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PREFACE

Editor of JITK (Jurnal Ilmu Pengetahuan dan Teknologi Komputer), 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 JITK editors to publish JITK Vol. 5, No. 2 February 2020, 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.

JITK is published 1 (one) year for 2 (two) times at the end of each semester, JITK 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 JITK 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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THE IMPLEMENTATION OF NAÏVE BAYES AND SUPPORT VECTOR MACHINE (SVM) ALGORITHM, IN DETERMINING ACHIEVING STUDENTS IN SMP NEGERI 8 CIMAHI

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Abstract— In schools that excel, many students have the ability, sometimes they are still confused in determining student achievement. Many students make teachers observant in determining student achievement, students tend to have almost the same probability of being the same, making it difficult for teachers to make decisions. In selecting students who excel, teachers who find it difficult to make decisions because they are not supported by the system to predict the selection and when choosing still use manual calculations this causes a decrease in effectiveness and can be subjective in choosing students who qualify for scholarships, inefficient in terms of time and a human error occurs. This study aims to determine which accuracy is better than the Naïve Bayes Algorithm and Support Vector Machine (SVM) in determining outstanding students. This research, using 400 student data with 10 attributes and in processing the data using R Studio. After testing, was it found that the supporting vector algorithm was 93% accurate and 88% for the Naïve Bayes algorithm. The Support Vector Machine algorithm has better accuracy than the Naïve Bayes algorithm in determining outstanding students at SMP Negeri 8 Cimahi.

Keywords: Naïve Bayes, Support Vector Machine, Student achievement

Abstrak— *Di sekolah yang berprestasi sangatlah banyak siswa yang mempunyai kemampuan, guru terkadang masih merasa kebingungan dalam menentukan prestasi siswanya. Banyaknya siswa membuat guru harus jeli dalam menentukan prestasi siswa, siswa cenderung memiliki kemampuan hampir rata-rata sama sehingga menyulitkan guru dalam mengambil keputusan. Dalam pemilihan siswa yang berprestasi, guru terkadang kesulitan untuk mengambil keputusan dikarenakan belum didukung oleh sistem untuk memprediksi dalam seleksi dan saat memilih masih menggunakan perhitungan manual hal ini menyebabkan penurunan efektifitas dan bisa subjektif dalam memilih siswa yang memenuhi syarat untuk mendapatkan beasiswa, tidak efisien dari segi waktu dan terjadi human error[1][1](Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017)(Kartika et al., 2017). Penelitian ini bertujuan untuk untuk mengetahui akurasi mana yang lebih baik dari Algoritma Naïve Bayes dan Support Vector Machine (SVM) dalam menentukan siswa berprestasi. Pada penelitian ini menggunakan sebanyak 400 data siswa dengan 10 atribut dan dalam pengolahan datanya mengunakan R Studio. Setelah dilakukan pengujian didapati hasil akurasi untuk algoritma support vector machine sebesar 93% dan untuk algoritma Naïve Bayes 88%. Algoritma Support Vector Machine nilai akurasinya lebih baik dari algoritma Naïve Bayes pada penentuan siswa berprestasi pada SMP Negeri 8 Cimahi.*

Kata Kunci:, *Naïve Bayes, Support Vector Machine, Siswa Berprestasi*

INTRODUCTION

Education is the most important thing in our lives, this means that every Indonesian human being has the right to get it and is expected to always develop therein. Education at the junior high school level is a foundation-laying in preparing the next generation to become humans who are ready to

compete in an increasingly advanced era. Quality and quality education is also in the heart of each student's parents, for example, a school that has many achievements is also a consideration.

In schools that excel some so many students have the ability, teachers sometimes still feel confused in determining student achievement. Learning achievement is defined as the achievement of students in completing the lesson stamp that is well-received [2]. The number of students makes teachers observant in determining student achievement, students tend to have almost the same ability, making it difficult for teachers to make decisions. This decision will certainly identify students who are likely to experience difficulties and obstacles in learning [3].

In selecting students who excel, teachers sometimes find it difficult to make decisions because they are not supported by the system to predict the selection and when choosing still use manual calculations this causes a decrease in effectiveness and can be subjective in choosing students who qualify for scholarships [4], inefficient in terms of time [5], human error occurs [1], large amounts of data cannot be handled [6].

Tabel 1 Research Literature

Literatur Supports	Kernel	Classifier	Accuracy
Application of Naïve Bayes Data Mining Method to Predict Learning Outcomes of Junior High School Students [7]	-	Naïve Bayes	56.79%
Analysis of the Performance of the C4.5 Algorithm and Naïve Bayes in Predicting the Success of Schools in Facing the National Examination [3].	-	Naïve Bayes	95.50%
Data Mining Method for Selection of Prospective Students for New Student Admissions at Pamulang University [8]	-	Support Vector Machine (SVM)	65%
Application of the Classification Algorithm to Support the Decision of Awarding Student Scholarships [9]	-	Naïve Bayes	80%
Application of the Support Vector Classification Method Machine (SVM) on Accreditation Data for Primary Schools (SD) in Magelang Regency [10]	Gaussian Radial Basis Function (RBF)	Support Vector Machine	93.902%

From table 1 it is explained that data mining can help in making decisions, data mining is very suitable for decision-making techniques [11], besides that data mining is a popular technique for determining student performance [12]. Due to data mining, the speed and accuracy of decision-making are effective and time-efficient, large data cannot be done quickly if it is still using manual methods [13]. Therefore, to assist Cimahi State Junior High School in selecting outstanding students, a method is needed that can assist in the data processing. This study aims to determine which accuracy is better than the Naïve Bayes Algorithm and Support Vector Machine (SVM) in determining outstanding students.

MATERIALS AND METHODS

The stages in this research are:
a. Data collection
   In this study, the authors took data from SMP Negeri 8 Cimahi which consisted of 4 00 student data with the attribute names NIM, Name, Gender, Attendance, Skills Mid-Term Exam, Knowledge Final Exam, Skills Final Exam, Knowledge Final Exam, Predicate, Extracurricular.
b. Initial Processing of Data
   Preprocessing carried out on the dataset, namely:
   1) Data Cleaning
   2) The data cleaning stage includes the process of cleaning data by removing duplicate data, checking for inconsistent data, and correcting errors in data, such as typos.
   3) Data Transformation
      In the transformation data itself, it can be obtained from the unit test data sample, where the data is converted from a variable to a numeric by providing a label for each character to calculate the value of the matrix using the algorithm method that will be used.
c. Data Test
   Is part of the dataset that is tested to see its accuracy, or in other words, to see its performance.
d. Model Used
   The model used is Naïve Bayes and Support Vector Machine (SVM)
e. Data Testing
   Is a part of the dataset that is trained to make predictions or carry out the functions of an algorithm. We provide clues through algorithms so that the trained machine can look for correlations on its own or learn patterns from the given data.
f. Experiment and Model Testing
   Experiments in this study using R studio in the data processing.

g. Evaluation and Validation of Results
    To perform accuracy, precision, and recall measurements using a confusion matrix.

    The following is a picture of the model from this research:
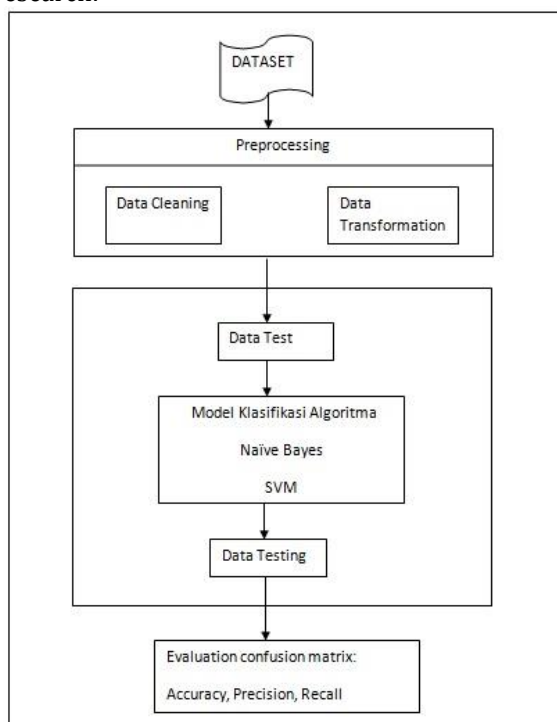
Source: [14]

Figure 1. Research Model

RESULTS AND DISCUSSION

Research data

    This research data is a collection of value Rapo r, grade 9 student extracurricular activities, the amount of data that studied 400 students, with the translation of each data has attribute used in the calculation process that will be used for determining students who excel. Following the student, data attributes are presented in tabular form.

Table 2 Student data attributes

No	Attribute	Information
1	NIM	Attribute that informs the student's NIM
2	Nama	Attribute that informs the student's name
3	Pendidikan Agama	Attributes that inform the value of Religious Education lessons
4	PPKN	Attributes that inform the value of the PPKN lesson
5	Bahasa Indonesia	Attributes that inform the value of Indonesian lessons
6	Matematika	Attributes that inform the value of a Math lesson

No	Attribute	Information
7	IPA	Attributes that inform the value of a science lesson
8	IPS	Attributes that inform the value of social studies lessons
9	Bahasa Inggris	Attributes that inform the value of English lessons
1	Seni Budaya	Attributes that inform the value of Cultural Arts lessons
11	Penjaskes	Attributes that inform the value of Penjaskes lessons
12	Prakarya	Attributes that inform the value of Practice lessons
13	Bahasa Sunda	Attributes that inform the value of Sundanese lessons
14	Ketidak hadiran, Sakit, Ijin, Alpha	Attributes that inform attendance
15	Ektra Kulikuler 1	Attributes that indicate extracurricular value 1
16	Ektra Kulikuler 2	Attributes that indicate extracurricular value 2
17	Ektra Kulikuler 3	Attributes that indicate extracurricular value 3

Data Selection

    In student data, attributes are selected and selected for use in the mining process. then the attributes that will be used in the study are presented in the table.

Table 3. Attribute selection

No	Attribute
1	NIM
2	Nama
3	Jenis Kelamin
4	Absensi
5	UTS Keterampilan
6	UTS Pengetahuan
7	UAS Keterampilan
8	UAS Pengetahuan
9	Predikat
10	Ekstrakulikuler

Model Testing with the Naïve Bayes Method

    Naïve Bayes is a classification based on the Bayes theorem and is used to calculate the probability of each class with the assumption that one class is independent of one another. In this method, all attributes will contribute to decision making, with attribute weights that are equally important and each attribute is independent of one another (Saputra, 2018).

$$P(v_j) = \frac{N}{sum} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

information:
$P(v_j)$ = Probability hypothesis v_j (prior)

N = Amount of training data where $v = v_j$
Sum = Amount of training data

Testing using the Rstudio application with the Naïve Bayes method. This process is a calculation to find the accuracy of the dataset. The following is the calculation table 4 from Naïve Bayes using R Studio.

