by the author explores the stages of observing the regional development planning information system directly, and conducting interviews with relevant officials, collecting data through the dissemination of questionnaires, and finally calculating the results of findings data using the COBIT 5.0 *Framework*
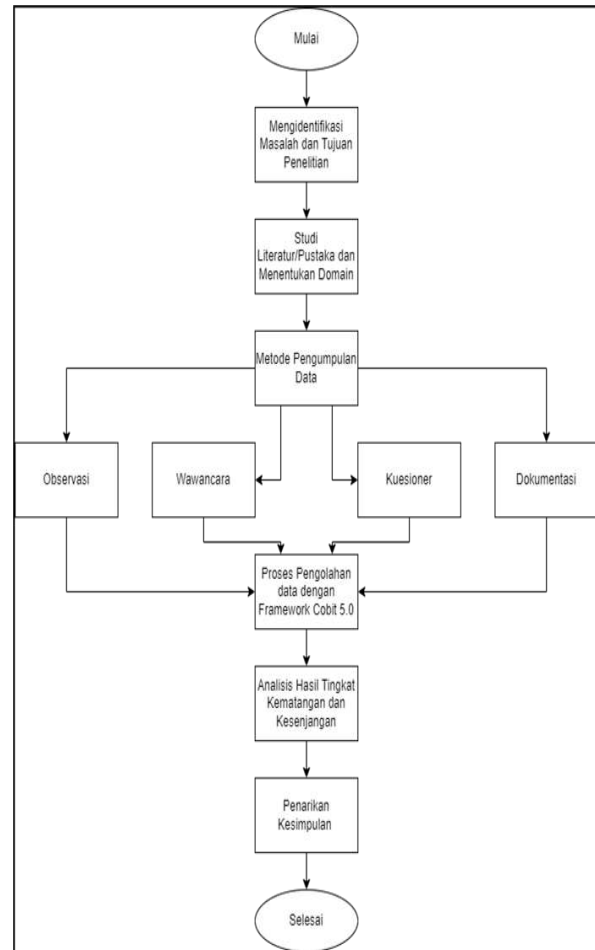
Source: Author's Research (2022)
Figure 1. Stages of Research

1. Questionnaire Dissemination

The data collection process is carried out by distributing questionnaires filled out by 50 system users, the details are found in the following table:

Table2. List of Researcher Respondents

Respond	Number of Respondents
Leaders and Members of the Tasikmalaya City Parliament	45
Secretary of the DPRD	1
Policy Analyst Functional Coordinator	1
Functional Executor	3
Total	**50**

Source: Author's Research (2022)

Based of table 2, the questionnaire is formed with an ordinal measurement model with a likert scale,

where the given ordinal size contains levels to measure objects from the lowest to the highest level, the size given is only for sorting only and is not given the absolute value of an object. Set the object to number 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree .(Febriani & Manuputty, 2021)

Table3. Ordinal Measurement

Sequence Value	Information
1	Very Disagree
2	Disagree
3	Neutral
4	Agree
5	Very Agree

Source: Author's Research (2022)

After the questionnaire data is collected, the next stage is calculation using the COBIT 5.0 Framework.

2. Data Processing with COBIT 5.0 *Framework*

The author performs the calculation of the results of the questionnaire with the formula:

Questionnaire Index = $\frac{\Sigma\ Jawaban\ Kuesioner}{\Sigma\ Domain\ Proses}$

Information:
Σ Questionnaire Answers = Total Number of Questionnaire Respondents
σ Process Domain = Total Number of Process Domains

3. Analysis of Maturity and Gap Level Results

At this stage, an analysis of the current level of maturity (as is) and an analysis of the gaps that occur at the current maturity level are carried out. The author calculates the maturity index of the domain using the formula:

Maturity Index Domain=
$\left\{\frac{\%\ Ketercapaian}{Work\ Product}\right\} x\ Index\ Kuesioner$

After the maturity index value of each domain is obtained, then to determine the level of capability of the author using the formula:

Maturity Level = $\frac{\Sigma\ Maturity\ Index\ Domain}{\Sigma\ Domain\ Proses}$

4. Drawing conclusions
The last stage of this study, the results of the audit consisting of the conclusions of all types of audit findings which contain the impact on Tasikmalaya Regional Representative Council's.

RESULTS AND DISCUSSION

Based on the results of the google form questionnaire that has been completed by 50 respondents, it will then be processed using the maturity level calculation formula based on COBIT 5:

A. Calculating *Maturity Level*

1. Maturity level EDM05 *Ensure Stakeholder Transparency*

a) Calculating the Maturity Index

The results of the questionnaire that have been recapitulated for EDM05.01 *Evaluate stakeholder reporting requirements* there is 1 respondent who chooses a value of 1, 8 respondents choose a value of 2, 50 respondents choose a value of 3, a value of 4 has a total of 53 respondents then 38 respondents choose a value of 5. Then the data will be processed with COBIT 5 calculations:

Questionnaire value EDM05.01 = (1*1) + (8*2) + (50*3) + (53*4) + (38*5) = 569

Questionnaire index = 569 / 3 =190

Actual WP value = 15%; standard WP value of EDM05 = 5

Maturity Index = (15%/5) * 190 = 5,69

b) Calculating *Maturity Level*

Table4. EDM05 *Ensure Stakeholder Transparency*

Sub Domain	Control Name	Maturity index
EDM05 Ensure Stakeholder Transparency	EDM05.01 Evaluate stakeholder reporting requirements	5.69
	EDM05.02 Direct stakeholder communication and reporting.	5.72
	EDM05.03 Monitor stakeholder communication.	5.59
Total Maturity Index		**17.00**
Maturity Level Domain EDM05 = 17,00/3 (total kontrol)		5.67

Source: Author Research (2022)

Base of table 4, after obtaining the *index* maturity value, all values are totaled and the process for calculation looks for the maturity level value, as in the table above, the maturity level result for the EDM05 domain is 5.67 or 567% worth. Based on

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the percentage calculation, it means that it has reached level F or *Fully Achieved* and the capability level is at level 5 – optimizing which means that the IT governance process is running well HR, processes and technology have been able to support the goals of the agency / organization.

2. Maturity Level APO03 *Manage Enterprise Architecture*

Tabel5. APO03 *Manage Enterprise Architecture*

Sub Domain	Control Name	Index maturity
APO03 Manage Enterprise Architecture	APO03.01 Develop the enterprise architecture vision.	2,23
	APO03.02 Define reference architecture.	1,99
	APO03.03 Select opportunities and solutions.	1,90
	APO03.04 Define architecture implementation.	2,18
	APO03.05 Provide enterprise architecture services.	2,06
Total Maturity Index		10,36
Maturity Level Domain APO03 = 10,36/5 (total kontrol)		**2,07**

Source: Author Research (2022)

After obtaining the index maturity value, all values are totaled and the process for calculation looks for the maturity level value, as in the table above, the maturity level result for the APO03 domain is 2.07 or 207% worth. Based on the percentage calculation, it means that it has reached level F or *Fully achieved* and the capability level is at level 2, namely the managed process so that in the process the goals with the programs carried out by the agencies are in line and the agencies are also ready to face the changes that will be faced.

3. Maturity Level APO07 *Manage Human Resources*

Tabel6. APO07 *Manage Human Resource*

Sub Domain	Control Name	Maturity index
APO07 Manage Human Resources	APO07.01 Maintain adequate and appropriate staffing.	1.87
	APO07.02 Identify key IT personnel.	1.78

	APO07.03 Maintain the skills and competencies of personnel.	1.92
	APO07.04 Evaluate employee job performance.	1.86
	APO07.05 Plan and track the usage of IT and business human resources.	1.90
	APO07.06 Manage contract staff.	1.84
Total Maturity Index		**11.16**
Maturity Level Domain APO07 = 11,16/6 (total kontrol)		**1.86**

Source: Author Research (2022)

After obtaining the *index* maturity value, all values are totaled and the process for calculation looks for the maturity level value, as in the table above, the maturity level result for the APO07 domain is 1.86 or 186% worth. Based on the percentage calculation, it means that it has reached level F or *Fully achieved* and the capability level is at level 2, namely the managed process so that in the process of managing human resources in the Tasikmalaya City DPRD is good, but specific performance targets are needed so that all regional development planning processes can run according to the main tasks and functions of each section.

4. Maturity Level BAI09 *Manage Assets*

Table7. BAI09 *Manage Assets*

Sub Domain	Control Name	Maturity index
BAI09 Manage Assets	BAI09.01 Identify and record current assets.	2.36
	BAI09.02 Manage critical assets.	2.27
	BAI09.03 Manage the asset life cycle.	2.33
	BAI09.04 Optimise asset costs.	2.25
	BAI09.05 Manage licences.	2.18
Total Maturity Index		**11.38**
Maturity Level Domain BAI09 = 11,38/5 (total kontrol)		**2.28**

Source: Author Research (2022)

After obtaining the *index* maturity value, all values are totaled and the process for calculation looks for the maturity level value, as in the table above, the maturity level result for the BAI09 domain is 2.28 or 228% worth. Based on the percentage calculation, it means that it has reached level F or

Fully achieved and the level of capability is at level 2, namely the managed process so that the asset management process in Tasikmalaya Regional Representative Council's is good, but there are several things that must be considered in asset management such as maintenance schedules, asset repair status, and a list of items that need to be updated to improve the public service process to the community.

5. Maturity Level DSS01 *Manage Operations*

Tabel8. DSS01 *Manage Operations*

Sub Domain	Control Name	Maturity index
DSS01 Manage Operations	DSS01.01 Perform operational procedures.	2.86
	DSS01.02 Manage outsourced IT services.	2.63
	DSS01.03 Monitor IT infrastructure.	2.77
	DSS01.04 Manage the environment.	2.80
	DSS01.05 Manage facilities.	2.84
Total Maturity Index		**13.88**
Maturity Level Domain DSS01 = 13,88/5 (total kontrol)		**2.78**

Source: Author Research (2022)

After obtaining the *index* maturity value, all values are totaled and the process for calculation looks for the maturity level value, as in the table above, the maturity level results for the DSS01 domain are 2.78 or 278% or 278% and the capability level is at level 3, namely the established process. Based on the percentage calculation, it means that it has reached the F or *Fully achieved* level, that is, the activities and operational procedures needed to provide services have been managed quite well.

6. Maturity Level MEA03 *Monitor, Evaluate and Assess Compliance with External Requirements*

Tabel9. MEA03 *Monitor, Evaluate and Assess Compliance with External Requirements*

Sub Domain	Control Name	Index maturity
MEA03 Monitor, Evaluate and Assess Compliance with External Requirements	MEA03.01 Identify external compliance requirements.	3.66
	MEA03.02 Optimise response to external requirements.	3.67
	MEA03.03 Confirm external compliance.	3.52
	MEA03.04 Obtain assurance of external compliance.	3.59
Total Maturity Index		**14.43**
Maturity Level Domain MEA03 = 14,43/4 (total kontrol)		**3.61**

Source: Author Research (2022)

After obtaining the *index* maturity value, all values are totaled and the process for calculation looks for the maturity level value, as in the table above, the maturity level results for the MEA03 domain are 3.61 or 361% or 361% and the capability level is at level 4, which is predictable. Based on the percentage calculation, it means that it has reached level F or *Fully achieved*, namely in terms of IT processes and regional development planning operations have been running according to the law and complying with the requirements of external parties

Table10. *Maturity Level* of Regional Development Information System

Domain	Index Maturity	Maturity Level
EDM05 Ensure Stakeholder Transparency	17.00	5.67
APO03 Manage Enterprise Architecture	10,36	2,07
APO07 Manage Human Resources	11.16	1.86
BAI09 Manage Assets	11.38	2.28
DSS01 Manage Operations	13.88	2.78
MEA03 Monitor, Evaluate and Assess Compliance with External Requirements	14.43	3.61
Sum	**78,22**	**18,26**
Average value of index maturity	**13.04**	**3,04**
Average Capability Level / Maturity Level		

Source: Author Research (2022)

Table11. *Capability Level* of Regional Development Information System

Domain	Maturity Level	Achievement Value	IT Capabilities
EDM05 Ensure Stakeholder Transparency	567%	Fully Achieved	Optimizing
APO03 Manage Enterprise Architecture	207%	Fully Achieved	Managed Process
APO07 Manage Human Resources	186%	Fully Achieved	Managed Process
BAI09 Manage Assets	228%	Fully Achieved	Managed Process

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DSS01 Manage Operations	278%	*Fully Achieved*	*Establised Process*
MEA03 Monitor, Evaluate and Assess Compliance with External Requirements	361%	*Fully Achieved*	*Predictable*

Source: Author Research (2022)

For the calculation of the average *maturity* level of the five sub-domains, which is 304%, which when viewed from the rating scale is included in the F level which indicates that it is *Fully Archieved*, meaning that there is a complete and systematic approach and full achievement. In terms of the rounding scale, the capability model mapping index is at level 3, namely the *Established Process*, which means that the regional development information system process applied to the Tasikmalaya Regional Representative Council's has implemented formal standard procedures for regional development planning in writing in accordance with applicable laws and regulations and has been successfully implemented even though it has not fully achieved the expected goals.