Tabel 4. Calculation of Naïve Bayes eith R Studio

	accuracy <dbl>	precision <dbl>	recall <dbl>
A	0.8888889	NaN	0.0000000
B	0.8888889	0.8888889	0.9655172
C	0.8888889	0.8888889	0.8648649
D	0.8888889	NaN	0.0000000

Confusion Matrix and Statistics
Reference

Prediction	A	B	C	D
A	0	2	0	0
B	0	56	2	0
C	0	5	32	0
D	0	0	2	0

Overall Statistics

Accuracy	:	0.8889
95% CI	:	(0.8099, 0.9432)
No Information Rat	:	0.6364
P-Value [Acc > NIR]	:	1.249e-08
Kappa	:	0.7738
Mcnemar's Test P-Value	:	NA

Statistics by Class:

	Class: A	Class: B	Class: C	Class: D
Sensitivity	NA	0.8889	0.8889	NA
Specificity	0.9798	0.9444	0.9206	0.9798
Pos Pred Value	NA	0.9655	0.8649	NA
Neg Pred Value	NA	0.8293	0.9355	NA
Prevalence	0.0000	0.6364	0.3636	0.0000
Detection Rate	0.0000	0.5657	0.3232	0.0000
Detection Prevalence	0.0202	0.5859	0.3737	0.0202
Balanced Accuracy	NA	0.9167	0.9048	NA
			R Console	

From the calculation using the Naïve Bayes method with the results, the environment for the data set is 400 data, the overall test_set is 99 and the training_set is 301 with an accuracy of 88%.

Model Testing with Support Vector Machine

Support Vector Machine (SVM) is a selection method by assessing the standard parameters of the candidate set to draw the accuracy that has the best classification value [15] SVM has a basic principle of linear classifier, namely classification cases that can be separated linearly, however, SVM has been developed to work on non-linear problems by incorporating the kernel concept in a high-dimensional workspace. In high-dimensional space, a hyperplane (hyperplane) will be sought which can maximize the distance (margin) between data classes.

The measurement of classification performance on the original data and the resulting data from the classification model was carried out using cross-tabulation (confusion matrix) which contains information about the original data class represented on the matrix row and the predictive data class of an algorithm represented in the classification column.

Tabel 5. Three Class Confusion Matrix

Fgh		Prediction Class (h)		
		Class 1	Class 2	Class 3
Original Class (g)	Class 1	F11	F12	F13
	Class 2	F21	F22	F23
	Class 3	F31	F31	F33

Classification accuracy shows the overall performance of the classification model, where the higher the classification accuracy, this means the better the classification model performance.

$$\text{Classification accuracy} = \frac{F11+F22+F33}{F12+F13+F21+F23+F31+F32+F11+F22+F33} \quad \text{(2)}$$

$$\text{Classification error} = \frac{F12+F13+F21+F23+F31+F32}{F12+F13+F21+F23+F31+F32+F11+F22+F33} \quad \text{(3)}$$

All classifications attempt to form models with high accuracy values and low error rates.

Table 6. Calculation of SVM with R Studio

	accuracy <dbl>	precision <dbl>	recall <dbl>
A	0.9393939	NaN	NaN
B	0.9393939	0.9682540	0.9384615
C	0.9393939	0.8888889	0.9411765
D	0.9393939	NaN	NaN

Confusion Matrix and Statistics
Reference

Prediction	A	B	C	D
A	0	2	0	0
B	0	62	4	0
C	0	2	32	0
D	0	0	0	0

Overall Statistics

Accuracy	:	0.9394

95% CI	:	(0.8727, 0.9774)
No Information Rat	:	0.6364
P-Value [Acc > NIR]	:	1.616e-12
Kappa	:	0.8675
Mcnemar's Test P-Value	:	NA

Statistics by Class:

	Class: A	Class: B	Class: C	Class: D
Sensitivity	NA	0.9683	0.8889	NA
Specificity	1	0.8889	0.9683	1
Pos Pred Value	NA	0.9385	0.9412	NA
Neg Pred Value	NA	0.9412	0.9385	NA
Prevalence	0	0.6364	0.3636	0
Detection Rate	0	0.6162	0.3232	0
Detection Prevalence	0	0.6566	0.3434	0
Balanced Accuracy	NA	0.9286	0.9286	NA
			R Console	

From the calculation using the support vector machine (SVM) method with the results, for the data set that is 400 data, the overall test_set is 99 and the training_set is 301 with an accuracy of 93%.

Other attributes will be analyzed based on predetermined classes, namely gender class and class based on achievement. From visualize, data can be read and found new from that data. For more details, it will be explained below each visualize of the attributes used.

Class-based on gender

The results of visualizing observations on gender attributes are divided into two (2), namely (0) and (1), code (0) is for the male gender, while code (1) is for the female gender. Meanwhile, the predicate itself is divided into four (4), namely code (0), (1), (2), and (3) the translation of the code (0) = grade A, (1) = grade B, (2) = grade C, and (3) = grade D, from the graph below it can be seen that the predicate that is most abundant in the table below is female.

Figure 2 . Achievement chart seen from a gender

Class-based on student achievement

The results of visualizing observations on student achievement attributes are divided into five (5) namely UTS Knowledge, Final Exam Knowledge, Attendance, Extracurricular, and Predicate.

Figure 3. Prestasi Siswa SMP 8 Cimahi

From the results of the calculation process using R studio by displaying the results of the data that has been processed above. This column provides information about the 9th-grade student data taken in 2020. Next is to find out the accuracy level of the Naïve Bayes algorithm and support vector machine (SVM), in testing using the R studio application, each has a difference in accuracy results. This shows that in comparison to the use of the support vector machine (SVM) algorithm method with an accuracy of 93% the results are better than the use of the Naïve Bayes algorithm method with an accuracy of 88%.

CONCLUSION

Based on the results of testing, and data analysis it can be concluded that the implementation of the SVM algorithm and Naïve Bayes in the classification of student achievement at SMP Negeri 8 Cimahi, the accuracy results obtained from the calculation of the two methods using the Rstodi application, namely SVM produces an accuracy of 93% and the Naive Bayes method of 88%. Based on the comparison of methods obtained from the testing above, the SVM method is a good method with a total average accuracy of 0.93%.

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DECISION SUPPORT SYSTEM FEASIBILITY OF GRANTING RECEIVABLES ON GOODS EXPORT SERVICES IN FREIGHT FORWARDING COMPANY WITH PROFILE MATCHING METHOD

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Abstract— Decision Support System (DSS) is a system that is able to provide problem solving skills in both semi-structured and unstructured ways. The company's role in the import-export business is very important because it can meet the needs of people who have been doing business in the trade sector, both domestic trade and international trade. Indonesia as a country with a high volume of international trade requires a transportation service company that can support goods export activities by providing payment facilities with a certain time period. The problem that occurs is that there are customers who experience congestion in payment of receivables. This is because there is no standardized procedure in determining the granting of receivables so that it is difficult to determine the feasibility of granting receivables to customers. Therefore, researchers will conduct research on a decision support system with the profile matching method to determine the feasibility of granting receivables to goods export services by applying the 5C principle so that decision makers do not use intuition again and have methods or standardized procedures in providing receivables to customers. This research is expected to help determine the feasibility of receivables by applying the 5C principle, it is hoped that it can help decision makers in making decisions about giving credit to customers.

Keywords: **Export, 5C principles, Profile Matching, Decision Support System**

Abstrak—*Sistem Pendukung Keputusan (SPK) adalah sebuah sistem yang mampu memberikan kemampuan pemecahan masalah baik secara semi terstruktur maupun tidak terstruktur. Peran perusahaan dalam bisnis ekspor impor sangat penting karena dapat memenuhi kebutuhan masyarakat yang telah melakukan bisnis dalam bidang perdagangan, baik perdagangan domestik maupun perdagangan internasional. Indonesia sebagai negara dengan volume perdagangan internasional yang tinggi membutuhkan perusahaan jasa angkutan yang dapat menunjang kegiatan ekspor barang dengan memberikan fasilitas pembayaran dengan tempo waktu tertentu. Permasalahan yang terjadi adalah adanya customer yang mengalami kemacetan dalam pembayaran piutang. Hal ini dikarenakan belum adanya standarisasi prosedur dalam penentuan pemberian piutang sehingga sulit menentukan kelayakan dalam pemberian piutang terhadap customer. Oleh karena itu, peneliti akan membuat penelitian mengenai sistem pendukung keputusan dengan metode profile matching untuk menentukan kelayakan pemberian piutang pada jasa ekspor barang dengan menerapkan prinsip 5C sehingga decision maker tidak menggunakan intuisi kembali dan memiliki metode atau standarisasi prosedur dalam memberikan piutang terhadap customer.Hasil pada penelitian ini diharapkan dapat membantu untuk menentukan kelayakan piutang dengan menerapkan prinsip 5C, diharapkan dapat membantu decision maker dalam pengambilan keputusan pemberian piutang terhadap customer.*

Kata kunci: Ekspor, prinsip 5C, Profile Matching, Sistem Pendukung Keputusan

INTRODUCTION

The role of freight forwarding services greatly facilitates exports and imports in the process of sending goods across national borders. In Indonesia, freight forwarder companies have started to exist in 1970 although they are still only in the form of groups [1]. Currently, Indonesia has entered the era of the global market, where all barriers to trade activities are small but competition is high in the world of trade [2]. Accounts receivable activity very often done in the world of freight

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forwarding. Accounts receivable is an income that will be received from a company in the form of cash, either as a result of the delivery of goods and services on credit or as a result of overpayment of cash to other parties [3]. The provision of Accounts receivable is carried out to speed up the process of exporting goods for customers who routinely use freight forwarding services [4]. Based on initial observations made on the object of research, the problem that occurs is that there are customers who experience congestion in making payments for receivables. This happens because decisions in granting receivables is only made using the intuition of the decision maker. The profile matching method is the method used in this study which is carried out based on the 5C principle (Character, Capacity, Collateral, Capital, Condition) [5]

Decision Support System

A decision support system can be defined as a system designed and used to support management in decision making [6][7][8]. Decision support systems can be used by someone in making decisions to be more effective [9].

Accounts receivable

Accounts receivable are company claims to other parties (companies) due to previous events in the form of money, goods, services or in the form of other non-cash assets that must be billed on the due date [10]. Receivables include all money claimed against other entities, both individuals, companies and other organizations [11].

Profile Matching Method

The Profile Matching method is a decision making by assuming an ideal predicate variable that must be met [12]. The profile matching method or better known as the GAP method (weighting value) is a method that often used in decision making by assuming that there is an ideal level of predictor variable and must be met. [9].

MATERIALS AND METHODS

The system development method approach used by researchers is the profile matching method [13]. The Profile Matching procedure is as follows:

1. Competency GAP Mapping

The competency gap is the difference between the existing criteria and the desired criteria [14]. The competency GAP formula is: GAP = Criteria Value – Minimum Value

2. Determination of weighting

If the GAP mapping has completed, then the results from the mapping are given a weighted value

according to the benchmark table 1 the weight of the GAP value.

Table 1. GAP Value Weight

No	GAP difference	Value Weight	Description
1	0	5	Competence as required
2	1	4,5	Competency of the subject excess 1 level
3	-1	4	Competency of the subject lacks 1 level
4	2	3,5	Competency of the subject excess 2 level
5	-2	3	Competency of the subject lacks 2 levels
6	3	2,5	Competency of the subject excess 3 level
7	-3	2	Competency of the subject lacks 3 levels
8	4	1,5	Competency of the subject excess 4 level
9	-4	1	Competency of the subject lacks 4 levels

3. Calculation and Grouping (*core factor and secondary factor*)

After we determine the weight of the gap value, then each aspect is grouped into 2 groups, namely the core factor and secondary factor.