B. The Value of the Current Maturity Gap

Based on the results of the calculation of the capability level above, the gap value obtained from the difference between the maturity value of the domain level and the targeted level value is as follows:

Table12. GAP *Analisys Capability Level*

No	Domain	Target Level	Current Maturity Level	GAP
1	*EDM05 Ensure Stakeholder Transparency*	5	5.67	0.67
2	*APO03 Manage Enterprise Architecture*	2	2.07	0.07
3	*APO07 Manage Human Resources*	2	1.86	-0.14
4	*BAI09 Manage Assets*	2	2.28	0.28
5	*DSS01 Manage Operations*	3	2.78	0.22
6	*MEA03 Monitor, Evaluate and Assess Compliance with External Requirements*	4	3.61	0.39

Source: Author Research (2022)
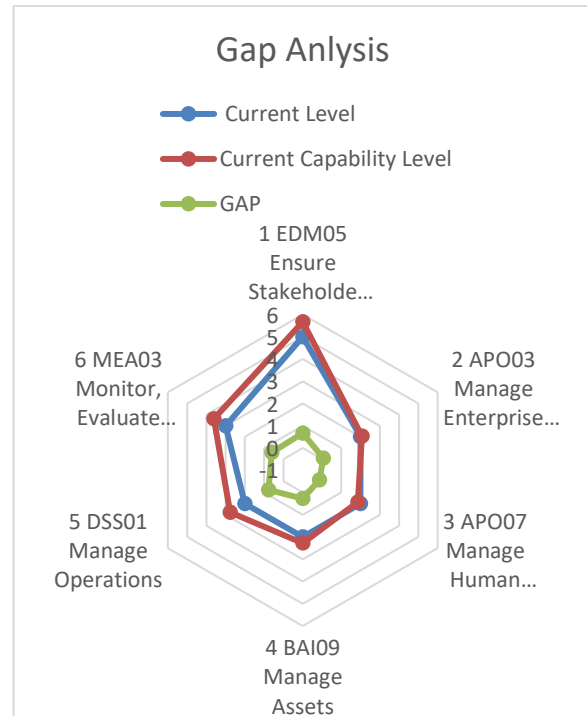
Source: Author Research (2022)
Figure 2. Gap Analysis Radar Chart

Base of Figure 2, from the results of the calculation of *maturity* level and gap or gap, it is known that there is one domain that has not reached the target level and there are five domains that have reached the expected target level. The results of the evaluation show findings from the domain analysis that:

1. EDM05 *Ensure Stakeholder Transparency*

In the transparency sub-domain, stakeholders found that at this stage they have achieved the expected goals and have carried out innovations and continuous development to improve the capability process in regional development planning.

2. APO03 *Manage Enterprise Architecture*

In the sub-domain of enterprise architecture management, it is found that this stage has achieved the expected goals, in its implementation the objectives with the programs carried out by the agencies are in line with each other, the agencies are also ready to face changes that will occur both from policies, systems, human resources and so on.

3. APO07 *Manage Human Resources*

In the human resource management sub-domain, it was found that in the process of managing this information system, there are still several employees who need to conduct training to run this

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regional development information system. So that the recommendations in this sub-domain are the need for information technology guidance or training to support service improvement for stakeholders and the need for performance evaluation at each planning stage.

4. BAI09 *Manage Assets*

In the asset management sub-domain in the asset recording process, it was found that there were several assets that needed to be repaired but were not controlled and left without follow-up. so that the recommendations in this sub-domain are that an asset maintenance schedule is needed, asset repair status, and a list of assets that need to be updated to support the regional development planning process at Tasikmalaya Regional Representative Council's.

5. DSS01 *Manage Operations*

In the operational management sub-domain, it was found that the facilitation, supervision and budgeting department in facilitating regional development planning through the leadership and members of Tasikmalaya Regional Representative Council's has been running based on standard operating procedures or policies set. To support the operational activities of the regional development information system, cooperation between OPD and SKPD and related stakeholders is needed to increase the expected target level by optimizing communication intensely in managing the operations of each activity related to the regional development information system.

6. MEA03 *Monitor, Evaluate and Assess Compliance with External Requirements*

In this sub-domain, it was found that the facilitation, supervision and budgeting department of collecting, validating, and evaluating business objectives and metrics, IT has been running according to the specified targets. As well as the facilitation department has been successful in monitoring the process of agreed performance and successfully providing systematic and timely reporting.

CONCLUSION

The regional development information system implemented in Tasikmalaya Regional Representative Council's has been implemented well even though it has not fully achieved the expected goals. At each stage this information system is still ineffective and needs to be improved

to support the regional development planning process.

The author recommends the holding of further information technology guidance or training to support the improvement of services for stakeholders and the need for performance evaluation of each stage of regional development planning. As a reference material for the development of a regional development planning system in Tasikmalaya Regional Representative Council's, the author recommends priority improvements in the APO07 sub-domain in accordance with the recommendations that have been submitted in this study.

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IMPLEMENTATION OF WEIGHTED PRODUCT METHOD IN DETERMINING SELECTION THE BEST MUSIC STREAMING SERVICE APPLICATION

Lilyani Asri Utami[1*]; Kaffah Febriningrum[2]

[1,2]Sistem Informasi
Universitas Nusa Mandiri
www.nusamandiri.ac.id
lilyani.lau@nusamandiri.ac.id[1*]; kaffah11182952@nusamandiri.ac.id[2]

Abstract— *At this time, the music streaming service is a platform that is often easily found on every device, either through downloads from the Playstore and Appstore or the default application from the device itself. Many companies in the world are competing to create platforms and applications that provide the most complete songs. For example, several well-known music streaming service applications in Indonesia have their own innovations and characteristics, such as Spotify, Joox, Youtube Music, Apple Music, SoundCloud, and so on. This causes users to have difficulties because of several considerations in deciding how to use the application according to their needs. This study aims to assist in providing solutions to music streaming service subscribers by recommending several music streaming service applications according to the ranking results, which are the best choice for the user version of the application through a Decision Support System using the Weighted Product method based on 5 criteria: subscription rates, available features, streaming quality, music, application design, and application efficiency. The final result of this study is the ranking of applications that have the highest score in accordance with the criteria provided, namely that in first place with a value of 0.415 is Spotify as a recommendation for the best music streaming service application, and Apple Music ranks last out of the 6 alternatives that have been provided.*

Keywords: *Weighted Product, Decision Support System, music streaming.*

Intisari— Pada saat ini, layanan *streaming* musik merupakan salah satu *platform* yang seringkali dengan mudah ditemukan pada setiap perangkat baik melalui *download* pada *Playstore* dan *Appstore* maupun aplikasi bawaan dari perangkat itu sendiri. Banyak perusahaan di dunia berlomba – lomba membuat *platform* dan aplikasi yang menyediakan lagu terlengkap, contohnya beberapa aplikasi layanan *streaming* musik yang terkenal di Indonesia memiliki inovasi dan ciri khasnya sendiri seperti Spotify, Joox, Youtube Music, Apple Music, SoundCloud dan sebagainya. Hal tersebut membuat pengguna memiliki kesulitan karena beberapa pertimbangan dalam memutuskan penggunaan aplikasi sesuai kebutuhannya. Penelitian ini bertujuan untuk membantu dalam memberikan solusi kepada pelanggan layanan *streaming* musik dalam merekomendasikan beberapa aplikasi layanan *streaming* musik sesuai dengan hasil perangkingan yang menjadi pilihan terbaik versi pengguna aplikasi tersebut melalui Sistem Penunjang Keputusan dengan menggunakan metode Weighted Product berdasarkan 5 kriteria yaitu tarif berlangganan, fitur yang tersedia, kualitas streaming musik, design aplikasi, dan efisiensi aplikasi. Hasil akhir pada penelitian ini berupa perankingan aplikasi yang memiliki nilai tertinggi sesuai dengan kriteria yang disediakan yaitu pada peringkat pertama dengan nilai 0,415 adalah Spotify sebagai rekomendasi aplikasi layanan *streaming* musik terbaik, dan Apple Music menempati peringkat terakhir dari 6 alternatif yang telah disediakan.

Kata Kunci: *Weighted Product, Sistem Penunjang Keputusan, streaming musik.*

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INTRODUCTION

Music is an alternative hobby for many people, and it is not only a hobby that can be channeled through music; it can also be a source of income, particularly for musicians. Music is an example of a medium that functions as an expression of art and can reflect the culture present in society. The high interest in music for both listeners and music makers so that music marketing is growing from time to time, starting from physical sales in the form of LPs, cassettes, CDs until now it can be easily found marketing in physical and digital forms.

In January 2020, there were 338.2 million cellular connections in Indonesia, of which 84% used music streaming services for at least 1.5 hours per day (Nabila, 2020). Many companies in the world are competing to create platforms and applications that provide the most complete songs on smartphones, tablets, and laptops with the reason that it is easy to find songs and download songs and save on storage memory (Dewatara & Agustin, 2019). For example some well-known music streaming service applications in Indonesia have their own innovations and characteristics such as Spotify, Joox, Youtube Music, Apple Music, SoundCloud.

From the results of the explanation above, this research using one of the methods in Decision Support System namely Weighted Product method which is used to support decisions, This method has the ability to obtain optimal solutions in decision making (Fitria & Rakhmah, 2019). Then the calculation results will be equated with calculations using SPSS using the value of each criterion and vector V to determine the best alternative sequence, which will be the final decision. It is hoped that the implementation will have accurate and effective results to achieve optimal results and assist in providing solutions to music streaming service customers in recommending several music streaming service applications according to the ranking results which are the best choices for the user. Implementation of the Weighted Product Method for Selection of the Best Music Streaming Application Services will be designed using a website-based system using the PHP programming language and a MySQL database.

Related Research

This study refers to several related studies shown in Table 1.

Table 1. Related Research

No	Topic/Title	Author	Results/Conclusion
1	Implementation of the Weighted Product Method in the Decision Support System for Choosing the Best Electronic Money Service	M. Wasti, S. Hartini, R. Rinawati	The purpose of this research is to identify the best electronic money service application that suits user needs and generate an assessment on each of the criteria provided. The results showed that the OVO application was ranked first with an ease value of 0.394 which had a positive influence and was the most chosen by 44 respondents in Bekasi City by answering 15 questionnaire questions (Wasti, Hartini, & Rinawati, 2019).
2	Analysis of Student Interest in Listening to Paid Music Apps and Free Music Downloads	J. Andry, C. Tjee	To get an idea of student interest in listening to music, one of which is through the Spotify application for streaming paid and unpaid music via downloads on the internet or websites. The results showed that there was more interest in music streaming applications with a value of 27.38 compared to free music downloads via the internet at 14.54, and it can be concluded from the research that respondents prefer streaming music more (Andry & Tjee, 2019).
3	Decision Support System for Determining the Best Customer Using the Weighted Product Method	V. Marudut, M. Siregar, S. Siregar, E. Damanik	The research was conducted at Subur Graphic Printing with the aim of being able to overcome problems in selecting the best customers using the assistance of a Decision Support System. Using the Weighted Product method where this method was chosen because it can do multi-criteria decision making, the incoming data is processed and will then enter the implementation stage and system testing (Marudut, Siregar, S, & Damanik, 2021).

MATERIALS AND METHODS

Implementation

An action or final result in applying a method or idea from an idea into a system that will have an impact on the final result that is in line with expectations, according to (Oktaviani.J, 2018) Implementation is carried out for a purpose in completing a policy or activity in order to achieve the end of a desired process, and implementation is carried out by parties who have an interest and have the authority to realize a program that has been prepared.

Music Streaming Service Application

Music streaming service is a service that is engaged in the music industry. This service provides digital music that is connected to the internet and can be listened to both online and offline, packaged in an application to a website. According to (Noviani, Pratiwi, Silvianadewi, Benny Alexandri, & Aulia Hakim, 2020) in addition to getting a wide audience reach and easy and flexible payments, it also makes it easier for users to listen to music without having to download audio files from the music itself.

PHP

Hypertext Preprocessor is an abbreviation of PHP or a programming language that has the function to create dynamic websites and website applications. The PHP programming language can interact with databases, files and folders so that the display of content on the website can be more dynamic (Yuliano, 2017).

Decision Support System

A form of artificial intelligence that helps make decisions and solve problems, The Decision Support System itself has the aim that in making a decision and providing more or better alternatives, it must increase the ability of the decision makers themselves (Setiyaningsih, 2015). Decision Support System serves the management, operations and planning levels of the organization and helps in making decisions about problems (Tonni Limbong, Muttaqin Muttaqin, Akbar Iskandar, Et. al, 2020).

(Fitriyani, Komarudin, Maulana, & Haidir, 2020) the following are the architectural stages in the DSS for selecting the best decision:

1. Intelligence, carried out the process of analysis and search for problems.
2. Design, this stage is a process to be able to understand the problems taken, find solutions and test the feasibility of these solutions.
3. Choice, to make a selection from the various available alternatives that will be processed

4. Implementation, implementation of the results of the previous three stages into a decision support system for final decision making. Conducting testing, evaluation, demonstration, orientation, training and deployment.

Weighted Product

In decisions involving multi-criteria or Multi-Criteria Decision Making (MCDM) (Sari, 2018) the set of decision alternatives described in the form of several criteria or referred to as a Weighted Product. The Weighted Product itself has stages of solving a problem, including:

a. Determine the criteria to be used
b. The process of normalizing the value of the weight of the criteria (W)

$$Wj = \frac{wj}{\sum wj} \dots \dots \dots \dots \dots \dots (1)$$

Information:
Wj = Criteria Weight

c. calculate the preference (S) value of each alternative with the equation 2

$$Si = \prod_{j=1}^{n} (Xij)^{Wj} \; ; 1 = 1,2,\dots,m \dots \dots (2)$$

Information:
Si = value result of matrix normalization
Xij = Variable Value of the alternatives on each criterion
Wj = Criteria weight value
I = Alternative value
J = Criteria value
$\sum_{j}^{n} = 1 \; Wj = 1$. Wj is a positive value for the profit criteria and negative value for the cost criteria.

d. Calculate the relative preference of each alternative using equation 3, the result will be a vector V.

$$Vi = \frac{Si}{\prod_{j=1}^{n} (Xij)^{Wj}} \; ; \text{with } i = 1,2,\dots,m \dots \dots (3)$$

e. The higher the value of V, the better the alternative.

Weighted Product has two variables, namely cost and benefit, which function in determining the criteria. If the benefit produces the largest value then the weight is negative, whereas if the cost produces the smallest value then the weight is positive.

Research Stages

The research stages that have been compiled by researchers are shown in Figure 1.

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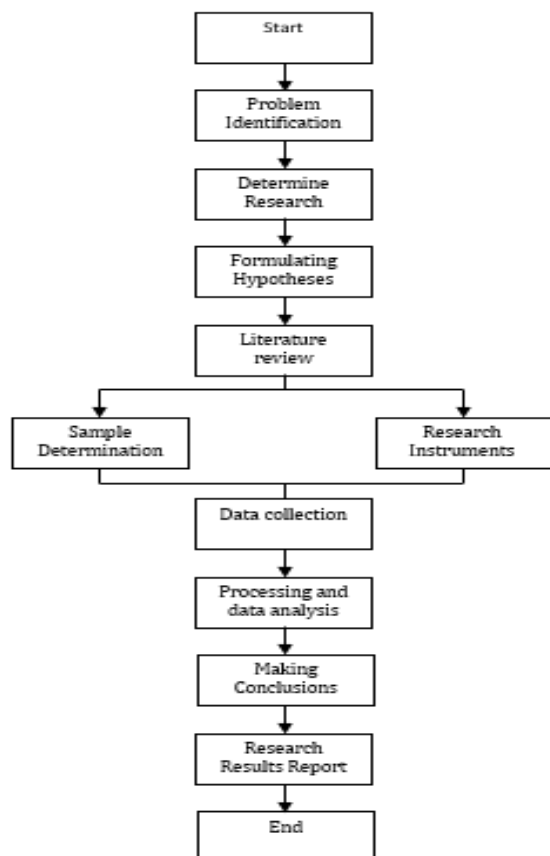
Figure 1. Research Stages

Based on Figure 1 above, the explanation is as follows:

1. Problem Identification and Formulation
   In this study, the problems that can be found in the selection of music streaming service applications are providing several alternative application options using the Weighted Product method and providing superior criteria as a step for considering the final decision in selecting a music streaming application.

2. Determine Research Objectives
   The purpose of this research is to assist in providing solutions to music streaming service customers and to recommend several music streaming applications according to the ranking results, which are the final result, namely the best choice of the user version of the application, and to develop research on selecting the best music streaming application using the Weighted Product method to implement into a system.

3. Formulating Hypotheses
   In expressing initial opinions about the research on selecting the best music streaming service application, a hypothesis was created for the research results, including:
   H0 : There is no relationship between the selection criteria and the selection of the best music streaming service application.
   H1 : There is a relationship between the selection criteria and the selection of the best music streaming service application.

4. Literature review
   Literature study includes books, articles, journals, theses, and others as a basis or source of writing to be compiled.

5. Data collection
   Data collection was carried out using questionnaires, observations, and interviews. The data can be used in hypothesis testing. In this study, researchers used questionnaires and observation as data collection techniques.

6. Processing and data analysis
   After the data is collected, the researcher can compile the data, and then the data that has been collected is processed and analyzed. Data processing uses the weighted product method, according to the steps, where this method functions as the main calculating tool in obtaining research results.

7. Making Conclusions
   After the data processing and analysis are done, the researcher can begin drawing conclusions. The conclusion must be related to the hypothesis that was previously made, so that it can be seen that the hypothesis can be rejected or accepted.

8. Research Results Report
   The final step in conducting scientific research is to write a scientific report on the findings.

Research methods

The researcher obtained research data using three methods of data collection techniques as follows:

a. Observation Method
   Observations or observations are made on related research objects in order to find problems and factually existing data from a group or an area.

b. Questionnaire
   As an instrument to obtain research primary data. Data collection techniques through this questionnaire target active users of music streaming services based on the selected criteria group.

c. Literature review
   Literature study is the stage where the collection of information about the object of research and research problems (Fernandez, Prihantoro, & Hidayah, 2021). This research contains books and journals of previous scientific works as a reference source for starting research.

Population and Research Sample

Population is not only about humans but population can also be in the form of goods and other things as well as nature that is in an area (Nalendra et al., 2021). Researchers used population data from Depok City, West Java Province as the research population. On the official website of the Central Statistics Agency of Depok City from 2018 to 2020 based on age and gender, 2,484,186 people were recorded as residents of Depok City (Statistik, 2021). The research sampling technique was using the Slovin formula. According to (Nalendra et al., 2021) The Slovin Formula is a formula for calculating the sample if the behavior in a population is not known with certainty, and is used for a population with a relatively large number.

$$n = \frac{N}{1+Ne^2}$$ .... (1)

In the application of this formula, the researchers set 15% as the level of error tolerance and the total population of 2,484,186 people as the value of N, then the sample that can be obtained is as follows:

$$n = \frac{2.484.186}{1+(2.484.186(0,15)^2)} = 44,4436 \sim 44$$

The research sample obtained by using the Slovin formula and being able to fill out the questionnaire was 44 respondents.

Research Instruments

According to (Yusup, 2018) a tool that is used as a tool to measure an object in research variables and functions as a tool to collect research data is a Research Instrument. The grid of research instruments is shown based on the five criteria that have been provided and is assumed to be valid and reliable and will be distributed to respondents:

1. Subscription Rates, commensurate with the quality and features of the application obtained and attractive to new users.
2. Available Features, very suitable for its use and very useful in daily use.
3. Music Streaming Quality, not constrained even though the internet network is not stable (no buffering), runs smoothly if open other apps at the same time.
4. Application Design (User Interface), Attractive interface, clear and easy to access menu layout, find song titles quickly.
5. Application Efficiency, use of internet quota in the application includes a small amount, saves

battery usage, doesn't take much time to run the application.

Likert scale

The Likert scale is used to measure the nature, perception, view of a person or group with the social symptoms they experience (Hidayat, 2021). This scale is characterized by its measurement using positive statements and negative statements. In the study of selecting the best music streaming, researchers used a Likert Scale with positive statements. The Likert Scale Rating is shown in Table 2.

Table 2. Positive Statement Likert Scale

Very Important	5
Important	4
Quite important	3
Unimportant	2
Very unimportant	1

Source: (Purnia & Alawiyah, 2020)

Instrument Validity Test

Validity test is used to measure the validity or invalidity of a research instrument. The instrument was tested using the formula 1 Pearson Correlation (Product Moment) (Yusup, 2018), namely the correlation coefficient with the following formula:

$$r_{xy} = \frac{n(\sum X_i Y_i) - (\sum X_i)(\sum Y_i)}{\sqrt{(n(\sum X_i^2) - (\sum X_i)^2)(n(\sum Y_i^2) - (\sum Y_i)^2)}}$$ ....(1)

Reliability Test

Reliability Test is a series of measuring instruments that give the same results. That is, the measurement is fixed and free from error (measurement error) and reliable. This test is carried out using Cronbach's alpha with a significant value of 0.5, 0.6 to 0.7 depending on research needs. The formula is as follows:

$$r_{11} = \frac{k}{k-1} \left(1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right)$$ ....(2)

Data Analysis

To determine the weighting value of the criteria, the criteria that are included in the calculation must be first described. The criteria for research on music streaming service applications are 5, so each criterion value is added and the results produce W (Amount of Criteria Weighting).

The value of each alternative in this study was obtained after distributing the questionnaire, where the results of filling out the questionnaire could be an alternative value or vector S. After correcting the weight value, the alternative value can be raised to the power of the weight value that has been normalized to become a positive rank or

vector V. The final calculation results from Vector V are sorted from the largest to the smallest weight, the weight value with the highest result can be categorized as the best result from the calculation using the Weighted Product method.

RESULTS AND DISCUSSION

Research Data

In Table 3, the researcher describes alternative tables, and in Table 4, the criteria used to determine the best music streaming service application using the weighted product method.

Table 3. Alternative

Alternative	Description
A1	Spotify
A2	Joox
A3	Apple Music
A4	Deezer
A5	Youtube Music
A6	Resso

Table 4. Criteria

Criteria	Description
C1	Subscription Rates
C2	Available Features
C3	Music Streaming Quality
C4	Application Design
C5	Application Efficiency

Research Result

The research was conducted using a questionnaire in Depok City, West Java, and collecting questionnaire data was carried out for approximately seven days, with the results showing that 44 respondents were categorized as active users of music streaming services for the last three months and distinguished by gender in Table 5 and age of respondents in Table 6.

Table 5. Respondents by Gender

Gender	Respondent	Percentage
Woman	25	57%
Man	19	43%
Total	**44**	**100%**

Table 6. Respondent Age Category

Age	Respondent	Percentage
15 – 20	26	59%
21 – 25	17	39%
26 – 30	1	2%
31 – 40	0	0%
Total	**44**	**100%**

The results of selecting respondents based on the alternatives provided and collected through a questionnaire, as shown in Table 7.

Table 7. Respondents on Music Streaming Applications

Application	Respondent	Percentage
Joox	13	30%
Youtube Music	6	14%
Spotify	21	48%
Resso	3	7%
Deezer	1	2%
Apple Music	0	0%
Total	**44**	**100%**

Calculation of Validity Test and Reliability Test

Test the validity of the questionnaire manually with a two-way test, which is a test of a hypothesis whose direction is unknown, to find Rtable using the formula df = N-2, df = 44–2 = 42, so that it can be seen through the distribution of the R table that a significance value of 5% is equal to 0.304. If $r\_count > r\_table$, the instrument is declared valid; otherwise, it is declared invalid. Calculations are performed using the following formula:

$$r_{xy} = \frac{44(12270)-(188)(2851)}{\sqrt{(44(820)-(188)^2)(44(186627)-(2851)^2)}} =$$

$$\frac{3892}{\sqrt{82736.83387}} = 0,4968$$

$$r_{table} = 0,304$$

Table 8. Validity Test Result

Number	r_{xy}	r_{table}	Status
1	0,4968	0,304	Valid
2	0,5891	0,304	Valid
3	0,5229	0,304	Valid
4	0,5256	0,304	Valid
5	0,5960	0,304	Valid
6	0,6002	0,304	Valid
7	0,5273	0,304	Valid
8	0,6629	0,304	Valid
9	0,6627	0,304	Valid
10	0,7468	0,304	Valid
11	0,6978	0,304	Valid
12	0,5659	0,304	Valid
13	0,7204	0,304	Valid
14	0,5283	0,304	Valid
15	0,7190	0,304	Valid

Based on Table 8, research instruments 1 to 15 are calculated using the Pearson Product Moment Correlation formula and are declared Valid because they have exceeded the predetermined R table value.

After the Validity Test is carried out, it is continued with the Reliability Test of the questionnaire which is carried out using the following formula:

$\sigma_b^2 = \frac{820 - \frac{188^2}{44}}{44} = 0,38$

$\sum \sigma_b^2 = 0,38 + 0,64 + 0,83 + 0,39 + 0,53 + 0,63 + 0,94 + 0,28 + 0,48 + 0,47 + 0,39 + 0,53 + 0,41 + 0,83 + 0,47 = 8,27$

$r_{11} = \frac{44}{44-1} \left(1 - \frac{\sum 8,27^2}{44,07^2} \right) = 0,870 \sim 0,87$ Very High Reliability

The results of the calculation above show that r11 is the reliability that is sought. According to the Guilford reliability coefficient, which is categorized based on the level of reliability

Number	Variance Item	Status
1	0,3890	*Reliable*
2	0,6427	*Reliable*
3	0,8351	*Reliable*
4	0,3932	*Reliable*
5	0,5301	*Reliable*
6	0,6321	*Reliable*
7	0,9487	*Reliable*
8	0,2833	*Reliable*
9	0,4862	*Reliable*
10	0,4799	*Reliable*
11	0,3932	*Reliable*
12	0,5327	*Reliable*
13	0,4122	*Reliable*
14	0,8372	*Reliable*
15	0,4751	*Reliable*

ranging from 0.80≤r11≤1.00 has a very high reliability status. Followed by 0.60≤ r11 0.80 which has high reliability, then at 0.40≤ r11 0.60 has moderate reliability, at 0.20≤ r11 0.40 has low reliability and the last 0, 00≤ r11 0.20 has a very low level of reliability.

Table 9. Reliability Test Result

Based on Table 9, the results of the Reliability Test show that the 1st to 15th research instruments are declared reliable with a Cronbach's Alpha value of 0.870 out of a total of 15 variants. The instrument is declared invalid if the Cronbach's Alpha value is <0.6.

Calculation with Weighted Product Method
A. Determining the Weighting and Normalization of Criteria

To start the calculation using the Weighted Product method, it is necessary to determine the value of the weight of the criteria for each of the Cost and Benefit criteria.

In Table 10, it has been determined as the initial value of the weight of each criterion. The criteria set as the cost value are subscription rates because they relate to a price issued for an application.

Table 10. Criteria Weight Value

Criteria	Code	Weight	C/B
Subscription Rates	C1	2	Cost
Available Features	C2	4	Benefit
Music Streaming Quality	C3	5	Benefit
Application Design	C4	3	Benefit
Application Efficiency	C5	4	Benefit
Total		**18**	

The second step is to set the Relative Value or Normalize the Weight Value that has been previously set using the following formula:

$W_1 = \dfrac{2}{2 + 4 + 5 + 3 + 4} = 0,11$

$W_2 = \dfrac{4}{2 + 4 + 5 + 3 + 4} = 0,22$

$W_3 = \dfrac{5}{2 + 4 + 5 + 3 + 4} = 0,28$

$W_4 = \dfrac{3}{2 + 4 + 5 + 3 + 4} = 0,17$

$W_5 = \dfrac{4}{2 + 4 + 5 + 3 + 4} = 0,22$

In Table 11, where 1.00 is the sum of the total criterion weights that have been normalized, or $\sum Wj$ and is the value that must be achieved after normalizing the criterion weights.

Table 11. Criteria Weight Normalization Results

Description	Criteria Weight
C1	0,11
C2	0,22
C3	0,28
C4	0,17
C5	0,22
Total ($\sum Wj$)	1,00

B. Assigning the Value of Each Alternative

After getting the value for normalizing the criteria weights, the next step is to enter the alternative values obtained from filling out the questionnaire according to the criteria shown in Table 12. Apple Music with the alternative code A3 received a rating of 0 out of 44 respondents who had chosen each alternative.