- Core factor is an aspect that most needed. The formula used to calculate the core factor is:

$$NCF = \frac{\sum NC\ (5c)}{\sum IC} \dots\dots\dots\dots\dots\dots (1)$$

Where:
NCF = The average value of core factor
NC(5C) = Total value of core factor (Character, Capacity, Collateral, Capital, Condition)
IC = Number of core factor items

- Secondary factors are items other than aspects that exist in the core factor. To calculate the secondary factor the formula used is:

$$NSF = \frac{\sum NS\ (5c)}{\sum IS} \dots\dots\dots\dots\dots\dots (2)$$

Where:
NSF = Average value of secondary factor
NS(5C) = Total value of secondary factor (Character, Capacity, Collateral, Capital, Condition)
IS = Number of secondary factor items

4. Total Calculation

From all the results of the calculation of each principle, the next step is to calculate the total value based on the percentage of core factors and

secondary factors that will affect the customer profile. [15]. The following is the formula to calculate the total value of each aspect:

$$(x)\% \; NCF + (x)\% \; NSF = N(5c) \; \text{...........................} \; (3)$$

Where:
(X)%   = Inputted percentage value
NCF   = Core factor average
NSF   = Average value of secondary factor
N   = The total value of the 5c principle
N(5c)   = *(Character, Capacity, Collateral, Capital, Condition)*

5. Calculation of Ranking
The result of the profile matching process is the ranking of customers who are eligible for credit. The determination of the ranking refers to the calculation results that have been obtained by the following formula:

$$\begin{aligned}
Final\;score = {}& (x)\% NCharachter \\
& + (x)\% NCapacity \\
& + (x)\% NColleteral \\
& + (x)\% NCapital \\
& + (x)\% \, NCondition
\end{aligned}$$

A. Prinsip 5C
The 5C principle is a principle that is used as a reference in granting credit to someone [16].

B. Data Collection
The data collection method used by the researcher is:
1. Interview
    The interview is to ask questions directly to the decision-maker so that data and information collection will be more relevant and accurate.
2. Observation
    Observation techniques are carried out by making observations to obtain the required data.
3. Literature Study
    Data collection is generated by researching, studying, reading several books, and reading journals related to decision support systems. In this case, the research conducted is related to the import of goods in freight forwarding companies, the feasibility of granting receivables, the profile matching method, etc.
4. Documentation
    Documentation is collecting documents related to data requirements that can support procedures. In this case, all documents that are owned are obtained through documents or archives originating from the company under study. In this study, data collection was carried out by studying facts or data such as the process of exporting goods at PT Carbin Teknologi

Logistik, customer data and receivable payment methods as well as receivables data.

Character, Capacity, Capital, Collateral, Condition of Economy is known as the 5C principle. The following is a hierarchy of decision-making for granting receivables.

1. Character
    Character consists of 2 parts, namely HSCode and destroy. HSCode is an international code in the grouping of types of goods. Meanwhile, destroy is if the export goods have entered the country and the tax is high, then the exporter does not want to pay the tax. Table 2 describes some of the criteria that will be used in the HSCode criteria.

Table 2. HSCode Criteria

HSCode Criteria	Description	Weight Value
GreenLine	Without checking	3
Green Yellow	Documents required	2
Green Red	Required physical inspection of goods	1

Table 3 explains some of the criteria that will be used in the criteria for destroying goods.

Table 3. Item Destroy Criteria

Item Destroy Criteria	Description	Weight Value
Frequently	>10	1
Moderate	5-10	2
Infrequently	0-5	3

2. Capacity
    Capacity consists of 2 parts, namely the number of transactions per month (kilograms) and the average invoice per month. The number of kilograms per month is the number of kilograms of shippers per month and the average invoice per month is the average invoice shipper per month. Table 4 describes several criteria that will be used in the criteria for the number of transactions.

Table 4. Criteria Number of transactions

Criterion	Description	Weight Value
High	>1000 kg	5
High Enough	801-1000 kg	4
Moderate	501-800 kg	3
Moderate enough	301-500 kg	2
Not enough	100-300 kg	1

Table 5 explains some of the criteria that will be used in the criteria for the Average invoice per month.

Table 5. Criteria for Average Invoice Per Month

Criterion	Description	Weight Value
Very good	>30 million	4
Good	21-30 million	3
Moderate	11-20 million	2
Deficient	1-10 million	1

3. Capital

Capital consists of 2 parts, namely SIUP and number of employees. SIUP is a permit issued by the minister or appointed official to entrepreneurs to carry out business in the trade and services sector. While the number of employees is the number of employees in the shipper company.

Table 6 describes several criteria that will use in the SIUP criteria.

Table 6. SIUP Criterion

SIUP Criterion	Weight Value
High	3
Medium	2
Small	1

Table 7 describes some of the criteria used as criteria for the number of employees.

Table 7. Criteria Number of Employees

Criteria	Number of employees	Weight Value
Small	1-20	1
Medium	21-100	2
High	>100	3

4. Collateral

The collateral consists of 2 parts, namely the percentage of deposits and freight. The percentage of deposits is the percentage of deposits that must be deposited from the average invoice value per month and freight is the value of goods. Table 8 explains some of the criteria used in the criteria for the percentage of deposits.

Table 8. Deposit Percentage Criteria

Criteria	Description of Deposit Percentage	Weight Value
High	31-50%	3
Medium	11-30%	2
Low	1-10%	1

Table 9 describes some of the criteria used in freight.

Table 9. Freight Criteria

Criterion	Freight Description	Weight Value
High	>1500	3
Medium	101-1500	2
Small	1-100	1

5. Condition of Economy

The condition of the economy consists of 2 parts, namely the feasibility of the business field and the type of goods. The line of business that is feasible or not is the feasibility of the business field of the company that will be given the receivables. and the type of goods is the company that will be given receivables engaged in the business what type of goods. Table 10 describes some of the criteria used in the eligibility criteria for the business sector.

Table 10. business feasibility

Criteria	Weight Value
Industry	3
Distributor	2
Service	1

Table 11 explains some of the criteria used in the criteria for types of goods.

Table 11. Criteria of Types of goods

Item criteria	Weight Value
Consumption	1
Industry	2
Standard	3

Each principle has a different weight according to the 5C principle. Table 12 describes the weighted values of each of the 5C principle criteria.

Table 12. 5C principle weighting

Principle	Weight Value
Character	25%
Capacity	25%
Capital	15%
Collateral	20%
Condition of Economy	15%

RESULTS AND DISCUSSION

In this research, a decision support system will be made using the profile matching method to determine the feasibility of granting receivables. All data used in this study were obtained from interviews, observations, literature studies, and documentation in freight forwarding companies. Table 13 contains the criteria that have been determined as the core factor and secondary factor of each principle and the company's target value.

Table 13. Core Factor and Secondary Factor and Company Target Value

No	Valuation Principle	Code	Group	Company Target Value
1	**Prinsip** *Character*	**CR**	-	-
	a. HSCode	K1	CF	3

	b. Destroy goods	K2	SF	3
2	**Capacity Principle**	**CY**	-	-
	a. Number of transactions per month (kg)	K3	CF	5
	b. Average invoice per month	K4	SF	4
3	**Capital Principle**	**CL**	-	-
	a. SIUP	K5	CF	3
	b. Number of employees	K6	SF	3
4	**Collateral Principle**	**CT**	-	-
	a. Deposit percentage	K7	CF	3
	b. *Freight*	K8	SF	3
5	**Condition of Economy Principle**	**CE**	-	-
	a. Eligibility of business field	K9	CF	3
	b. Types of goods	K10	SF	3

After determining the criteria and weights of each criterion to be used, the next step is to explain the calculations and the expected outputs in this study. The following is an explanation of the calculation and expected output:
1. Criteria:
a. HSCode (K1)
b. Destroy goods (K2)
c. Number of transactions per month (kg) (K3)
d. Average invoice per month (K4)
e. SIUP (K5)
f. Number of employees (K6)
g. Deposit percentage (K7)
h. Freight (K8)
i. Business Feasibility (K9)
j. Types of goods (K10)

2. Determine the value of each Shipper.
Table 14 is the value of the character criteria obtained.

Table 14. Value of Character Criteria

No	Shipper's Name	HSCode (K1)	Destroy goods (K2)
1	PT IVS Express	1	1
2	PT Taxas Integrasi	2	2

Table 15 is the value of the capacity criteria obtained.

Table 15. Value of Capacity Criteria

No	Shipper's Name	Number of transactions per month (K3)	Average Invoice (K4)
1	PT IVS Express	1	1
2	PT Taxas Integrasi	4	3

Table 16 contains the value of the capital criteria obtained.

Table 16. Value of Capital Criteria

No	Shipper's Name	SIUP (K5)	Number of employees (K6)
1	PT IVS Express	1	1
2	PT Taxas Integrasi	2	2

In table 17 is the value of the collateral criteria obtained.

Table 17. Value of Collateral Criteria

No	Shipper's Name	Deposit Percentage (K7)	Freight (K8)
1	PT IVS Express	1	1
2	PT Taxas Integrasi	3	2

Table 18 is the value of the condition of economy criteria obtained.

Table 18. Value of Condition of Economy Criteria

No	Shipper's Name	Business Feasibility (K9)	Types of goods (K10)
1	PT IVS Express	1	1
2	PT Taxas Integrasi	3	2

3. Determine the value of the gap from each criterion.
Table 19 is the determination of the calculation of the value of the gap character criteria.

Table 19. Gap Character Calculation

No	Shipper's Name	HSCode (K1)	Destroy goods (K2)
1	PT IVS Express	1	1
2	PT Taxas Integrasi	2	2
Gap Profile		3	3
1	PT IVS Express	-2	-2
2	PT Taxas Integrasi	-1	-1

Table 20 is the determination of the calculation of the value of the gap capacity criteria.

Table 20. Gap Capacity Calculation

No	Shipper's Name	Number of Transactions Per Month (K3)	Average Invoice (K4)
1	PT IVS Express	1	1

No	Shipper's Name	Number of Transactions Per Month (K3)	Average Invoice (K4)
2	PT Taxas Integrasi	4	3
Gap	Profile	5	4
1	PT IVS Express	-4	-3
2	PT Taxas Integrasi	-1	-1

Table 21 is the determination of the calculation of the gap for capital criteria.

Table 21. Calculation of Capital Gap

No	Shipper's Name	SIUP (K5)	Number of employees (K6)
1	PT IVS Express	1	1
2	PT Taxas Integrasi	2	2
Gap	Profile	3	3
1	PT IVS Express	-2	-2
2	PT Taxas Integrasi	-1	-1

Table 22 is the determination of the calculation of the gap for criteria of collateral.

Table 22. Calculation of Collateral Gap

No	Shipper's Name	Deposit Percentage (K7)	Freight (K8)
1	PT IVS Express	1	1
2	PT Taxas Integrasi	3	2
Gap	Profile	3	3
1	PT IVS Express	-2	-2
2	PT Taxas Integrasi	0	-1

Table 23 is the determination of the calculation of the gap for the criteria of economic condition.

Table 23. Calculation of the Economic Condition Gap

No	Shipper's Name	Business Feasibility (K9)	Types of goods (K10)
1	PT IVS Express	1	1
2	PT Taxas Integrasi	3	2
Gap Profile		3	3
1	PT IVS Express	-2	-2
2	PT Taxas Integrasi	0	-1

4. Weighting the difference by the GAP value weight table.

Table 24 is the result of weighing the value of the gap character.

Table 24. Character Gap Weighting Results

No	Shipper's Name	HSCode (K1)	Destroy goods (K2)
1	PT IVS Express	3	3
2	PT Taxas Integrasi	4	4

In table 25 is the result of weighing the value of the gap capacity.