Table 12. Respondent's Answer of Each App

Alternative	Criteria				
	C1	**C2**	**C3**	**C4**	**C5**
A1	269	272	275	281	264
A2	152	167	176	178	167
A4	14	13	15	15	11
A5	68	76	74	77	72
A6	43	45	43	43	41

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C. Determining the Value of the Vector S

In determining the preference value for each alternative, the respondent's answers in each alternative are summed.

$$Si = \prod_{j}^{n} = 1\,(Xij)^{Wj}\,; 1 = 1,2,\dots,m \dots\dots\dots\dots (2)$$

S_1 = 78,503
S_2 = 55,497
S_4 = 7,487
S_5 = 28,889
S_6 = 18,632

Table 13. S Vector Value Result

Alternative	Vector S
A1	78,503
A2	55,497
A4	7,487
A5	28,889
A6	18,632
Total	**189,0089**

In Table 13, the value of the vector S for each alternative is A1 = 78.503, A2 = 55.497, A4 = 7.487, A5 = 28.889, and A6 = 18.632, for a total value of 189.0089. After getting the value of the vector S, the calculation continues to determine the value of the vector V for each criterion.

D. Determining the Value of the Vector V

The result in Vector V will be the value for ranking the results, using Vector S in each alternative and dividing by the sum of Vector S.

$$Vi = \frac{Si}{\prod_{j=1}^{n}(Xij)^{Wj}}\,; \text{with } i = 1,2,\dots,m \dots\dots\dots\dots(3)$$

V_1 = 0,415
V_2 = 0,293
V_4 = 0,039
V_5 = 0,152
V_6 = 0,098

Table 14. V Vector Value Result

Alternative	Vector V
A1	0,415
A2	0,293
A4	0,039
A5	0,152
A6	0,098
Total	**1,00**

In Table 14, it can be seen that the results of the vector V values for each alternative are V1 or A1 = 0.415, V2 or A2 = 0.293, V4 or A4 = 0.039, V5 or A5 = 0.152, and V6 or A6 = 0.098, with a total vector value of V of 1.00. The ranking will be sorted according to the results of the vector V value, from the highest to the lowest.

E. Results Ranking

After completing the calculation phase of the Weighted Product method, the last step is to rank the results by using the Vector V value to get the best application recommendations.

Table 15. Alternative Ranking Results

Alternative	Vector V	Rank
A1	0,415	1
A2	0,293	2
A5	0,152	3
A6	0,098	4
A4	0,039	5
A3	0	6

Table 15 shows that the highest acquisition value of Vector V from the top three, namely 0.415 is A1 or Spotify, in the 2nd position with a value of 0.293 is A2 or Joox and the 3rd position with a value of 0.152 is A5 or Youtube Music. While the 4th position with a value of 0.098 is Resso, the 5th position with a value of 0.039 is Deezer and in the 6th position is A3, namely Apple Music with a value of 0 because it was not chosen by the respondent

Implementation of the Website-Based Weighted Product Method

Implementation of the Weighted Product Method Selection of the Best Music Streaming Application Services into a simple website-based system using the PHP programming language and database using MySQL. This system can be accessed with localhost using the help of the XAMPP application.

1. Login and Home Pages

In Figure 2, the login page is shown. This website is intended for administrators who will manage data in a decision support system. After the admin has successfully logged in, the page will be forwarded to the dashboard shown in Figure 3. menu consisting of Home, Criteria Data, Alternative Data, Calculation Analysis, Calculations, About Weighted Products, and Logout.
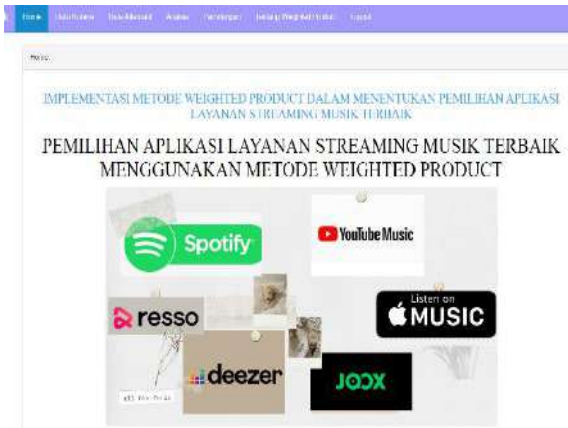

Figure 2. Login Page

Figure 3. Home Page

2. Criteria Data Menu

Figure 4 shows the criteria data table, which consists of criteria, interests, costs and benefits, and editing features.

Figure 4. Criteria Data Page

3. Criteria Alternative Menu

Figure 5 displays the alternative data provided along with the results of collecting questionnaire data.

Figure 5. Alternative Data Page

4. Calculation Analysis Menu

Figure 6. Calculation Analysis Page

In Figure 6, the data is displayed, which contains the bar chart of the results of the ranking analysis on the calculation menu. This menu displays visually and briefly the ranking results using a bar chart with a Vector V value along with the name of the recommended music streaming application with the highest gain. This menu can assist in displaying ranking results other than when using the calculation menu.

Display of the top recommendation results obtained from the final table of results, which can be printed in PDF format as shown in Figure 7,

Figure 7. Calculation Page

CONCLUSION

The first best music streaming service application is Spotify = 0.415, the second order is

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Joox = 0.293, the third order is Youtube Music = 0.152, The fourth order is Resso = 0.098, The fifth order is Deezer = 0.039, while for the Apple Music application did not get an assessment from respondents and was in the last position with a total score of 0. In the implementation of the Weighted Product method, the solution to the problem of selecting the best music streaming service application with a relatively simple calculation and a high level of subjectivity in the formation of consideration criteria to get the best alternative results. The process and calculation results of the Weighted Product method have a high level of accuracy between SPSS calculations and a website-based system using the PHP programming language in recommending the best music streaming service application according to suitable criteria for users to increase the promotion of these services.

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ANALYSIS OF GOODS MANAGEMENT SYSTEM IN THE COMMUNICATION AND INFORMATICS DEPARTMENT OF SERDANG BEDAGAI DISTRICT

Cut Try Utari[1], Richard Parlindungan Simanjuntak[2], Firman Styono[3], Junerdi Nababan[4*]

Sistem Informasi[123]
, Universitas Tjut Nyak Dhien[123]
www.utnd.ac.id[123]

Bisnis Digital[4]
Universitas Mahkota Tricom Unggul[4]
www.mtu.ac.id[4]

tarie.try91@gmail.com[1], richsparlin0@gmail.com[2], styonof@gmail.com[3], junerdinababan1@gmail.com[4*]

Abstract—*The current problem is that the Serdang Bedagai district communication and informatics office is experiencing difficulties in managing incoming and outgoing goods. Management is currently carried out manually and cannot be viewed online so that many errors occur, one of which is a mismatch between the stock of goods recorded and the physical stock of existing goods. The goods management system that will be built in this study uses the waterfall model and PHP and HTML programming languages as well as CSS to design the web appearance. The system has 9 entities, namely: officer, user, sender, person in charge, goods, recipient, detail_recipient, expenditure and data_dinas. The results of the implementation of the proposed system are more optimal management of goods and help the performance of the warehouse admin in making real-time stock update reports and borrowing goods.*

Keywords: *Waterfall, PHP, CSS*

Intisari—*Permasalahan saat ini dinas komunikasi dan informatika kabupaten serdang bedagai mengalami kesulitan didalam pengelolan barang masuk dan keluar. Pengelolan saat ini dilakukan secara manual dan belum bisa di lihat secara online sehingga banyak terjadi kesalahan salah satunya ketidakcocokan antara stok barang yang dicatat dengan stok fisik barang yang ada Sistem manajemen pengelolaan barang yang akan dibagun dalam penelitian ini mengunakan model waterfall dan bahasa pemrograman PHP dan HTML serta CSS untuk mendesain tampilan web. Sistem memiliki 9 entitas yaitu : Petugas, penggunna, pengirim, penanggung jawab, barang, penerima, detail_penerima, pengeluaran dan data_dinas. Hasil implementasi pada sistem yang telah diusulkan pengelolaan barang lebih optimal serta membantu kinerja admin gudang dalam membuat laporan update stock dan peminjaman barang secara realtime.*

Kata Kunci: *Waterfall, PHP, CSS*

INTRODUCTION

The current problem is that the goods management system at the Serdang Bedagai district communication and informatics office still uses the Microsoft Excel program to store data on incoming and outgoing goods as well as the stock of goods in the warehouse. With the current system used to manage data on dozens of items, it is very confusing for the warehouse admin ((Pratama et al., 2020)(Agustian & Ramadhani, 2022) . The old system that was implemented also created a number of problems such as: incompatibility between the recorded stock of goods and the physical stock of existing goods , takes time to search for the required data, errors often occur in processing input and data and delays in reporting stock of good. Currently, the leadership is having difficulties in making a decision whether the item is worth buying or not because the reports and presentation of management data must be updated first by the warehouse admin.

Based on these problems, the Serdang Bedagai District Communication and Informatics Service requires a goods management system that can provide real-time reports, so this research will

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propose a web-based goods management system using the system development method. waterfall SDLC model . This system that will be created records every process in the flow of an item, starting from the entry of goods, checking of goods, requesting goods(Ernawati, 2020) , approval of goods(Riswanda & Priandika, 2021), condition of goods to releasing goods from the warehouse (Tirzasari et al., 2022). Several system development studies use models Waterfall SDLCs such as: (Hasanudin, 2020)(Gani, 2022) in their research developed a web-based goods inventory system using the waterfall model. The system built can manage incoming and outgoing goods data, inventory data, ordering goods . Furthermore, by (Aji & Pratmanto, 2021)(Norhayati et al., 2022) overcoming the problem of recording inventory of goods, namely recording expenses and income. Other research put forward by (Gunawan et al., 2021)In implementing a new system, it is better not to suddenly, but first make adjustments between the old system and the new system. Similar research was also conducted by (Makki & Durbin Hutagalung, 2022)(Therry, 2022) The inventory information system that has been built can function according to the design and waterfall model.

MATERIALS AND METHODS

A. Place And Time Of Research

The time of this research was carried out for 4 months, from September to December 2022. The place of research was conducted at the Office of Communication and Informatics, Serdang Bedagai Regency.

B.System Development Method

The system development method used in this research uses the waterfall SDLC model . The stages of development can be seen in Figure 1.
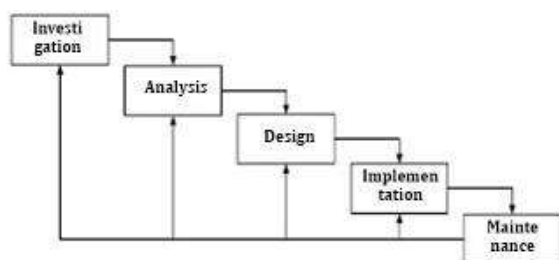

Figure 1 Waterfall scheme (Sanjaya et al., 2022) (Yennimar et al., 2019)

In Figure 1 you can see the model that will be used in system development. It starts with conducting an investigation to determine whether the problem was the previous one. Then carry out a system analysis to find out the needs of the system to be built and after obtaining the required data it

will proceed to the system design stage (Rizal et al., 2020) . At this stage the illustration of the system to be built is illustrated with a Flowchart as a system flow model and an ERD (Entity Relationship Diagram) as a relationship model design between databases (Rizal & HS, 2019) . Furthermore, at the implementation stage using the programming language PHP and HTML and CSS to design the web appearance. The final stage, namely the maintenance stage, is carried out when the information system has been operated. At this stage, process monitoring, evaluation and changes (improvements) are carried out if necessary.

RESULTS AND DISCUSSION

A. Current System Analysis

System problems that are currently running at the Serdang Bedagai District Communication and Informatics Service can be seen in Figure 2 and Figure 3.
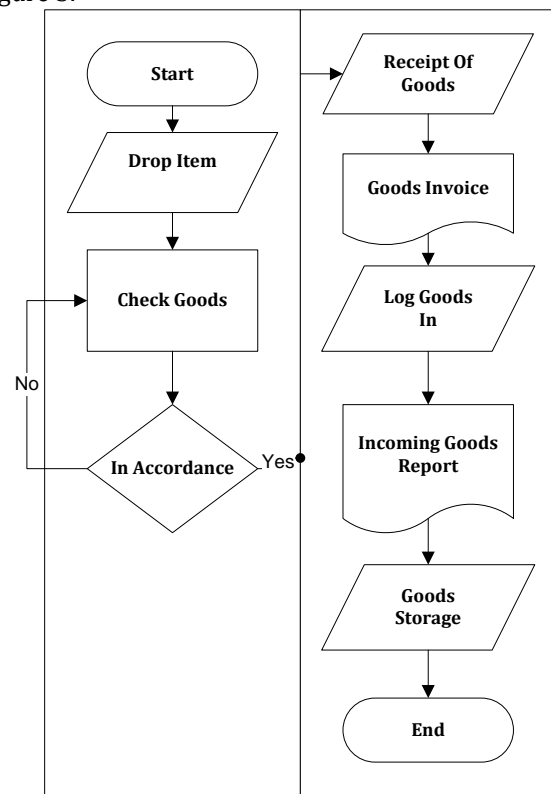
Figure 2. Flowchart of the old incoming goods system

In Figure 2 you can see the system process that is currently running for incoming goods, starting with the supplier arriving and delivering the goods , then the employee will check the goods , if appropriate with the order will be accepted and if not the sender will be asked to re-check the goods , the employee signs the order note from the sender and records using the Microsoft Excel application. The final stage of goods is stored in the warehouse.
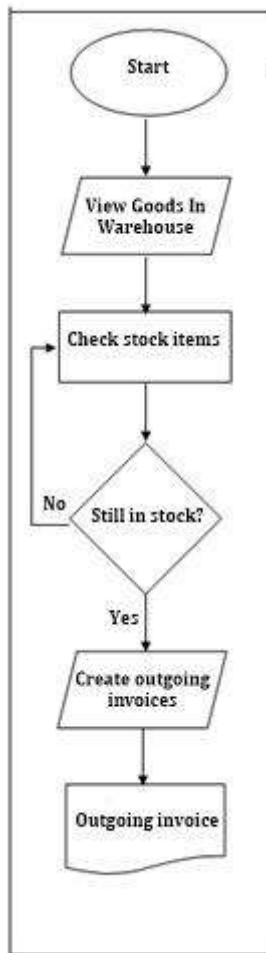
Figure 3. Flowchart of the old system of goods coming out

In Figure 3 you can see the system process that is currently running for outgoing goods, starting with looking directly at the stock of goods then creating an invoice for outgoing goods without any recording in the outgoing goods report system.