Table 25. Gap Capacity Weighing Results

No	Shipper's Name	Number of Transactions Per Month (K3)	Average Invoice (K4)
1	PT IVS Express	1	2
2	PT Taxas Integrasi	4	4

Table 26 contains examples of the results of weighing the value of the capital gap.

Table 26. Gap Capital Weighting Results

No	Shipper's Name	SIUP (K5)	Number of employees (K6)
1	PT IVS Express	3	3
2	PT Taxas Integrasi	4	4

Table 27 is the result of weighting the value of the collateral gap.

Table 27. Gap Collateral Weighting Results

No	Shipper's Name	Deposit Percentage (K7)	Freight (K8)
1	PT IVS Express	3	3
2	PT Taxas Integrasi	5	4

Table 28 is the result of weighting the value of the gap condition of the economy.

Table 28. Gap Condition of Economy Weighting Results

No	Shipper's Name	Business Feasibility (K9)	types of goods (K10)
1	PT IVS Express	3	3
2	PT Taxas Integrasi	5	4

5. Calculate the value of the core factor and secondary factor to get the weight on each criteria.

Table 29 contains an example of the results of grouping the weight of the gap value on the character criteria.

Table 29. Grouping Value Weighted Gap of Character

No	Shipper's Name	(K1)	(K2)	CF	SF	T1
1	PT IVS Express	3	3	3	3	3
2	PT Taxas Integrasi	4	4	4	4	4

Manual calculation of Character Calculation of CF and SF:
PT IVS Express (CF) = 1.8
PT Taxas Integrasi (CF) = 2.4

PT IVS Express (SF) = 1.2
PT Taxas Integrasi (SF) = 1.6

Manual calculation of the sum of the core factor and secondary factor for each character
PT IVS Express (T1) = 3
PT Taxas Integrasi (T1) = 4

Table 30 contains the weight grouping of the capacity criteria gap values.

Table 30. Grouping Gap Capacity Values

No	Shipper's Name	(K3)	(K4)	CF	SF	T1
1	PT IVS Express	1	2	1	2	1.4
2	PT Taxas Integrasi	4	4	4	4	4

Manual calculation of *Capacity* of CF dan SF:
PT IVS Express (CF) = 0.6
PT Taxas Integrasi (CF) = 2.4
PT IVS Express (SF) = 0.8
PT Taxas Integrasi (SF) = 1.6

Manual calculation of the sum of the core factor and secondary factor for each character.
PT IVS Express (T2) = 1.4
PT Taxas Integrasi (T2) = 4

Table 31 contains the weight grouping of the capital criteria gap values.

Table 31. Grouping of the Capital Criteria Gap Values

No	Shipper's Name	(K5)	(K6)	CF	SF	T1
1	PT IVS Express	3	3	3	3	3
2	PT Taxas Integrasi	4	4	4	4	4

Manual calculation of *Capital* of CF and SF:
PT IVS Express (CF) = 1.8
PT Taxas Integrasi (CF) = 2.4
PT IVS Express (SF) = 1.2
PT Taxas Integrasi (SF) = 1.6

Manual calculation of the sum of the core factor and secondary factor for each character.
PT IVS Express (T3) = 3
PT Taxas Integrasi (T3) = 4

Table 32 contains an example of grouping the weights of the collateral criteria gap values.

Table 32. Grouping of the Collateral Criteria Gap Values

No	Shipper's Name	(K7)	(K8)	CF	SF	T1
1	PT IVS Express	3	3	3	3	3
2	PT Taxas Integrasi	5	4	5	4	4.6

Manual calculation of *Collateral* of CF and SF:
PT IVS Express (CF) = 1.8
PT Taxas Integrasi (CF) = 3
PT IVS Express (SF) = 1.2
PT Taxas Integrasi (SF) = 1.6

Manual calculation of the sum of the core factor and secondary factor for each consignee.
PT IVS Express (T4) = 3
PT Taxas Integrasi (T4) = 4.6

Table 33 contains the grouping of the gap values for the condition of economy criteria.

Table 33. Gap Value Grouping of Condition of Economy

No	Shipper's Name	(K9)	(K10)	CF	SF	T1
1	PT IVS Express	3	3	3	3	3
2	PT Taxas Integrasi	5	4	5	4	4.6

Manual calculation Condition of Economy Calculation of CF and SF:
PT IVS Express (CF) = 1.8
PT Taxas Integrasi (CF) = 3
PT IVS Express (SF) = 1.2
PT Taxas Integrasi (SF) = 1.6

Manual calculation of the sum of the core factor and secondary factor for each consignee.
PT IVS Express (T5) = 3
PT Taxas Integrasi (T5) = 4.6

6. Calculation of the sum of each principle on each consignee (starting from T1 to T5).
Table 34 contains an example of the final result of the profile matching calculation.

Table 34. Final Result of Profile Matching Process

No	Shipper's Name	T1	T2	T3	T4	T5	Results
1	PT IVS Express	3	1.4	3	3	3	2.6
2	PT Taxas Integrasi	4	4	4	4.6	4.6	4.21

Final Result of Manual Calculation of Profile Matching Process:
PT IVS Express = 2.6 (Rejected)
PT Taxas Integrasi = 4.21 (Accepted)

CONCLUSION

Based on research on PT IVS Express and PT Taxas Integration, it can be seen that the granting of receivables to PT Taxas Integration with a score of 4.21 is acceptable, but the granting of receivables to

PT IVS Express with a score of 2.6 is declined. The results of this study indicate that the profile matching method and 5c principle can be used to determine companies that are acceptable to be given company receivables in accordance with the given criteria.

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PROTOTYPE OF MOBILE EDUCATION TECHNOLOGY WITH MULTIMEDIA FOR AUTISTS CARE PROGRAM

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Abstract—Autism is a neurobiological development disorder in children. This disorder causes difficulties for children to communicate and establish relationships with the environment. The impact, they cannot properly interact with other people or their surroundings, because of their inability to understand what other people mean. Parents or families who have family members with autism need the convenience and wide openness of information regarding education paths, pathways of care and treatment, lines of work, pathways of therapy, and other path information. Includes information about autism such as symptoms, characteristics of autism, and how to deal with tantrums. All information needed by all these parties should be easily accessible. This study proposes an educational technology that contains information needed by patients and their families. This educational technology is mobile-based and equipped with multimedia features so that educational materials are easier to understand. The method used for system development is prototyping. The output of this research is a prototype design of mobile-based educational technology with additional multimedia features.

Keywords: autism, education, mobile, multimedia, prototyping.

Abstrak—*Autisme adalah gangguan perkembangan neurobiologi pada anak. Gangguan ini menimbulkan masalah bagi anak, dalam hal berkomunikasi dan menjalin hubungan dengan lingkungan. Akibatnya anak autisme tidak bisa berinteraksi dengan siapapun secara berarti, karena ketidakmampuan memahami apa yang dimaksud orang lain. Orang tua atau keluarga yang memiliki anggota keluarga dengan autisme membutuhkan kemudahan dan keterbukaan informasi yang luas terkait jalur pendidikan, jalur perawatan dan pengobatan, jalur pekerjaan, jalur terapi, dan informasi jalur lainnya. Termasuk informasi mengenai autisme seperti gejala, ciri-ciri autisme, dan cara penanganan saat mengalami tantrum. Semua informasi yang dibutuhkan oleh seluruh pihak tersebut sebaiknya dapat dengan mudah diakses. Penelitian ini mengusulkan agar informasi yang bertujuan untuk edukasi tersebut dibangun dalam bentuk mobile dan disertai dengan fitur multimedia sehingga lebih mudah difahami dan di. Adapun metode yang digunakan untuk usulan penelitian ini adalah metode prototyping. Adapun keluaran dari penelitian ini adalah sebuah rancangan prototipe dari teknologi edukasi yang berbasis mobile dengan tambahan fitur multimedia.*

Kata Kunci: *autism, edukasi, mobile, multimedia, prototyping.*

INTRODUCTION

Autism is a neurobiological development disorder in children. This disorder causes difficulties for children to communicate and establish relationships with the environment. The impact, they cannot appropriately interact with other people or their surroundings because of their inability to understand what other people mean. Generally, symptoms of autism in children can be described as follows: (1) Communication disorders, verbal and non-verbal, such as late speaking, babbling in an incomprehensible language, even though they are beginning to communicate but they do not understand the meaning; (2) Social interaction disorder such as refusing face to face and refusing to look when called; (3) Behaviour disorder, hyperactivity, unable to stay for a while, undirectly motoric activity, jumping around, turning around, banging doors or tables, repeating specific movement, etc.; (4) emotional disorder, such as laughing ti him/her self, crying or angry with no known reason, rampaging out of control (temper tantrum), especially when she/he doesn't get what their wants, even be very aggressive and destructive; (5) Sensory disorder, such as kissing,

biting any toy or object, when hears aloud sound then immediately covers his/her ears, and dislikes touch or hug [1].

Bogor is one of a city in the west of Java that cares for children with special needs. 0n May 24, 2016, Bogor Government declared That Bogor a special children-friendly city Even for two years, Bogor officially is inaugurated as a child-friendly city at the middle-level Indonesia government (Madya)

KOMPAKK is a community that cares for children with special needed in Bogor City. In 2015, Ibu Naziah and her friends with autism spectrum children initiated this community. They ask other mothers with autistic children and other special needs (down syndrome, slow learner, Attention Deficit Hyperactivity Disorder (ADHD)) to join so that this community gets more members.

Karmella as a committee member of KOMPAKK explained that KOMPAKK actually is a group for mothers with autistic children, but then many parents came to join because of difficulties in accessing information related to the handling of their children with special needs. Karmela said that having a child with autism requires many things to do, such as several kinds of therapy (speech, behavior/behavioral, etc.), psychologists, special education (pedagogy), and health consultants.

Currently, there are 110 members of KOMPAAK, consisting of parents with special needed children. Since 2016, KOMPAKK has been regularly conducting many activities. Until now, chatting group applications and social media is used by KOMPAKK for sharing important information among their members. They share information about therapy services, children's growth and development clinic, hospital services, education services (school, university, course, and so on), pedagogic services, and other information. Chatting application used is what apps group and social media used is Facebook.

However, the use of these two media for sharing information still causes obstacles like overwrite information between them. New information will overwrite the previous information. Another medium is through various activities carried out by KOMPAKK with cooperation partners. This activity usually involves experts related to autism to share their expertise with community members. However, this activity cannot be carried out routinely because this community consists of housewives who tend to be very busy in their daily lives.

Based on the explanation above, the problem proposed in this study is the limited information media for KOMPAKK related to the following:

1. Information about autism, tantrums, and other basic information related to autism.

2. Information about educational institutions such as schools, academies, courses, and colleges that accept autistic patients
3. Information on various types of therapy and treatment sites for autistic patients.
4. Information about health service places for autistic patients including clinics, medical centers, hospitals, and others.
5. Information on doctors and medical personnel
6. Information on pedagogic experts for learning tips for autistic patients.

Based on the above problems, the research team proposes a prototype of educational technology related to autism for KOMPAKK. The proposed technology is mobile-based so that it can be easily accessed using a mobile device, such as a smartphone. Mobile technology has entered people's lives, as well as students who always use mobile devices in their everyday life. Technological sophistication and lower prices are supporting factors for increasing smartphone users. The presence of mobile learning is a complement to learning and providing opportunities for students to relearn less mastered material whenever needed[2].

The proposed technology will also involve multimedia in presenting the information so that the information presented on the system is easier for users to understand and use [3].

Regarding educational technology by utilizing multimedia, it has been carried out in previous studies, first, research was conducted by I Kadek Bangkit Ardana, Luh Gede Surya Kartika, and Ida Bagus Suradarma. This research uses multimedia to present information about marriage procedures for Hinduism. Information is presented on mobile-based. So that learning materials can be accessed via mobile devices. According to research, the background of the learning system built is poorly understood by modern society. The information provided by the application includes Manawa Dharmasastra, Types of Marriage, Marriage Procedures, Marriage Conditions, Marriage Purposes, and the Meaning of the Song. Applications developed with Visual Studio 2010 software and the programming language C #[4].

Second, research was conducted by Mr. Muhamad Ali. The research background is because the electromagnetic field course is a difficult subject for students to learn. This difficulty is due to its abstract nature and involves specific mathematical science, namely vectors and others. The indicator of difficulty in this course can be seen from the fairly high repetition frequency. In addition, the average student grade for this course is B-. From these considerations, the researcher proposes a computer program based on interactive multimedia to support the learning process of electromagnetic

fields. The concept that the researcher wants to emphasize is the concept of independent learning. Through computer programs, students can study electromagnetic fields more easily. Also, users can interact with computer programs by responding to the system. The research method used is Research and Development with 5 stages, namely needs analysis, media design, media development, testing, and implementation[5].

Another form of technology that implements multimedia on mobile-based technology is educational game applications [6]. In 2011, game education users reached 6.5 people, in line with the increasing number of game developers. Educational games are defined as games that promote education and learning. Educational games aim to make it easier for students/learners to understand the educational content presented [7]. For example, the use of educational game technology for children with special needs such as autism. This educational game technology also involves multimedia features and can also be implemented on mobile-based devices [8]. The use of a combination of mobile and multimedia technology was carried out in a 2018 study by three researchers. This study produces a mobile-based interactive animation for the introduction of the Sundanese language for children. The system development method used in this research is the ADDIE method. Based on the evaluation results using the logical validity of a set of questionnaire entries, the validity score was 82.6%. It means the interactive animation application developed can be used to support learning [9].

MATERIALS AND METHODS

In this study, the required data were obtained from a community known as KOMPAKK through interviews and observations. The data collected are as follows:

- Autism-related data and other related matters.
- Activity from the community to socialize autism to many people.
- Data about several educational institutions, clinics, hospitals, therapy centers for autism patients in the City and Regency of Bogor.
- Data of characteristics, symptoms, method of treatment, treatment process, etc. for autism patients

Analysis of the problem based on the data collected was carried out using a cause and effect

diagram. Meanwhile, to design the proposed prototype, this study uses a use-case diagram [10]. Another design is database design. The database design includes conceptual, logical, and physical designs [11].

The method for the system development is prototyping but this study will be separated into two parts. The first part, the stage until building the prototype. The prototype will then be evaluated with black-box testing. The purpose of the evaluation is related to the function of the system. This evaluation method ensures whether all functions or feature displays have met user needs [12]. Usually, the evaluation results by black-box testing are presented in a table form that lists the system's functions and then signs confirmation with the requirements [13].

RESULTS AND DISCUSSION

In this section, the results of each stage of the research will be presented as well as an explanation of these results. Following the system development method used, namely prototyping, the first stage of the system development life cycle is gathering needs and making prototypes. And finished with testing or evaluation. Based on the research output, then the evaluation will be done to system prototype. According to the definition of a prototype then we can evaluate the prototype the same as system test methods such as black-box testing, white-box testing, and others.

At the gathering needs stage, the developer and the user have a meeting to determine general goals and general needs. At the beginning of this, many details of needs may be overlooked. The results of research at this stage are in the form of data needed and business processes that are currently running. At this stage, users convey their activities, problems, and needs. The explanation from the user is then analyzed by the developer to identify optimal problems and needs.

Based on the previous explanation, the problem in this study is how to educate KOMPAKK members regarding various information needed by patients and families of autism patients. If you adopt the technique of making cause and effect diagrams, the causes of the problems raised are grouped into 4 groups, namely people, environment, method, and machines. Figure 1 is a representation of the problems and causes identified based on the collected data as a problem analysis process.
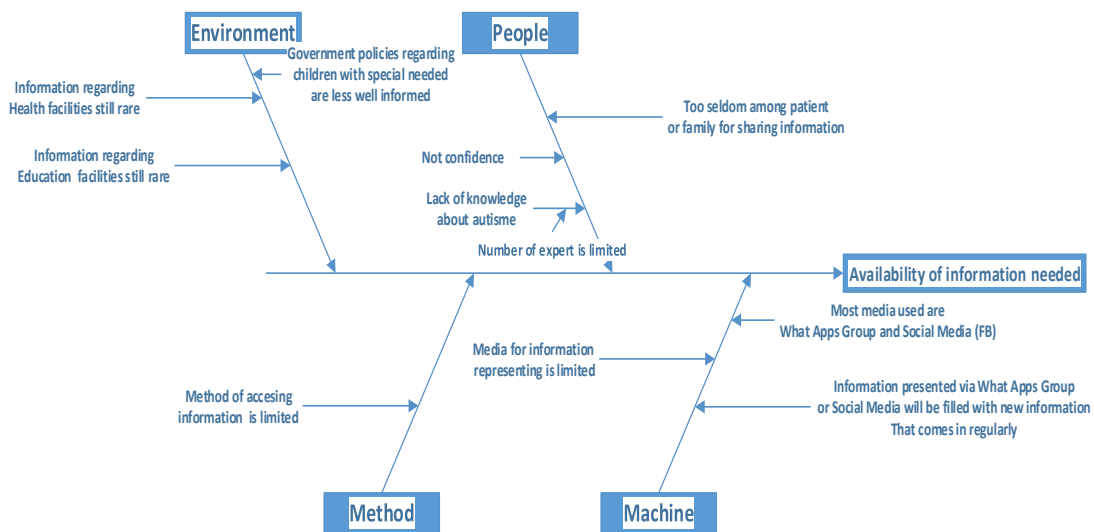
Figure 1. Fish Bone Diagram

The problem with this study is the limited availability of information needed by patients and their families who are members of the KOMPAKK community. While the causes are divided into 4 primary causes, namely methods, machines, people, and the environment. The four causes are then distributed again into secondary causes.

After analyzing the problem, it is followed by a needs analysis. The results of the needs analysis are functional and non-functional requirements. Functional requirements are representations of functions or features that must be met by the system. Meanwhile, non-functional requirements include security aspects, hardware/software specifications to run the proposed technology.

Following the functional requirements identified in the previous stage, the functional requirements are then translated into a use case diagram [14]. Usecase diagram presents the features or functions that will be presented by the system. Figure 2 below is a use case diagram display of the proposed educational system or technology. From the picture below, there are many functions offered by the system to show the interaction between the user and the system such as login and logout function for both of user and admin, view health services function for the user, view education services for the user, view autism general information for the user, and entry data function for admin. In addition, generate a serial number for the user is included by the login function. View education services fee is as extend from education services function, and View health services fee is also as extend of view health service function.
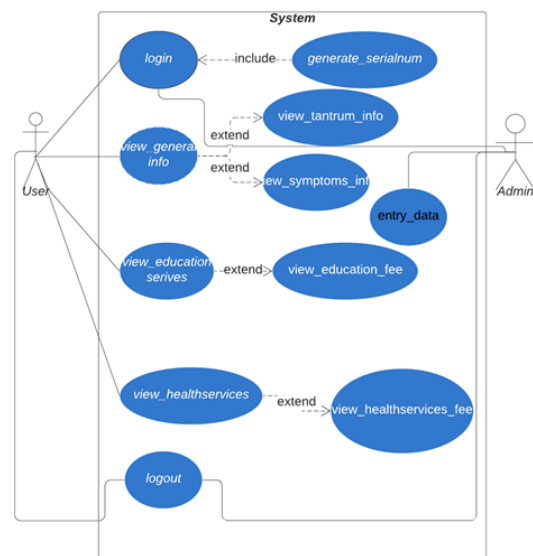

Figure 2. Use Case Diagram

The next stage is to build the database design into ER diagram (ER: Entity Relationship). ER-diagram shows the relation among the entity involved. How entities interact with each other. Besides entities, there is cardinality in the ER-Diagram. Cardinality show relationship among entities. Cardinality consists of three classifications: 1 to 1, 1 to many, and many to many. ER-Diagram is a method for denoting a database by defining the database structure before it is stored in the DBMS (database management system). Technically, the database structure is described in a series of tables connected by each key [15]. According to figure 3 show that cardinality among entities is many to many.
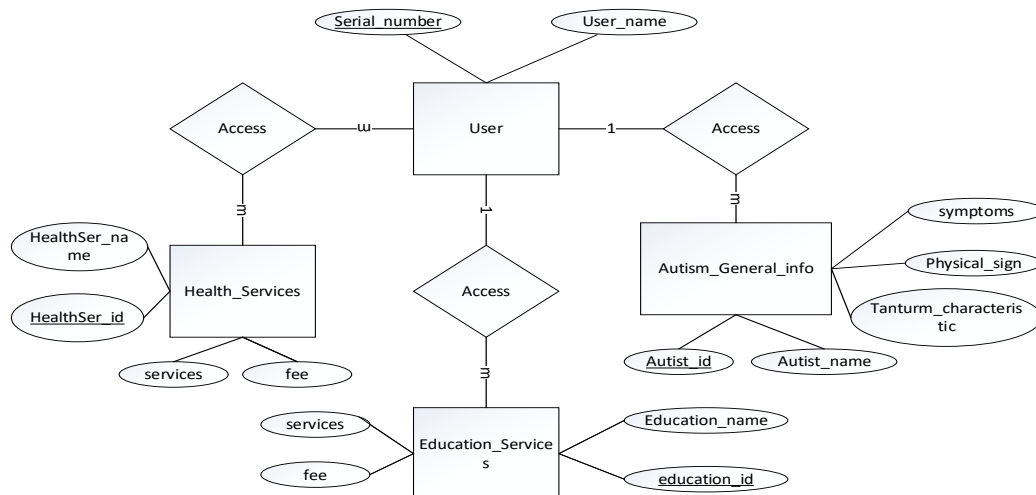
Figure 3. Conceptual Database Design-ER Diagram

This ER-Diagram will be implemented physically on the DBMS (database management system) in the form of an interrelated table structure. ER-Diagram above will generate 4 tables as relation result following the cardinality: user, general information about autism, education services, health services, and access (as relation results among entity). Attributes of the user consist of the user name and serial number. This serial number will automatically generate each visitation. Then, general information of autism has some attributes such as autism_id, autism_name, autism_class, physical_sign, tantrum_charateristic, and symptoms. Likewise, the table results of the relationship between users and health services and users with education services.