B. Proposal System Analysis

The proposed system is designed and will be developed in web form with the hope of helping in printing reports and recording in real time so that it is easier for employees to get information quickly. The following are some of the uses of this information system later:

1. Make it easier to record inventory data, because it will automatically calculate if there are later incoming or outgoing goods.

2. There is a search feature for income and expenditure report results to make it easier for the admin and warehouse staff to print reports of income or expenditure of goods.

3. With the approve feature, purchases of goods become more controlled by ascertaining whether the goods are worth buying or not. Expenditure of goods is also more controlled with this feature.
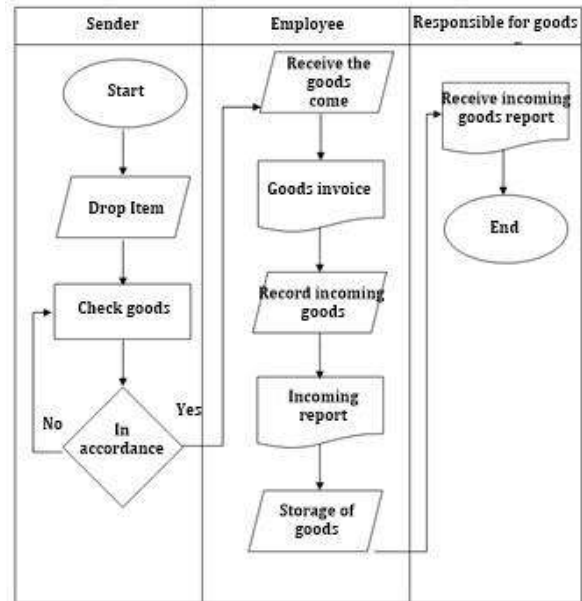
Figure 4. Flowchart of the proposed incoming goods system

In Figure 4 you can see the process of the proposed system stages that will be made, the proposal process is not much different from the old system, the difference is by adding a person in charge so that all items can be reported online.

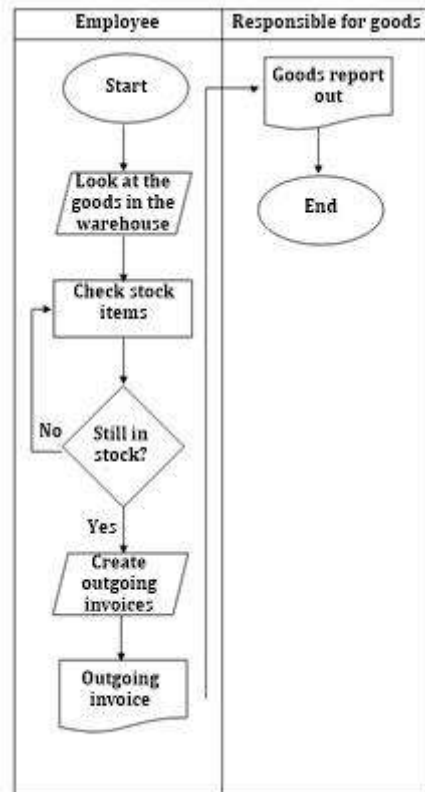Figure 5. Flowchart of the system that proposes goods out

In Figure 5 you can see the process of the proposed system stages that will be made, the proposal process is not much different from the old

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system, the difference is by adding a person in charge so that all outgoing goods can be reported online and makes it easier for employees to get stock information without having to check in to the warehouse. The ERD system to be built can be seen in Figure 6.
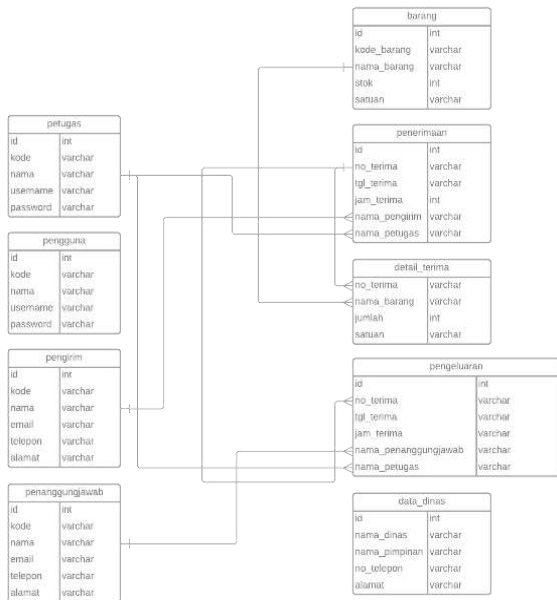

Figure 6. ERD Incoming and Outgoing Goods System

The proposed ERD image for the Incoming and Outgoing Goods Management Information System at the Serdang Bedagai Communication and Informatics Service can be seen in Figure 6. In this research proposal it has 9 entities namely: officer, user, sender, person in charge, item, recipient, detail_recipient , expenses and data_dinas.

C . Implementation Of Testing and Evaluation

The results of the implementation of the design of the goods management system at the Ministry of Communication and Information in this study used the programming language PHP and HTML and CSS to design the web appearance.
1. Login Page

Figure 7. Login Page

In Figure 7 it can be seen on this page that users registered in the system can log in using their username and password , there are three levels, namely admin, employee and person in charge.

2. Goods Page
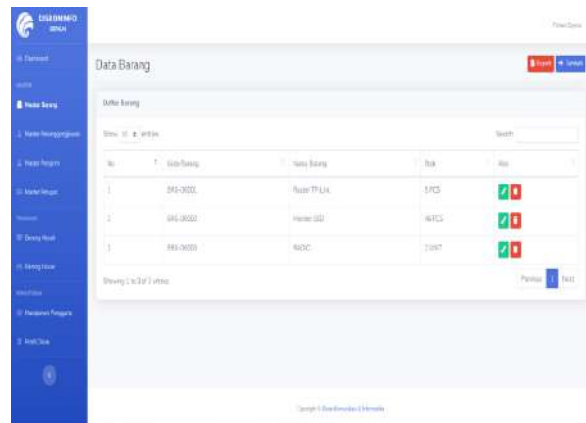
Figure 8. Stock Goods page

In figure 8. You can see the appearance of the stock item page . This page is used by the admin to add, change, delete, and view item stock data . This page is also the start page after the admin has successfully logged in. On this page, the admin can print stock reports.

3. Incoming Goods Transactions
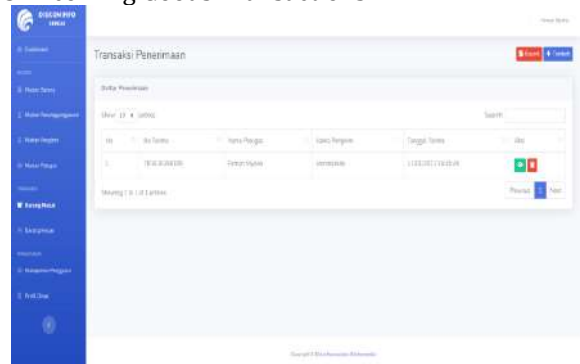
Figure 9. Entrance Goods Page

In Figure 9 you can see the display of the incoming goods page. This page is used by admins, employees and persons in charge to add, change, delete, and view incoming goods data. On this page you can also print an incoming goods report.

4. Exit Goods Transaction Page

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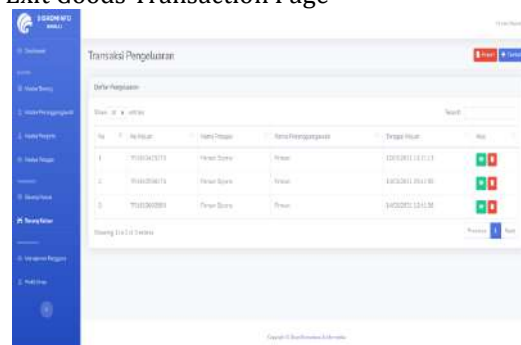
Figure 10. Outgoing Goods Page

In Figure 10 you can see the display of the outgoing goods page. This page is used by the admin to add, change, delete, and view outgoing item data. On this page you can also print data on outgoing goods and ask the recipient to sign it as proof of loan and archive.
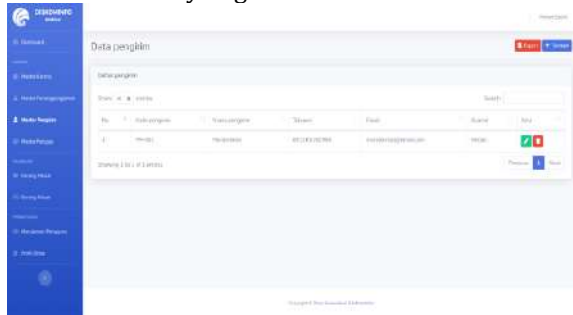
5. Goods Delivery Page

Figure 11. Implementation of Goods Delivery Data Pages

In Figure 11 you can see the display of the goods delivery page. This page is used by the admin and the person in charge to add, change, complete, and view data on borrowing goods and can print data on borrowing goods and ask the borrower to sign it as proof of borrowing and archives.

D. System Testing Results

To find out the successful implementation of the system that has been done, it is necessary to test the system. The testing method used is Black box, testing is carried out by Warehouse admins, users, senders, persons in charge of goods, recipient_detail officers, service data cost report makers and leaders. The stages of testing that have been carried out are as follows:

Table 1. Testing of the goods management system

NO	Description	Procedure	Input	Output	Results	Conclusion
1	System *login* testing	*login* page	Fill in *the username* "staf45" and *password* "12345"	Enter the system (*stock* item page)	Log into the system	Good
2	Testing the addition of data *stock* goods	Open the item *stock page* and click add item	Fill in the data item name, item type, item description, quantity, unit, and image	The data item is displayed on the *stock* item page	The data is displayed on the *stock* item page	
3	Testing *the edit of* goods *stock* data	Open the item stock page and click *edit* on the item *stock data*	Change the item name, item type, item description, unit, and image data	Data changes on the *stock* item page	Data changes on the *stock* item page	Good
4	incoming goods data	Go to the incoming goods page and click add goods	Fill in the data item name, amount, description, and note number	Data is displayed on the incoming goods page and data on *the stock of goods increases*	Data is displayed on the incoming goods page and data on *the stock of goods increases*	Good
5	Testing of incoming goods data *editing*	Open the incoming goods page and click *edit* on the incoming goods data	Change data amount, note number and description	Data changes on the incoming goods page and *stock* items	Data changes on the incoming goods page and *stock* items	Good

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NO	Description	Procedure	Input	Output	Results	Conclusion
6	Testing added goods data out	Go to the item out page and click add item	Fill in the data item name, *quantity*, recipient, and description	The data is displayed on the outgoing goods page and the data on *the stock of goods is reduced*	The data is displayed on the outgoing goods page and the data on *the stock of goods is reduced*	Good
7	Exit item data *editing* test	Go to the outgoing goods page and click *edit* on the outgoing goods data	Change *the quantity*, recipient, and description data	Data changes on the outgoing goods page and *stock items*	Data changes on the outgoing goods page and *stock items*	Good
8	Testing the addition of goods borrowing data	Open the item loan page and click add data	Fill in the data item name, *quantity*, recipient, and description	The data is displayed on the page for borrowing goods and data on *the stock of goods is reduced*	The data is displayed on the page for borrowing goods and data on *the stock of goods is reduced*	Good
9	Testing the editing of goods borrowing data	Open the item lending page and click edit	Fill in the data on the number of items returned and the date of return	The data is displayed on the item lending page	The data is displayed on the item lending page	Good

Based on table 1 it can be seen that the tests that have been carried out where all the tests that were carried out were successful and met expectations. With this, it is ensured that the goods management information system is running well and can be used immediately.

CONCLUSION

Based on the trial of the proposed system that was carried out at the Bedagai Regency Communication and Informatics Service Serdang, the test ran smoothly without error problems with a total of 100 input data during testing. Problems such as: discrepancies between inventory records and physical inventory, takes time to find the required data, frequent data input errors and delays in reporting stock of goods have all been resolved with the new system implemented. The existence of this goods management system is also very helpful for the performance of the warehouse admin in making reports on stock updates and borrowing of goods so that reports can be viewed in real time by the leadership..

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COMPARISON ANALYSIS OF BANDWIDTH SPEED USING MIKROTIK ROUTERBOARD 750

Ericky Benna Perolihin Manurung[1*)] , Mutammimul Ula[2]

Sistem Informasi[1]
Institut Bisnis Informasi Teknologi dan Bisnis[1]
www.itnb.ac.id

Sistem Informasi[2]
Universitas Malikussaleh[2]
www.unimal.ac.id[2]

ericky@itnb.ac.id[1*], mutammimul@unimal.ac.id[2]

Abstract— *The problem being faced by aminet cafes is that every cafe user often experiences problems when using a computer. The network is often disrupted on each computer because the distribution of bandwidth has not been done. In this study, a comparison of upload and download speeds will be carried out when distribution is done. Bandwidth management in this study uses a proxy and Queue Tree with the Network Development Life Cycle (NDLC) system development method. The results of the study show that bandwidth management runs optimally with balanced upload and download speeds for each user because the bandwidth distribution process has been carried out. The average upload speed is 121 kbps and the download speed is 732kbps.*

Keywords: *Aminet, Mikrotik, Queue Tree*

Intisari— *Permasalahan yang sedang dihadapi oleh warnet aminet yaitu setiap pengguna warnet sering mengalami kendala disaat menggunakan computer. Jaringan sering terganggu pada setiap computer dikarenakan pembagian bandwidth belum dilakukan. Pada penelitian ini akan dilakukan perbandingan kecepatan upload dan download ketika sudah di lakukan pembagian. Pengelolan bandwith pada penelitian ini menggunakan mikrotik dan Queue Tree dengan metode pengembangkan system Network Development Life Cycle (NDLC). Hasil penelitian menunjukan pengelolaan bandwitd berjalan optimal dengan kecepatan upload dan download yang seimbang disetiap usernya di karenakan sudah dilakukan proses pembagian bandwidth. Rata-rata kecepatan upload di kecepatan 121 kbps dan kecepatan download 732kbps.*

Kata Kunci: *Aminet, Mikrotik, Queue Tree*

INTRODUCTION

Bandwidth problems are the most common problem that is often encountered in computer network technology, including in Aminet cafes (Prihantoro et al., 2021). At Aminet cafes, bandwidth leaks often occur where users can access the internet without bandwidth restrictions. Bandwidth management at Aminet cafes is currently needed because 90% of Aminet internet cafe users are online game users(Naya et al., 2021). Where the need for the bandwidth for online games must be supported by an optimal internet network so that connection stability is maintained from lag (Dasmen et al., 2022). One way of internet bandwidth management is to limit or limit internet bandwidth(Siddik et al., 2023), so that the total available bandwidth capacity is not monopolized by one or several groups of internet users(Darmadi, 2019). The purpose of bandwidth management itself is to expedite the connection of all computers so that they can access the internet optimally(Arta et al., 2018). Bandwidth management can be done with several software and hardware, one of which is by using the Mikrotik RB 750 router. The MikroTik router(Rahmawan et al., 2022) is known as a router that is economical on hardware, has many features, is easy to configure and can be installed

on a personal computer (Arius et al., 2022). Of the several features of the Mikrotik Router, one of the highlights is the Queues Tree which functions to limit bandwidth on MikroTik(Putra et al., 2020).

The use of Mikrotik with Queues Tree in bandwidth management has been widely carried out by several researchers such as :(Syukur, 2018) in their research applying Mikrotik in internet bandwidth management, but problems occur when applications with different characteristics try to access the internet at one time so management much-needed bandwidth. Similar research was also carried out by (Gunawan et al., 2018) where to increase the effectiveness of using and managing internet bandwidth at Ki Hajar Dewantoro Vocational School by using a Mikrotik Router to make it easier for administrators to manage the network. Likewise, research conducted by (Tantoni et al., 2019)analyzes the need for online game bandwidth speed to be able to manage it so it doesn't lag. Furthermore, research was carried out by (Prayoga, 2021)and (Prihantoro et al., 2021)using a Queue Tree in dividing bandwidth for each internet cafe user and research (Dasmen et al., 2022) overcoming the problem of bandwidth leakage in internet cafes using a proxy.

MATERIALS AND METHODS

A. Research Stages

The research used the Network Development Life Cycle (NDLC) system development method which can be seen in Figure 1.
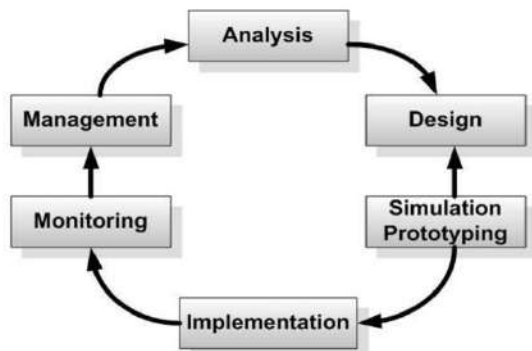

Figure 1. NDLC Model(Rizal & HS, 2019)(Yennimar et al., 2019)

In Figure 1 you can see the stages of the NDLC model where the analysis stage is analyzing system requirements which aims to identify problems and system specific requirements. Furthermore, at the design stage, a work flow system design drawing will be made, the design can be in the form of a topological structure design, data access design, cabling design, and so on which will provide a clear picture of the project to be

built. Furthermore, at the Simulation stage, namely describing a prototype which aims to see the initial performance of the research to be carried out and the final stages of implementation. The flowchart of this research can be seen in Figure 2.
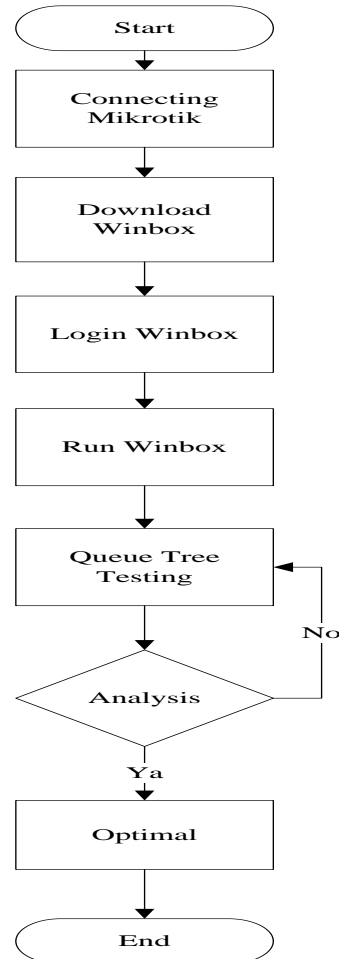

Figure 2. Research flowchart (Rizal et al., 2020)

Figure 2 explains the research design that was carried out starting with connecting the proxy and downloading Winbox and logging in. Then run winbox with the queue tree method. The last stage is to analyze the bandwidth for the eight computers in the cafe and whether it is stable and optimal, the following is an explanation regarding the steps taken:
1. The initial stage is connecting Mikrotik where at this stage it is carried out to be able to start sharing bandwidth on each computer.
2. Download winbox: at this stage it functions to access and manage the MikroTik RouterOS configuration.
3. Login winbox: at this stage to be able to access all the tools available on winbox.
4. Run Winbox: at this stage it is carried out to see the results of the trials that have been carried out whether they are optimal or not.

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5. Queue tree testing: at the stage of starting the process of limiting proxy bandwidth separately for browsing, downloading and online games

6. Analysis: at this stage start doing analysis on 8 computers whether it is optimal. If the process is stopped.

B. Network Design

The design of the network topology used by Aminet cafe uses a star topology where each computer is connected directly to a switch and the switch is directly connected to the modem without a router to properly control the distribution of incoming bandwidth to each computer. The design before and after using the proxy router can be seen in Figure 3 and Figure 4.
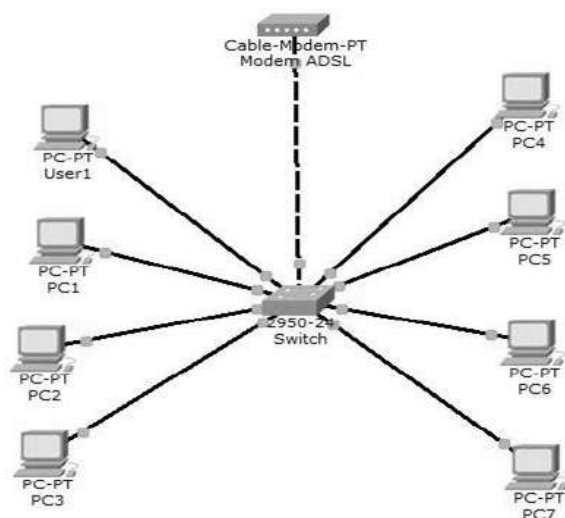

Figure 3. Design before using Mikrotik

In Figure 3 it can be seen the design of the Computer Network before using Mikrotik on the modem device that is used directly connected to the switch/hub device without a router between the modem and the switch, so that the switch is directly connected to the user's computer without any bandwidth controller.
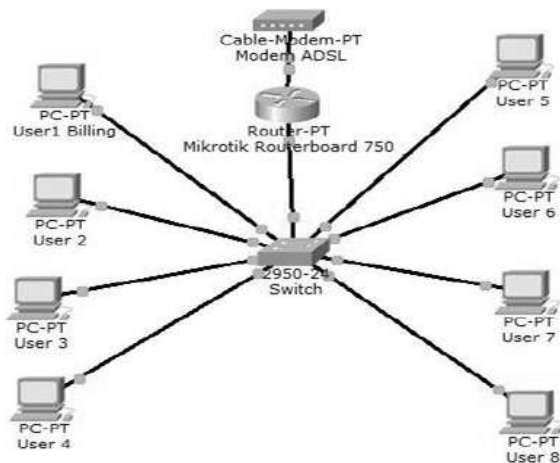

Figure 4. The design after using Mikrotik

Whereas in Figure 4, namely the design of a computer network after using Mikrotik, it can be seen that between the modem and switch devices, there is a proxy router that functions to regulate internet connections and manage bandwidth. In other words, the modem is not directly connected to the switch/hub on the user's computer but must go through the proxy router. This is because the internet connection settings and bandwidth settings for several user computers must go through the setting agreement made on the proxy router.

RESULTS AND DISCUSSION

In this study, Winbox tools were used as a data test that had been analyzed to find out the causes of the problem and find the right solution to solve the problem. The first step to be taken in this study is to conduct field observations. Based on field observations through direct observation, the results show that upload and download speeds are not good. This is because bandwidth management is not yet optimal, so bandwidth management is needed at Aminet cafes. On average, users at Aminet cafes use computers to play online games, many users experience problems every day, while the managers of Aminet cafes are not tech savvy. Bandwidth Speed Testing before and after using a proxy in this study uses the http://speedtest.cbn.net.id/ site by displaying download and upload speed results.

Table 1. User Bandwidth Management Testing
Before using the proxy and Queue Tree

	Aktivitas (Kbps)	
User	Upload	Download
User1	497	1167
User2	397	1014
User3	221	945
User4	502	2057
User5	397	1765
User6	477	1694
User7	447	2108
User8	419	1967

In table 1 it can be seen that the User Bandwidth Management Test before using the proxy. Where the most dominant upload speed is user 4 while the download speed is user 7.

Table 2. User Bandwidth Management Tests after using the proxy and Queue Tree

	Aktivitas (Kbps)	
User	Upload	Download
User1	121	720
User1	120	735
User1	120	739
User1	121	725
User1	126	745
User1	122	735
User1	120	727
User1	124	732

In table 2 it can be seen the User Bandwidth Management Test after using the proxy and Queue Tree. Where the average upload speed is 121 kbps while the average download speed is 732kbps. It can be seen that there is no dominant upload and download speed so that every internet cafe user remains optimal in using the computer.

A. Testing Results of Limit Extension Mikrotik

In the settings made on Mikrotik, a test was also carried out to see whether the settings made worked properly or not, but the settings for all limit extensions were the same as made on Mikrotik, therefore the limit extension test on Mikrotik was only taken 1 sample, representing all limit settings extension used, and at this stage, the test is carried out on the ".mp3" extension.
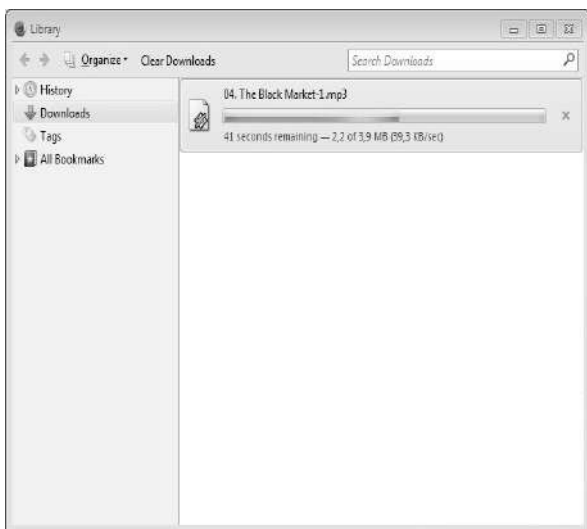

Figure 5. Queue Tree Limit Extension Test Results

In Figure 5 it can be seen the results of testing using the Queue Tree Limit Extension, the result is that the file being downloaded is at a speed of 39.9 KB or 319.2 kbps, so it is still within the range of bandwidth usage, namely 512k.
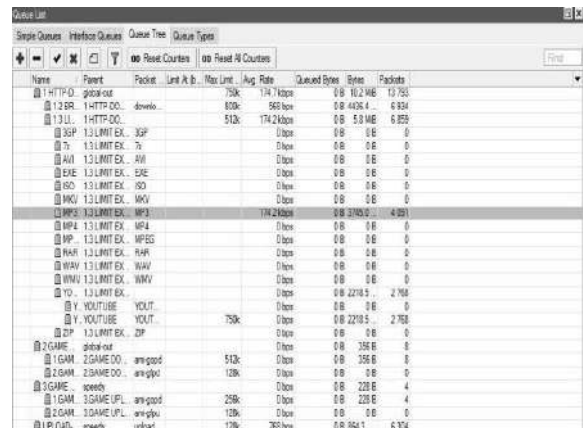
Figure 6. View of the Queue Tree

In Figure 6. The results of the Queue Tree Limit Extension Test can be seen at the average rate of 174.2 kbps by testing the type of file downloaded, namely ".mp3" when the bandwidth usage to download the extension is still within the range applied, namely 512k/ 512 kbps .

B. Testing Queue Tree Online Game Results

The test was carried out with several computers playing online games, therefore the results displayed from the online game queue list are almost close to the bandwidth limit, the results can be seen in Figure 7.
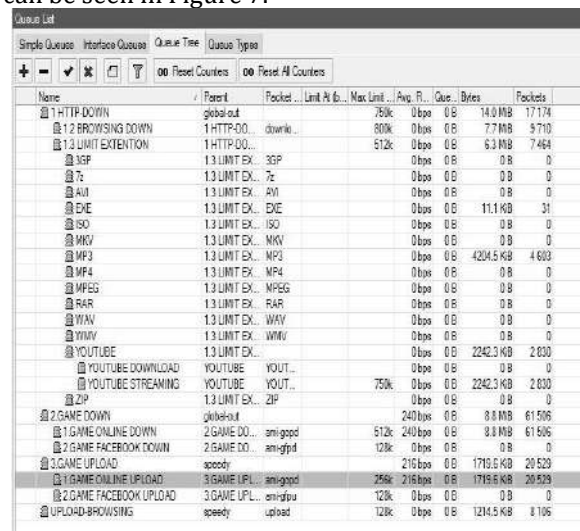
Figure 7. Online Game Queue Tree Results

In Figure 7 you can see the test of 1.GAME ONLINE DOWN (online game download) bandwidth speed of 240k/240kbps, where the test results in a given max limit of 512k/512kbps and speed 1.GAME ONLINE UPLOAD also gets a bandwidth speed of 216k/216kbps where the speed is also almost at the max bandwidth limit of 256k/256kbps.