If the system design and database design have been completed, the next step is to make a graphic interface design from educational technology. This graphic interface design shows the menus of the proposed educational system/technology. Figure 4 is one of the window or menu designs of this educational technology. There are 3 windows or menus proposed for this technology, namely:

1. The design of the initial page graphic interface. On this page, there are buttons for entering the username/visitor. By the database design in Figure 3, system users will be stored in the database. The aim is to identify who uses the system outside KOMPAKK members.
2. The design of the main page graphic interface. On this main page, several tabulations of information needed by users are displayed, such as information about autism and information on several health and education services.
3. The detailed page graphic interface design of each menu on the tabs provided on the main page. For example, when a user clicks on a

hospital, the next will open a detailed menu related to the hospital.
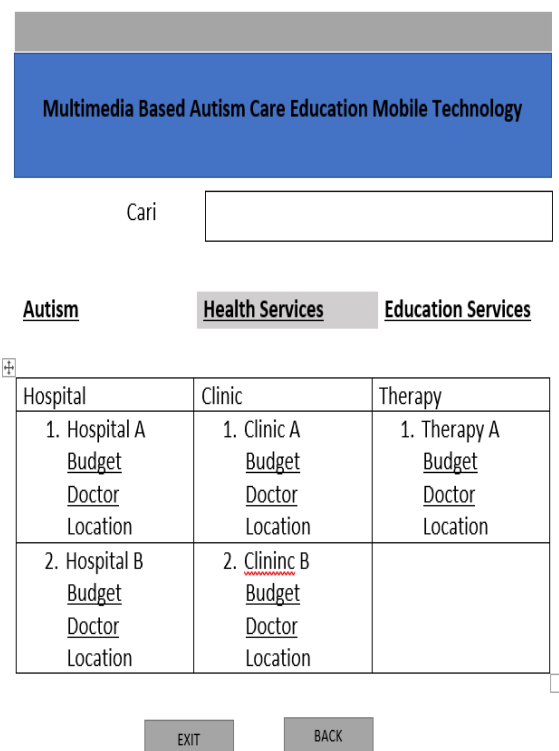

Figure 4. Graphical User Interface

The final result of this research is a prototype of educational technology related to autism based on mobile with the addition of multimedia features. The addition of multimedia features means adding media images, audio, video, text, or animation to the proposed technology. Figure 5 is a prototype made using the balsamic application.
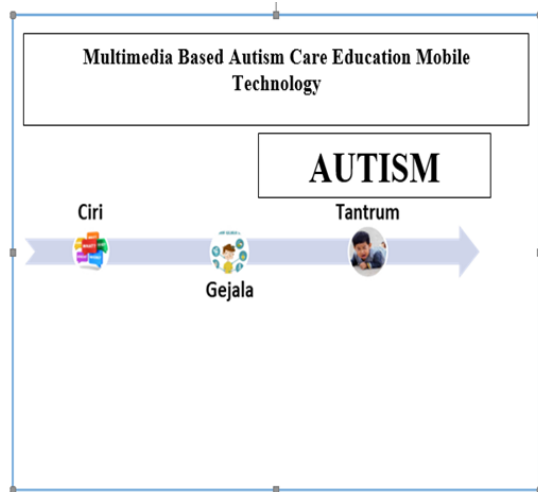
Figure 5. Education Technology Prototype

methodology. Black box testing evaluates the prototype based on system function. This method evaluates whether all system functional is met with user requirements. Table 1 shows the evaluation result for this system prototype.

Before taking the conclusion, the prototype obtained is evaluated with a black box testing

Table 1. Evaluation Result

No	Function	Scenario	Result	Conclusion
1	Login	Entry Username	Get into system and system generate serial number	Meet the requirement
2	View general info of autism	User choose some general information displayed	System open window choose by user	Meet the requirement
3	View education services information for autism	User choose some education information displayed	System open window choose by user	Meet the requirement
4	View health service information for autism	User choose some health service information displayed	System open window was chosen by the user	Meet the requirement
5	Logout	User press logout button	System close the window	Meet the requirement

CONCLUSION

The entire series of research activities that have been carried out to produce output in the form of a prototype from autism care education technology, shows that the involvement of multimedia is very helpful in presenting information simply so that it is easier to use and understand by the system. In addition, the proposed system development method by prototyping is also very helpful for system analysts and designers when modeling or building a prototype of the system. With the consideration that most of the users of technology are housewives. So it is necessary to hold several meetings with these users to get a prototype of the system. Likewise, with the involvement of multimedia on system prototypes. Multimedia offer image, audio, video, animation, and text to preset the information needed. It is

expected easier for the user to understand the material.

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IMPLEMENTATION OF PROGRESSIVE WEB APPS-BASED CLICK PROFILE ON SOCIAL MEDIA

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Abstract— *Instagram as one of the social media that has active users with a high number of users is an example of the use of social media as promotional media. However, limitations on Instagram by not allowing placing a "Link" to a post cause limitations in promoting products or services. Instagram is a native app-based application found in app stores such as the Google Play Store and Apple's App Store that requires memory on a smartphone to be installed. Based on these problems the author has a desire to create an application that can be used as a medium of sharing and promotion for various types of content that can be channeled through images that are categorized into images and videos, each uploaded image can be embedded with certain "Links" using Progressive Web Apps Technology (PWA). The goal of implementing Progress Web Application is to design and build a system that can share content with other users. The result of the implementation of PWA is to increase the number of visitors (visitors) an average of two times on content published on the website when compared to conditions before using PWA technology.*

Keywords: *Application, App Native, Instagram, Progressive Web Apps, Social Media.*

Intisari— *Instagram sebagai salah satu sosial media yang memiliki pengguna aktif dengan jumlah pengguna yang tinggi merupakan salah satu contoh penggunaan media sosial sebagai media promosi. Akan tetapi keterbatasan pada Instagram dengan tidak diperbolehkanya menempatkan "Link" ke sebuah posting menyebabkan keterbatasan dalam melakukan promosi produk atau jasa. Instagram merupakan aplikasi berbasis app native yang terdapat pada app store seperti Google Play Store dan App Store milik Apple yang membutuhkan memori pada smartphone untuk dapat diinstal. Berdasarkan permasalahan tersebut penulis memiliki keinginan untuk membuat aplikasi yang dapat digunakan sebagai media berbagi dan promosi untuk berbagai jenis konten yang bisa disalurkan melalui image yang dikategorikan menjadi image dan video, setiap image yang diupload dapat disematkan"Link" tertentu dengan menggunakan Teknologi Progressive Web Apps (PWA). Tujuan dari implementasi Progress Web Applcation yaitu merancang dan membangun sistem yang dapat berbagi konten kepada pengguna lainnya. Hasil dari implementasi PWA yaitu meningkatkan jumlah pengunjung (visitor) rata-rata dua kali lipat pada sebuah konten yang dipublikasi di website, jika dibandingkan dengan kondisi sebelum menggunakan teknologi PWA.*

Kata Kunci: *Aplikasi, App Native, Instagram, Media Sosial, Progressive Web Apps.*

INTRODUCTION

In 2016 the Association of Indonesian Internet Service Providers (APJII) issued a survey of internet users in Indonesia reaching 132.7 million, this number has increased from 2014 which was at 88 million users [1]. Where the most accessed type of content is social media as much as 97.4%, in the second place is entertainment content as much as 96.8%, in third place is dominated by news content as much as 96.4%, in the four educational content as much as 93.8%, in fifth position 93.1% commercial content and 91.6% public services at sixth position.

A large number of social media users in Indonesia, of course, creates an opportunity to optimize the presence of social media as a medium of communication, so that then raises the question, how to use social media to make communication effective in society, both in the field of marketing, politics and in the field of learning

Instagram as one of the social media that has active users with a high number of users is an example of the use of social media as promotional

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media. However, the limitations on Instagram by not being allowed to place a "Link" to a post cause limitations in promoting products/services. And Instagram is a native app-based application found in app stores such as the Google Play Store and Apple's App Store that requires memory on a smartphone to be installed.

Indeed, even with the accessibility of a completely created versatile web application, it battles to give an eye-satisfying and palatable experience to the clients mostly on account of the absence of solid organization association across different regions. Hence, PWA (Progressive Web Apps) is another innovation planned and created by Google to beat the limit of versatile perusing and local applications [2].

PWA is not packaged and published through the App Store, PWA is just a Mobile Web that is given advantages that can make the Mobile Web top-level on the task switcher, home screen, and notification tray without having to install it beforehand [3]. In terms of implementation, PWA uses several approaches, ranging from optimizing applications, using new technologies, to standardizing the Mobile Web. This is claimed to be able to improve performance to improve the quality of the user experience.

A lot of research on implementation has been done. One method that can be used to make it easier for tourists to find public transportation is to create a guide transportation application based on Progressive Web Apps [4]. YSlow-related performance on PWA is superior compared to web-native. Although web-native has a faster fully loaded system than PWA, it turns out that this does not significantly affect YSlow's performance on web-native [5]. With the Progressive Web Application technology developed by Google and in collaboration with other browser and mobile developers, the challenge of making multi-platform applications becomes easier and faster [6]. Progressive web apps start as simple websites, but as users follow them, they gain more and more power. They went from a website to something much more like a native app [7]. Web app manifest that makes a website can be like a native application [8]. The API works as a liaison that unites various applications from various types of platforms, commonly known as the public API. Public APIs are widely distributed, while users, namely programmers who want to find public APIs, must search through various ways such as general search engines, repository documentation, or directly on web articles [9]. Lighthouse is an open-source application built by Google to test the PWA concept with its aspects, performance, accessibility, and best practices. Lighthouse can be run from the user's browser in the form of an extension on Google

Chrome [10]. Some of the features of Laravel are the development of a system of manageable modules, introducing different ways to access relational databases, utilities that help in application deployment, and easy maintenance [11].

MATERIALS AND METHODS

Progressive Web Apps (PWA)

Progressive web apps (PWA) start as simple websites, but as users use them, they experience a whole new experience, the app transforms from a website into something much nicer like a native app [12]. PWAs are useful for users because first open a web page with the PWA concept, and as users use more Web applications, applications will become more and more powerful [13].

With PWA Fast application loading speed, even if in poor network conditions, can send push notifications, there is an app icon on the home screen, and can run in full-screen mode [10]. Progressive web application (PWA) is a collection of concepts and keywords, such as progressive, responsive, independent of connectivity, similar to the original application, new, safe, easy to find, reconfigurable, installable design and can be linked [14].

Some of the technologies found in the progressive web app include :
a. Service worker

The service worker is already running when the web is first loaded automatically, in other words, the user doesn't need to take any action to fire up the service worker. Life cycle service worker in figure 1.
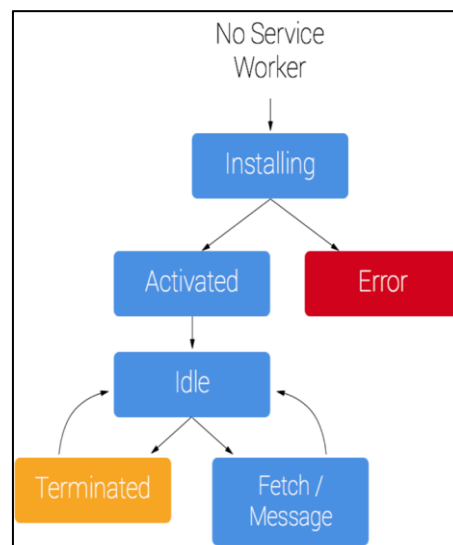

Figure 1. Life cycle Service worker [15]

b. Web Manifest
   A web app manifest that makes a website look like a native app [8].
c. Application Programming Interface (API)
   Public APIs are widely distributed, while users, namely programmers who want to find public APIs, must search through various means such as general search engines, repository documentation, or directly on web articles [9].
d. Lighthouse
   Lighthouse can be run from the user's browser in the form of an extension on Google Chrome [10].

Some of the steps involved in developing and implementing PWA are illustrated in Figure 2.
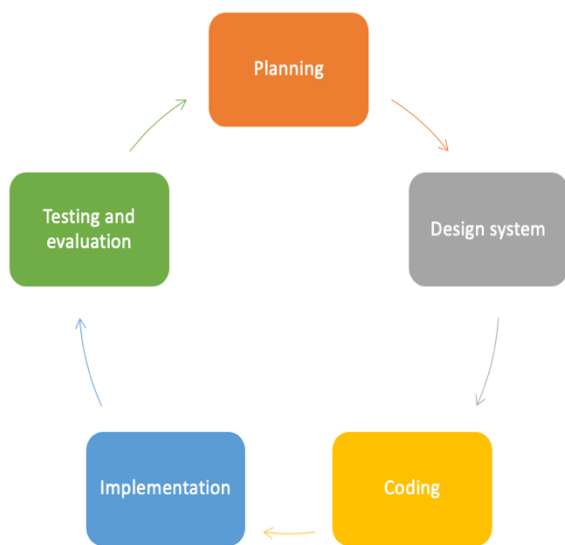

Figure 2. Stages of development and implementation

Several stages are carried out for implementation :
1. Planning
   This stage observes the problems and opportunities of many social media users in Indonesia.
2. Design & System Stage
   This stage is the application and system design that will be made. Using a mockup application, use case diagram, and mockup.
3. Implementation
   This stage describes the system architecture of the implementation of making applications using the PWA method.
4. Testing and Evaluation
   At this stage, the end-user conducts testing with the developer to identify forms of errors from the system. The method used for testing is the user acceptance test (UAT).

RESULTS AND DISCUSSION

The results of this study are the implementation of a progressive web apps-based click profile on social media. Some of the sections :

Design & System Stage

At this stage, we describe the interaction between users and the system using use case diagrams.

Figure 3. Use case diagram users
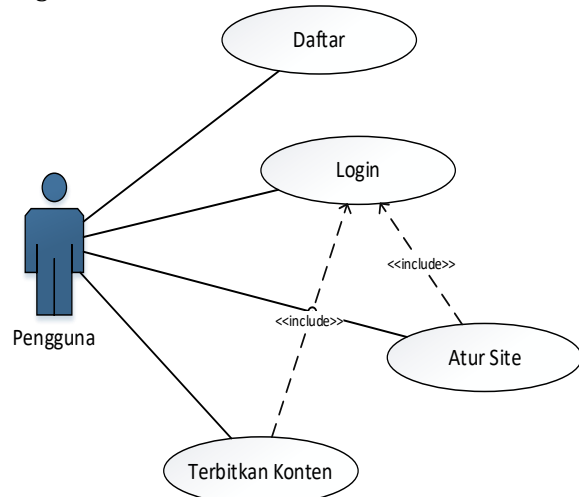
Figure 3 users can register before having an account and log in after going through an account. Facilities owned by users after registering are managing the site and publishing content. Figure 4 activity diagram when the user logs in to the system.
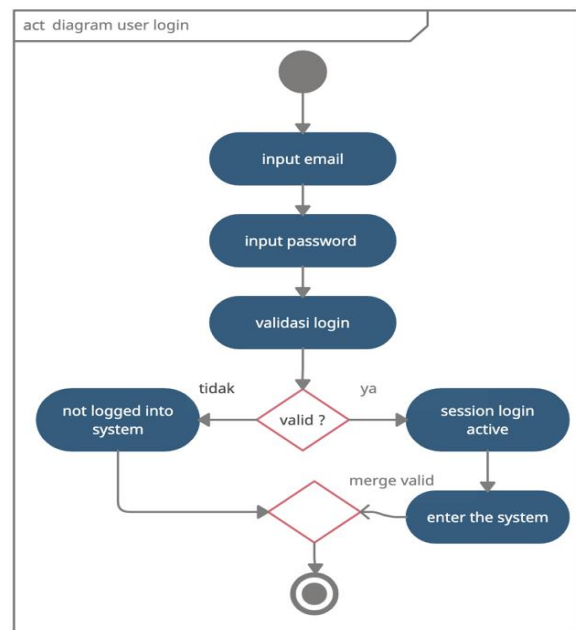

Figure 4. Activity diagram login

Figure 4 is an activity diagram of when the user uses the system. Users can use the system if the

email and password used are correct. Figures 5(a) and 5(b) are mockups of a user setting up a site and publishing content.

Figure 5(a) mockup set up the site and 5(b) mockup publish content

Implementation System

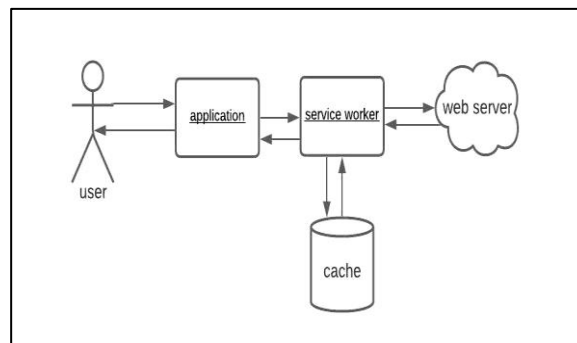The system architecture of the implementation of progressive web apps is shown in Figure 6.

Figure 6. Application system architecture

Figure 6 describes the technology used by progressive web, namely service workers, with this technology applications that must be installed on mobile phones can be run through all browsers.

Testing and Evaluation Stage

The testing stage is the final stage when all processes are passed to find out whether the application is by the expected results. This test uses the BlackBox Testing method, where this test focuses on the functional needs of the device to try to find errors, the errors in question are the error of functional, interface errors, data structure errors, or performance errors.

User acceptance testing (UAT) has been carried out on the system to find out it is suitable for the user. End users perform tests to identify and fix problems. The results of the tests that have been carried out are shown in Table 1.

Table 1. Test results with the UAT method

No	Use case	Succeed/fail	Tested By	Test Date
1	Test name: Registration Test description: verification of entering registration data Test description : • Fullname: Setiawan Jodi • Email: jodi12345@gmail.com • Password: rahasia12345 • Confirm Password: rahasia 12345 Expected results : • The system will redirect to a notification page for email verification The system will refuse to sign up and display the message "This field is required." in the column of each column that is empty	Succeed Succeed	Eko Setiawan Feri Suryanata	25 July 2020 25 July 2020
2	Test name: login Test description: Verification of access rights can only be accessed by registered users Test description : • Username: jodi1988@gmail.com • Password: rahasia12345	Succeed Succeed	Eko Setiawan Feri Suryanata	25 July 2020 25 July 2020

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No	Use case	Succeed/fail	Tested By	Test Date
	Expected results : • The system will receive login access and redirect to the main application page The system will deny login access and display the message "Incorrect username or password. Please try again."			

CONCLUSION

With the Progressive Web Apps-based Klikprofile application, application users can share content and information without having to install applications through the "Apps Store". The interest in using progressive web-based applications is quite high, so the application display is made as attractive as possible.

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ADDITIVE RATIO ASSESSMENT ALGORITHM ON DECISION SUPPORT SYSTEM FOR SELECTING THE BEST SMA AND SMK

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Abstract—*Determination of the best SMA and SMK through the Education Office Technical Implementation Unit (UPTD) of Pinggir Subdistrict, Bengkalis Regency, needs to be done to provide information to parents, especially students who want to continue their schooling to SMA and SMK level in order to know the ranking of destination schools and be able to make choices. The assessment is still done manually and has not used the right ranking method to determine the best school at the SMA and SMK level, especially in Pinggir District, Bengkalis Regency so that the assessment system is still not on target so that there is difficulty in the process of selecting the best SMA and SMK in the Pinggir Education UPTD. Bengkalis Regency to be right on target. The purpose of this study is to provide convenience in the process of selecting the best SMA and SMK with a decision support system using 7 criteria, namely school facilities, accreditation status, graduates, student achievement, location, human resources and extracurricular activities. The method used in this research is to use the Additive Ratio Assessment (ARAS). There are 8 schools that serve as alternative data, namely SMAN 1, SMAN 2, SMAN 3, SMAN 4, SMAN 5, SMAN 6, SMKN 1 and SMKN 2. The results obtained are that there are 4 recommended schools, namely SMKN 1 = 0.122477, SMKN 2 = 0.121488, SMAN 5 = 0.116763, SMAN 6 = 0.112653 and SMAN 1 = 0.108850. So that the results of this research can help in determining the best school.*

Keywords: *decision support system, senior high school, additive ratio assessment, uptd.*

Abstrak—Penentuan SMA dan SMK terbaik melalui Unit Pelaksana Teknis Dinas (UPTD) Pendidikan Kecamatan Pinggir Kabupaten Bengkalis perlu dilakukan untuk memberikan informasi kepada orang tua terutama siswa/i yang ingin melanjutkan sekolah ke tingkat SMA dan SMK agar mengetahui rangking sekolah tujuan dan bisa menentukan pilihan. Penilaian yang dilakukan masih secara manual dan belum menggunakan metode perangkingan yang tepat untuk menentukan sekolah terbaik pada tingkat SMA dan SMK khususnya di Kecamatan Pinggir Kabupaten Bengkalis sehingga sistem penilaian masih belum tepat sasaran sehingga terjadi kesulitan dalam proses pemilihan SMA dan SMK terbaik di UPTD Pendidikan Kecamatan Pinggir Kabupaten Bengkalis agar tepat sasaran. Tujuan dalam penelitian ini adalah memberikan kemudahan dalam proses pemilihan SMA dan SMK terbaik dengan sistem pendukung keputusan dengan menggunakan kriteria 7 kriteria yaitu Fasilitas Sekolah, Status Akreditasi, Lulusan, Prestasi Siswa, Lokasi, SDM dan Ekstrakurikuler. Metode yang dilakukan dalam penelitian ini adalah menggunakan Additive Ratio Assesment (ARAS). Terdapat 8 sekolah yang dijadikan sebagai data alternatif yaitu SMAN 1, SMAN 2, SMAN 3, SMAN 4, SMAN 5, SMAN 6, SMKN 1 dan SMKN 2. Hasil penelitian yang diperoleh adalah Terdapat 5 sekolah yang direkomendasikan yaitu SMKN 1 = 0,122477, SMKN 2 = 0,121488, SMAN 5 = 0,116763, SMAN 6 = 0,112653 dan SMAN 1 = 0,108850. Sehingga dengan hasil penelitian ini bisa membantu dalam penentuan sekolah terbaik.

Kata Kunci: sistem pendukung keputusan, sekolah, ARAS, UPTD.

INTRODUCTION

National Education based on the 1945 Constitution article 31 paragraph (1) states that "Every citizen has the right to education". And Paragraph (3) emphasizes that "The government seeks and organizes a national education system that increases faith and piety as well as noble character in the context of educating the nation's life which is one of the goals of the State of Indonesia[1]. SMA (High School) is a level of education that aims to shape a student's personality and prepare themselves, students' thinking patterns for school to a higher level[2].

The selection of the best schools, especially for SMA and SMK levels, is something that is

expected by students who will continue to that level. In determining the choice of schools that are affordable from an economical point of view, the ability of students and students to be interested in learning according to their fields, time and locations that are easily accessible are not easy.[3]. A decision support system is a computer-based information system, to produce several alternative decisions to help deal with problems using data and models[4]. In previous studies, the implementation of ARAS on a decision support system for livable housing recipients aimed to apply ARAS in determining the eligibility decisions of prospective recipients of livable housing assistance from all existing criteria, so that it can be determined using a decision support system[5]. In a study entitled the best village assessment decision support system also uses ARAS[6].