Table 3 results of comparison before and after
bandwidth management is carried out

|	Before		After	
User	Upload	Download	121	720
User1	497	1167	120	735
User2	397	1014	120	739
User3	221	945	121	725
User4	502	2057	126	745
User5	397	1765	122	735
User6	477	1694	120	727
User7	447	2108	124	732
User8	419	1967	124	732

Based on the table 3, it can be seen that the test before and after bandwidth management is carried out using a proxy and Queue Tree. In the previous column, it can be seen that the speed of each user is not the same where the highest upload speed is on user 4 while the highest download speed is on user 7. These results are very different after bandwidth management is carried out using a proxy and Queue Tree where each user has the same speed so there is no who have trouble using the computer

CONCLUSION

Based on the results of the analysis during testing at the Aminet cafe using a proxy router with Queue Tree, the upload and download speeds are balanced for each user because the bandwidth distribution process has been carried out. The difference in bandwidth usage after using the Mikrotik router in the download process is 281 kbps, this is because the bandwidth has been divided within the router so that it does not produce a significant difference, such as the download process before using the Mikrotik router, which is 1163 kbps. Meanwhile, the difference in bandwidth usage in the upload process is only 6 kbps, where previously using a proxy router the difference in the upload speed process was 281 kbps.

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THE POWER OF ADAPTABILITY: ACHIEVING AGILITY AND QUALITY IN WEB BASED COMPANY PROFILES THROUGH EXTREME PROGRAMMING

Harjunadi Wicaksono [1]; Jafar Shadiq [2]; Dwi Ismiyana Putri [3*]; Rina Sayekti [4]

Sistem Informasi [1,4] ; Rekayasa Perangkat Lunak [2,3]
Universitas Bina Insani
www.binainsani.ac.id
harjunadi.wicak@binainsani.ac.id [1], jafarshadiq@binainsani.ac.id [2], dwiismiyana@binainsani.ac.id [3*],
sayrin387@gmail.com [4]

Abstract— *This study explores the utilization of Extreme Programming (XP) methodology, coupled with black box testing, in developing a Web-Based Company Profile as a supportive medium for information and promotional purposes. The objective is to optimize the effectiveness and usability of the company's online profile through an adaptive and collaborative approach. However, successful implementation of XP methodology in developing Web-Based Company Profiles relies not solely on methodological approaches. Effective project management, good team communication, and support from management are equally essential to achieve optimal outcomes. In conclusion, the integration of Extreme Programming methodology, together with black box testing, enables companies to enhance their Web-Based Company Profiles as effective mediums for information and promotional purposes. This study emphasizes the importance of adaptability, collaboration, and quality assurance in achieving successful online profiles.*

Keywords: Company Profile, Extreme Programming (XP), Web Based, Black Box, Brand Identity.

Intisari—*Penelitian ini mengkaji penggunaan metodologi Extreme Programming (XP) yang dikombinasikan dengan black box testing dalam pengembangan company profile berbasis web sebagai sarana informasi dan promosi penjualan. Tujuannya adalah untuk mengoptimalkan efisiensi dan kegunaan profil bisnis online melalui pendekatan adaptif dan kolaboratif. Namun, keberhasilan penerapan metodologi XP dalam pengembangan profil perusahaan berbasis web tidak hanya bergantung pada pendekatan metodologi, manajemen proyek yang efektif, komunikasi tim yang baik, dan dukungan manajemen sama pentingnya untuk mencapai hasil yang optimal. Singkatnya,* *integrasi metodologi Extreme Programming bersama dengan pengujian kotak hitam memungkinkan perusahaan untuk meningkatkan profil perusahaan berbasis web mereka sebagai alat komunikasi dan promosi yang efektif. Studi ini menggarisbawahi pentingnya kemampuan beradaptasi, kolaborasi, dan jaminan kualitas untuk mencapai profil online yang sukses.*

Kata Kunci: Profil Perusahaan, Extreme Programming (XP), Website, Black Box, Brand

INTRODUCTION

The world of information technology and promotional media is currently growing increasingly rapidly (Infante & Mardikaningsih, 2022). This is evidenced by the large number of people who need this information, as a result of which human activities are gradually starting to switch from manual systems to fully computerized systems (Alda, 2023). The types of promotional media sources that exist today are very diverse, one of which is a website that can be accessed via the internet from anywhere and anytime.

Nowdays, almost every agency or institution around the world already has a website which is a means of communication between the company and customers (Hidayat & Handayanto, 2019). This is very much needed by an agency in publishing the profile of the agency itself to parties in need, both inside the agency and outside the agency (Fahril & Farhan, 2021). One of the solutions used as a means of conveying information is by making a profile or what is called a company profile. Several studies that have been conducted related to the design of the company profile information system show that with the development of the company profile owned by PT Gotrans Logistics (Fahril & Farhan, 2021) with the company profile information system, what

is highlighted is the delivery of company profile information, Other studies (Eko Valentino & Jodi Hardiansyah, 2020) by using company profile, the information provided is easier to understand for the general public who want to know in advance about hotels or places to stay. (Santoso & Dewi, 2021) said implemented company profile website as a media marketing information system and school introduction online during a pandemic. With the company profile information system, what is highlighted is the delivery of detailed information media online, so that prospective customers get this information easily because it can be accessed online (Nugraha et al., 2021).

Company Profile is a summary description of a company's information where the company can choose what information it wants to convey openly to the public according to its objectives (Eko Valentino & Jodi Hardiansyah, 2020). Company Profile is also an asset of an institution or company that can be used to improve an image or image of the company to establish cooperation with company relations, institutions and other related agencies. In general, the Company Profile is made in the form of a well-organized book using visual communication design elements using a combination of elements of shape, color, typography and other supporting aesthetic elements arranged in a dynamic compositional order.

This era really needs to be considered in the utilization and development of information technology, namely the internet, to carry out business process activities. One of the advantages of using the internet is that it provides market coverage that is no longer limited by distance, time, and space, but is global with local, national, and even international coverage. It is hoped that with this website, it can make customers more familiar with the products and services owned by the company (Hidayat & Handayanto, 2019).

MATERIALS AND METHODS

This research collects relevant information and facts by identifying data sources derived from documentation of the results of interviews and observations made at the object of research, namely one of the companies in Indonesia. Sources taken from the literature method are books, papers, national and international journals, and online media.

The software development method has several approaches that can be done, in this study the method used is Extreme Programming (XP) which is a process with an object-oriented approach (Putri et al., 2022) so that it has a target in the form of a team that can be formed on a small to medium scale, and this method is also suitable if in the development process there are changes in system

requirements that do not require too long a time (Sayfulloh, 2021), this is depicted in the Figure 1.
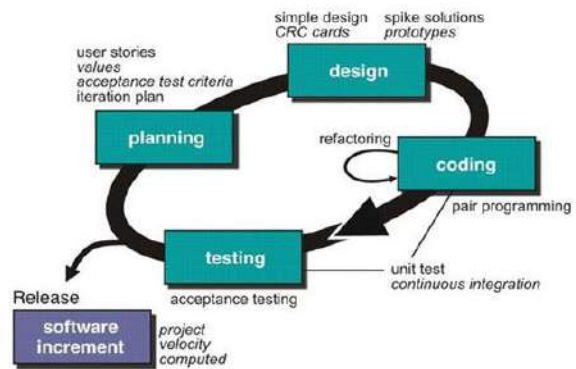

Figure 1. Software Development Life Cycle of XP

According to Ahmad et al (Sefina Samosir et al., 2022), XP is a scientific software development method that is predictable, fast, efficient, low-risk, flexible. The extreme programming development method is one of the agile methods (Borman et al., 2020).
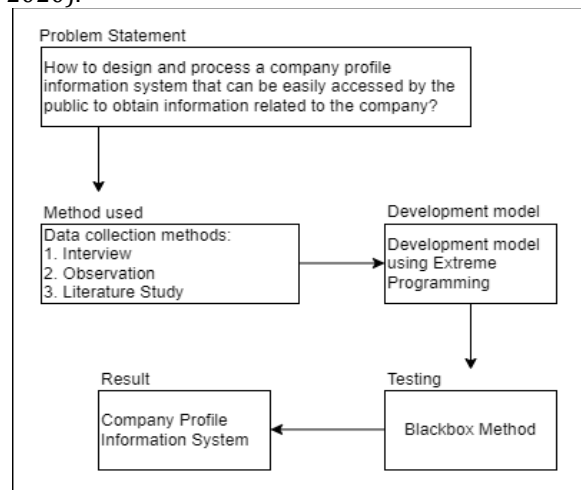
Figure 2. Design of Thinking

Figire 2 describes the stages of this method are Planning, at this stage the initial user needs are collected by identifying problems, creating user stories (Risma et al., 2021), determine the purpose and use of the software, determine the information needed, and analyze application requirements.

Next is design, by describing the system using UML models in the form of usecase diagrams and activity diagrams. Design here is a representation of the system to facilitate developers in building the system. After design, followed by coding, the system development process directly implements the design that has been made before. The activities carried out are creating a database and user interface.

Finally, testing, the system testing stage uses the black box testing method (Setiyani, 2019). The

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results of the research will be tested first so that errors can be found that may occur. Testing is done to find out whether users can learn and use the system to achieve their goals (Ningrum et al., 2019) and how big is the level of user satisfaction with the usability and use of the system created.

RESULTS AND DISCUSSION
PLAN

Planning based on the results of interviews with sources about the current system can be used as a reference for system developers in building a customer complaint data processing system so that the business context of the system can be known. The results of listening to the answers to several questions to the sources, then compiled in the form of a functional needs analysis. Functional requirements are needed to find out what processes can be carried out by the system, as well as who can use the system being built.

The following are the functional requirements of the system to be developed:
1. Admin, has the task of processing the information submitted on this company profile website, including:
   a. Processing categories of information submitted such as profile, information center, project, customer feedback and contact.
   b. Apart from the information category, the admin processes data that will be conveyed to all visitors from the subcategories provided, including company profile, vision and mission, management profile, news, project gallery, document download, organizational structure, project goals, list of customer comments, and contact information that can be contacted.
   c. Information by the admin can be done on the administrator page configuration, which consists of master data to transaction data.
   d. Admin holds full rights to changes in information that has been submitted
2. Visitors can survey information on the website and download documents if needed as additional information material. In addition, visitors can send an email to the company if they need other additional information beyond the existing information. Based on observations, interviews and user and functional identification that will be made as the basis for research on designing a website-based company profile, the following data identification such as:
   a. Company history data
   b. Photo data of company officials
   c. Image data
   d. Contact data
   e. Company service type data
   f. Client data
   g. Organizational structure data
   h. Additional information

DESIGN

Design stage using UML models in the form of usecase diagrams and activity diagrams.
1. Usecase Diagram

Usecase diagrams are used to explain the function of the system seen from the actof side for more specific purpose. Figure 3 illustrates the 2 actors owned in this information system, consisting of admin and visitors.
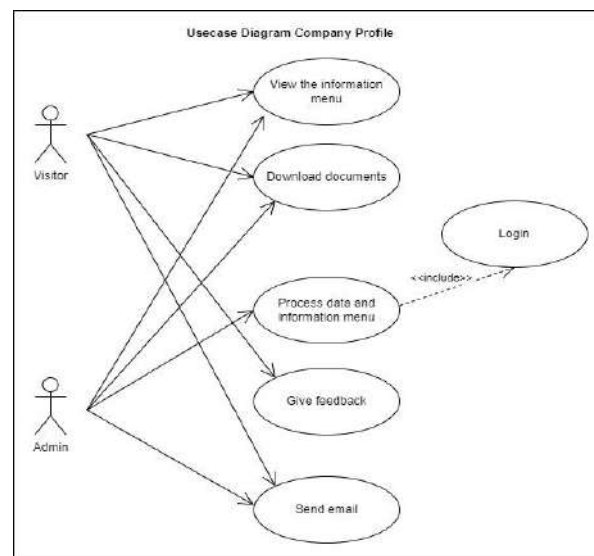

Figure 3. Usecase Diagram of Company Profile Website

The usecase diagram from Figure 3 describes what functions or services can be performed by the administrator or admin and visitors from the system. To perform user data management, the admin is required to register first and then can log in, if successful it will proceed to the dashboard page. On the dashboard page, the admin can process customer complaint data input, manage master data, manage customer complaint transactions, and recap customer complaints.

In the customer usecase, there is a function of processing customer complaint data input, here the intention is that the customer receives a complaint report notification after the data input process from the admin. In the technician usecase, there is a function of managing customer complaint transactions, this includes technicians receiving customer complaint reports from the admin after the process of inputting customer complaint data and providing feedback on repair progress.
2. Activity Diagram

Activity diagrams are used to describe the activities that exist in a system. To understand more

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about the system being created, it is necessary to make an activity diagram of the system that will be proposed. The activity diagram that is being proposed is as follows:

A. Activity Diagram – Login

User login then the system will verify the username and password entered by the user as admin. The following Figure 4 is the proposed Login Activity Diagram:
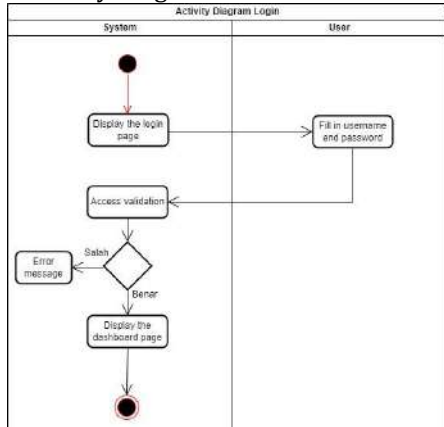

Figure 4. Activity Diagram Login

B. Activity Diagram – Processing information data

The administrator page has features to process information data that will be submitted to visitors to this website. The way for the admin to enter the administrator page is only by adding a login slash at the end of the website url. Then the admin will choose from the available features to make changes or add data as needed. The following Figure 5 is the proposed Activity Diagram:
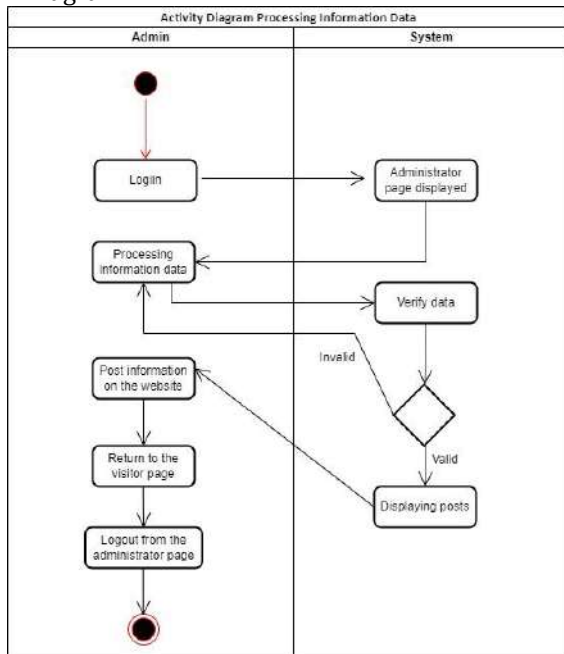
Figure 5. Activity Diagram Processing information data

C. Activity Diagram – Document Download

Visitors can download documents that have been provided by the owner through the admin as additional information about the company. the document list is on the visitor's web page. The following Figure 6 is the proposed Activity Diagram:
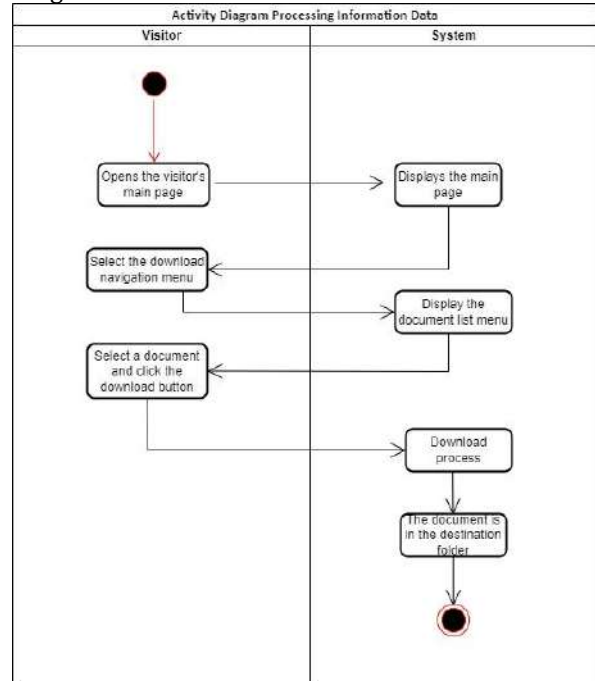
Figure 6. Activity Diagram of Document Download

CODING

The completed program must run well for the user. In the design of the information system Visual Studio Code as software that supports system design that produces the appropriate application program. Operation is carried out by activating the software as a server of the application that has been created then calling the file to be executed.

1. Dashboard Page

Figure 7. Visitor Page

Figure 7 describes the first display encountered by visitors when opening the company link. On this visitor page there are several sub menus that can be seen by visitors which contain various information needed by visitors if cooperation continues.

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2.   Profil Page

Figure 8. Company Profil Page

The profile page in Figure 8 has information related to the history and field of the company. In addition, the profile page contains information related to the field of projects that can be provided with services that are described in detail.

3.   News Page

Figure 9. News Page

A news page on a website in Figure 9 is a page that serves to display the latest news or other informative content. This page is designed to give visitors easy access to current news, related topics, and possibly additional features such as search, news categories, or other customization options. Here are some of the elements contained in a news page:

a. Headline and Date: Every news story has a headline that grabs the visitor's attention, usually followed by the date of publication to indicate the newness of the information.
b. Summary/Lead: This section contains a summary or lead that gives a brief overview of the news content. The lead aims to attract visitors' interest and explain the gist of the news.
c. Images and Media: News stories are often accompanied by images or other media such as video or audio that support the story and enhance the reading experience.
d. News Content: This section is the core of the news story, containing further explanation of the topic. It should be informative, clear, and well-organized, usually by using organized paragraphs and subheadings for easy reading.
e. Related News: Some news pages may feature a list of related news or related articles that can

interest readers and direct them to relevant content.
f. Search: A search feature that allows visitors to search for news by certain keywords can also be added to the news page.
g. News Archive: This section can include a list of past news stories that have been published, usually organized by date or category, for easy navigation and access to older stories.

The news page on the website should be designed with an attractive appearance, good user experience, and ease of navigation in mind so that readers can easily access the news they are looking for and engage with the content.

4.   Gallery Page

Figure 10. Gallery Page

Figure 10 described the gallery page on a website is intended to display a collection of images or visual media from the form of all company activities or projects. This page allows visitors to see and enjoy various artworks, photos, or other visual content presented by the company. In addition, the gallery page is designed to showcase visual works in an attractive way and make it easier for visitors to explore the collection. It is important to consider an attractive layout, intuitive navigation, and focus on the quality of the images or visual content to provide an optimal experience for visitors.

5.   Organization Structure Page
The organizational structure page on a website presents information about the hierarchical structure and relationships between parts or work units in the company. This page provides an overview of how the company is organized, who is responsible for each part, and how the relationship between these parts. The organizational structure page aims to provide a clear understanding of the structure and relationships within an organization. The design should be easy to navigate, informative, and give a professional impression that matches the image of the organization.

6.   Document Download Page
The Document Download page on this website was created with the aim of providing easy and convenient access for visitors to download relevant

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or important documents. This page presents a list or direct links to documents available for download, such as PDF files, Word documents, presentation files, forms, guides, or other materials.

There are some of the reasons why a Document Download Page is created on a website, namely easy access for visitors to download the documents they need without having to search for them throughout the site or go through a complicated navigation process. Visitors can quickly see a list of available documents and download them in a few clicks, sharing more detailed or comprehensive information in a downloadable document format, Visitors can read the document offline or save it for future reference, time, and resource savings in accessing information instantly and without having to contact or submit a special request to the company.

It is also important to keep the downloaded documents secure and pay attention to any copyright or usage permissions associated with the documents. In addition, it is also important to provide a clear description or caption on each available document so that visitors can understand the content and benefits of the document they are about to download.

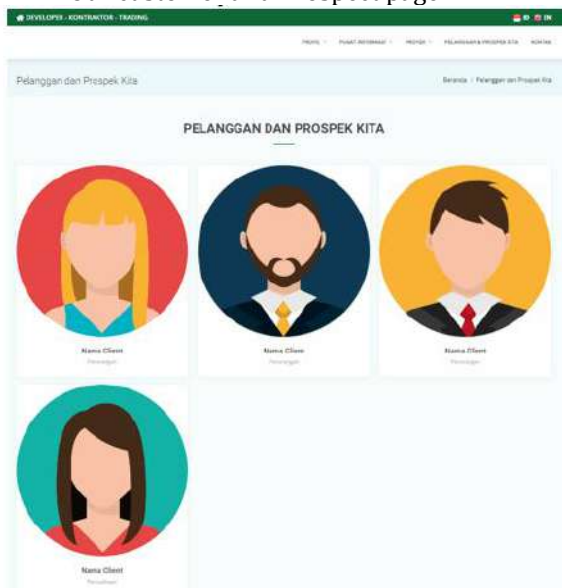7.   Our customer and Prospect page

Figure 11. Our customer and Prospect page

Figure 11 described the "Our Customers and Prospects" page on a website is created with the aim of providing information about customers and business prospects who have worked with or are interested in the company or organization that owns the website. This page can include a list or brief description of customers that have been served by the company as well as potential

customers or partners that the company is focusing on.

It is important to ensure that the information presented on the "Our Customers and Prospects" page is accurate and relevant. The Company should obtain consent or permission from customers before including their names or logos in the customer list. In addition, it is necessary to maintain the confidentiality of sensitive information that may relate to such customers or business prospects.

Users can register on the login page if there are new users who will process on this website. Prospective users can fill in their full name, email, and password, then in the last section prospective users can choose a session according to the needs of prospective users. After filling in these data, the admin will verify the prospective user's data so that at the next stage change the status of the prospective user to a user with login access according to the session.

TESTING
Testing is one of the most important parts of making a program. Testing is done to ensure quality and also find out the weaknesses of the program. The purpose of software testing is to ensure that the software built has reliable quality, which is able to present the main studies of specifications, analysis, design, and coding of the software itself.
Blackbox testing on this company profile website is done by focusing on testing the functionality and performance of the website without paying attention to the implementation details or the code behind it. The purpose of black box testing is to ensure that the website functions properly and in accordance with user expectations. Here are some steps that can be taken in blackbox testing for a company profile website:

1.   Testing Plan
   Testing this program uses the Black Box testing method. Black Box testing focuses on the functional requirements of the application created as shown in Table 1 as follows:

Table 1. Black Box Test Plan

Test Class	Testing	Type Testing
Navigation Testing	Ensure website navigation works properly	*Black Box*
Display and Responsiveness Testing	display the website on various devices and screen resolutions to ensure good responsiveness	*Black Box*

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Test Class	Testing	Type Testing
Document Download Testing	Users can download documents that are provided as additional information.	*Black Box*
Browser Compatibility Testing	make sure the download link works properly and users can download the document without any problems	*Black Box*
Speed and Performance Testing	pages do not take too long to load	*Black Box*
Link and Link Testing	no links are broken or lead to the wrong page	*Black Box*

2. Implementation and Results Test
Navigation Testing: Testing the website menus that have been provided functions can be accessed such as the main menu, company profile menu, information center menu, project menu, customer menu and our prospects, and contact menu, and the explanation in Table 2 is as follows:

Table 2. Navigation Testing

Input Data	Which expected	Observation	Conclusion
Select the navigation menu	Display information according to the selected navigation	In accordance with What to expect	[X] Accepted [ ] Rejected

Test Result (Faulty data)			
Input Data	Which expected	Observation	Conclusion
Select the navigation menu	Display information that does not match the selected navigation	Display the selected navigation	[ ] Accepted [X] Rejected

3. Display and Responsiveness Testing: Testing the website display on various devices such as smartphones, notebooks and personal computers and the resolution layer of each device can adjust in the sense that the responsiveness of the website is functioning properly, and the explanation in Table 3 is as follows:

Table 3. Display and Responsiveness Testing

Input Data	Which expected	Observation	Conclusion
Website accessed on *smartphones*, *notebooks,* and *personal computers*	The responsiveness function of the website works according to the device used.	In accordance with What to expect	[X] Accepted [ ] Rejected

Test Result (Faulty data)			
Input Data	Which expected	Observation	Conclusion
Website accessed on *smartphones*, *notebooks,* and *personal computers*	Responsiveness The website does not work when opened on *smartphones*, *notebooks,* and *personal computers.*	Responsive website adjusts to the device being used	[ ] Accepted [X] Rejected

4. Document Download Testing: If the website provides downloadable documents, ensure that the download link works properly and users can download the documents without any issues.

Table 4. Document Download Test Results

Input Data	What to expect	Observation	Conclusion
Select the file to be downloaded on the Download Document page.	The file is downloaded and matches the one selected by the user	In accordance with What to expect	[X] Accepted [ ] Rejected

Test Result (Faulty data)			
Input Data	Which expected	Observation	Conclusion
Select the file to be downloaded on the Download Document page.	It takes a long time to download what you want.	The document download page displays quickly	[ ] Accepted [X] Rejected

5. Browser Compatibility Testing: Test on a variety of commonly used browsers (such as Chrome, Firefox, Safari, and Internet Explorer) to ensure that the website displays properly and works on all these platforms.

Table 5. Browser Compatibility Testing Results

Input Data	Which expected	Observation	Conclusion
Website accessed on browsers including Chrome, Firefox, Safari, and Internet Explorer	Website can display properly on Chrome, Firefox, Safari, and Internet Explorer browsers	In accordance with What to expect	[X] Accepted [ ] Rejected

Test Result (Faulty data)			
Input Data	**Which expected**	**Observation**	**Conclusion**
Website accessed on browsers including Chrome, Firefox, Safari, and Internet Explorer	Different website views from different types of browsers namely Chrome, Firefox, Safari, and Internet Explorer	Website display remains consistent even though different browsers Chrome, Firefox, Safari, and Internet Explorer	[ ] Accepted [X] Rejected

6. Speed and Performance Testing: Check the loading speed of the website to ensure that pages do not take too long to load. Ensure that images and content are well compressed and the cache is set correctly to improve website performance.

Table 6. Speed and Performance Testing Results

Input Data	What to expect	Observation	Conclusion
Opens the gallery page and news page.	Open and display pages quickly	In accordance with What to expect	[X] Accepted [ ] Rejected

Test Result (Faulty data)			
Input Data	**Which expected**	**Observation**	**Conclusion**
Open the gallery page and news page	It takes a long time to load the desired images, videos, and news.	Gallery and news pages display quickly as well as images and news	[ ] Accepted [X] Rejected

7. Link Testing: Check all the links within the website to ensure that none of the links are broken or lead to the wrong page.

Table 7. Link Testing Results

Input Data	Which expected	Observation	Conclusion
Click links and links one by one	Go to the appropriate view or page	In accordance with What to expect	[X] Accepted [ ] Rejected

Test Result (Faulty data)			
Input Data	**Which expected**	**Observation**	**Conclusion**
Click on links and links one by one	Go to the wrong view or page	Go to the page according to the link and link destination	[ ] Accepted [X] Rejected

Blackbox testing helps ensure that the company profile website functions properly and provides a good user experience. It is also important to test it using representative and diverse data, so as to identify any issues or shortcomings that may arise when used by actual users.

CONCLUSION

The development of a company profile information system has significant benefits for companies. With increased visibility, relevant information provided, enhanced professionalism, and wide marketing reach, the company can strengthen its brand image. The system assists the company in effective presentation to the audience, increases the trust of potential clients and business partners, and provides easy access to company information. Thus, the development of a company profile information system is an important investment that brings long-term benefits and helps companies build a strong and successful reputation in today's digital era..

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