ARAS is a multi-criteria decision-making method based on the concept of ranking using the utility degree, namely by comparing the overall index value of each alternative to the overall index value of the optimal alternative[7]. In a study entitled the best teacher assessment decision support system with ARAS, with the ARAS ranking method to get the best teacher assessment results to be more targeted because the assessment process uses criteria and weight calculations[8]. A decision support system using ARAS is also carried out to determine the best head of production, using ARAS[9]. A decision support system is also used to predict the portion of housing development funds[10].

A decision support system has also been carried out for assessing lecturer performance using ARAS so that decision makers will easily determine the order of lecturers based on the weight values obtained in the assessment process [11]. In previous studies, ARAS was also used for a decision support system for evaluating public competitions and village administrations[12]. The results of this decision are not absolute because the decision support system (DSS) is the provision of alternative decision solutions, while the absolute decision is still decided by the party making the decision[13]. ARAS is a method that has utility to the value of the function so that the results obtained areefficiency on a number of viable alternatives [14]. ARAS is also used as a ranking method because it has an optimization value[15]. Choosing the best school is the right choice for students who will continue to high school or vocational school, especially in the UPTD area of Pinggir District.

There needs to be a decision support system that can provide information in determining the preferred high school or vocational school in order to find out the ranking of the school. The purpose of this study is to create a decision support system for

determining the best SMA and SMK using the ARAS algorithm so that the results obtained become a source of information that can assist in choosing the best SMA and SMK to be the school of choice.

MATERIALS AND METHODS

The stages of research on the ARAS algorithm on a decision support system for determining the best SMA and SMK are as follows:
1. Identifying problems, namely problems found in making decisions for determining the best SMA and SMK in accordance with the literature and information obtained.
2. Analyzing the problem, namely the problem found in the object of research, then analysis is carried out.
3. Data collection, namely collecting the data needed in this study by means of observation, interviews and literature.
4. Determining the criteria, which is to be a reference in the calculation process using ARAS in determining a decision.
5. Data analysis, namely the data that has been obtained will be managed and from the data can also be given a weight for each criterion.
6. Implementation of ARAS in order to obtain the best results in determining a decision.
7. Alternative ranking, which is doing a ranking process to get the highest value from all alternative data.
8. System evaluation, which is conducting a system evaluation process with accuracy as a comparison between the actual data and the data calculated by the system using ARAS.
9. Conclusion, namely taking a conclusion on the data that has been analyzed and processed previously so that it becomes the result of this study.

The data used by the author in this study were sourced from UPTD Kec. Edge through direct observation. The data used as a reference for research is a list of names of high school and vocational high schools. There are 10 schools that will be implemented in ARAS for the calculation process to be carried out based on the criteria that have been set in determining the best school.

The data collection techniques used by the author are:
1. Observation, the author collects data from the object of research directly by making observations at the Air Jamban village office.
2. Literature study, namely the author approaches with references such as journals or books that are in accordance with the research topic.
3. Interview, where the author conducts discussions with related parties to be able to

obtain information on what is needed for research material.

The following are the steps in the calculation using ARAS [16] :

1. Formation of Decision Making Matrix.

$$X = \begin{bmatrix} X_{01} & \cdots & X_{0j} & \cdots & X_{0n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ X_{i1} & \cdots & X_{ij} & \cdots & X_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ X_{n1} & \cdots & X_{mj} & \cdots & X_{mn} \end{bmatrix}$$

$$i = j = \overline{0, m}; \overline{1, n}; \quad \text{.......................................(1)}$$

where:
m = number of alternatives
n = number of criteria
Xij = performance value of alternative i against j
X0j = optimum value of criteria

2. Normalization of Decision Making Matrix for all criteria.

$$X = \begin{bmatrix} X_{01} & \cdots & X_{0j} & \cdots & X_{0n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ X_{i1} & \cdots & X_{ij} & \cdots & X_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ X_{n1} & \cdots & X_{mj} & \cdots & X_{mn} \end{bmatrix}$$

$$i = j = \overline{o, m}; \overline{1, n}; \quad \text{.......................................(2)}$$

If the proposed criteria is the maximum value then the normalization is

$$X_{ij} = \frac{X_{ij}}{\sum_{i=0}^{m}} X_{ij} \quad \text{...(3)}$$

If the proposed criteria is a minimum value, then the normalization process has 2 stages, namely:

$$X_{ij} = \frac{1}{X * ij} \quad ; \quad X_{ij} = \frac{X_{ij}}{\sum_{i=0}^{m}} X_{ij} \quad \text{..............(4)}$$

3. Determine the matrix weights that have been normalized in step 2.

$$\sum_{j=1}^{n} W_j = 1 \quad \text{...(5)}$$

4. Determine the optimum function value.

$$S_i = \sum_{j=1}^{n} X_{ij} ; \quad i = o, m \quad \text{...(6)}$$

Si is the overall index value on the i-th alternative[17].

5. Determine the rating level.

$$K_i = \frac{S_i}{S_0} ; i = \overline{o, m} \quad \text{...(7)}$$

RESULTS AND DISCUSSION

1. Alternative Data

In making a decision support system required data to be processed and referred to as alternative data (Ai) as shown in Table 1.

Table 1. List of School Names

No	School Name	Subdistrict
1	SMA Negeri 1	Pinggir
2	SMA Negeri 2	Pinggir
3	SMA Negeri 3	Pinggir
4	SMA Negeri 4	Pinggir
5	SMA Negeri 5	Pinggir
6	SMA Negeri 6	Pinggir
7	SMK Negeri 1	Pinggir
8	SMK Negeri 2	Pinggir

2. Determining Criteria and Weights

To determine the ranking of each alternative data, the process of assigning a weight value is carried out first. The determination of the importance weight of each criterion (Wj) can be seen in Table 2.

Table 2. Criteria and Weights

No	Criteria (Ci)	Information	Mark Weight (%)
1	C1	School facility	15
2	C2	Accreditation Status	20
3	C3	Graduate Quality	10
4	C4	Student achievement	10
5	C5	School Location	15
6	C6	HR Professional	15
7	C7	Extracurricular	15

In Table 2 it is explained that the criteria are given the initials (Ci) and a description of each criterion, then the weights and variables are given. The criteria for school facilities (C1) are as shown in Table 3.

Table 3. Criteria for School Facilities (C1)

Variable	Sub-Criteria	Weight Value
Complete Facilities	Very good	5
Complete Facilities	Well	4
Facilities Not Complete	Pretty good	3

In Table 3 there are variables for the criteria for School Facilities, namely complete and quite complete and incomplete. The highest weight value

is 5 with Very Good criteria and the lowest weight is 3 for Good Enough criteria.

Table 4. Criteria for Accreditation Status (C2)

Variable	Sub-Criteria	Weight Value
A Accreditation	Very good	5
B Accreditation	Well	4
C Accreditation	Pretty good	3

In Table 4 there are variables of Accreditation Status A, Accreditation B and Accreditation C.

Table 5. Graduate Quality Criteria (C3)

Variable	Sub-Criteria	Weight Value
1. Continuing Study at PTN/PTS	Very good	5
2. Work without Study	Well	4
3. Not working/studying	Not good	2

In Table 5 there are variables for the quality criteria of graduates, namely Continuing Study in PTN/PTS, Working without studying and Not working/college. The highest weight value is 5 with Very Good criteria and the lowest weight is 2 for Less Good criteria.

Table 6. Student Achievement Criteria (C4)

Variable	Sub-Criteria	Weight Value
International	Very good	5
National	Well	4
Region/Local	Pretty good	3
There is not any	Not good	2

In Table 6 there are variables for student achievement criteria, namely International, National, Regional/Local and None. The highest weight value is 5 with Very Good criteria and the lowest weight is 2 for Less Good criteria.

Table 7. Criteria for School Location (C5)

Variable	Sub-Criteria	Weight Value
Close	Very good	5
Far	Well	4

In Table 7 there are variables for school location criteria, namely Near and Far. The highest weight value is 5 with Very Good criteria and the lowest weight is 4 for Good criteria.

Table 8. Professional HR Criteria (C6)

Variable	Sub-Criteria	Weight Value
100% Linear	Very good	5
80% Linear	Well	4
50% Linear	Pretty good	3
20% Linear	Not good	2

In Table 8 there are variables for the HR Professional criteria, namely 100% linear, 80% linear, 50% linear and 20% linear. The highest weight value is 5 with Very Good criteria and the lowest weight is 2 for Less Good criteria.

Table 9. Extracurricular Criteria (C7)

Variable	Sub-Criteria	Weight Value
Complete	Very good	5
Quite complete	Well	4
Not complete	Pretty good	3

In Table 9 there are variables for extracurricular criteria, namely complete, quite complete and incomplete. The highest weight value is 5 with Very Good criteria and the lowest weight is 3 for Less Good criteria.

3. Determining Criteria and Weights

Step 1: Formation of decision matrix (Decision Matrix)

Table 10. Decision Matrix

(ai)	C1	C2	C3	C4	C5	C6	C7
A0	**5**	**5**	**5**	**4**	**5**	**5**	**5**
A1	3	4	4	3	4	4	5
A2	4	3	2	2	4	3	5
A3	4	4	4	4	4	3	3
A4	3	3	2	2	4	3	3
A5	3	5	5	3	5	4	4
A6	4	4	4	4	4	4	4
A7	4	5	4	3	5	5	4
A8	5	5	5	3	4	4	4
For all criteria worth _Max_							

In Table 10 there are 7 criteria, namely C1-C7 and 8 Alternative Data, namely A1-A8. A0 is the initialization of additional alternatives as a place for the Max value criteria determined from the highest value of each criterion.

Step 2: Normalization of decision matrix for all criteria.

$$X=\begin{bmatrix} 5 & 5 & 5 & 4 & 5 & 5 & 5 \\ 3 & 4 & 4 & 3 & 4 & 4 & 5 \\ 4 & 3 & 2 & 2 & 4 & 3 & 5 \\ 4 & 4 & 4 & 4 & 4 & 3 & 3 \\ 3 & 3 & 2 & 2 & 4 & 3 & 3 \\ 3 & 5 & 5 & 3 & 5 & 4 & 4 \\ 4 & 4 & 4 & 4 & 4 & 4 & 4 \\ 4 & 5 & 4 & 3 & 5 & 5 & 4 \\ 5 & 5 & 5 & 3 & 4 & 4 & 4 \end{bmatrix}$$

The above matrices are added down to get the results [35, 38, 35, 28, 39, 35, 37]. Then normalize the matrix for all criteria (Ci). Furthermore, the results of the calculation of the decision matrix from criteria C1 to C7, the normalized values are obtained as follows:

$$\begin{bmatrix} 0,142857 & 0,131579 & 0,142857 & 0,142857 & 0,128205 & 0,142857 & 0,135135 \\ 0,085714 & 0,105263 & 0,114286 & 0,107143 & 0,102564 & 0,114286 & 0,135135 \\ 0,114286 & 0,078947 & 0,057143 & 0,071429 & 0,102564 & 0,085714 & 0,135135 \\ 0,114286 & 0,105263 & 0,114286 & 0,142857 & 0,102564 & 0,085714 & 0,081081 \\ 0,085714 & 0,078947 & 0,057143 & 0,071429 & 0,102564 & 0,085714 & 0,081081 \\ 0,085714 & 0,131579 & 0,142857 & 0,107143 & 0,128205 & 0,114286 & 0,108108 \\ 0,114286 & 0,105263 & 0,114286 & 0,142857 & 0,102564 & 0,114286 & 0,108108 \\ 0,114286 & 0,131579 & 0,114286 & 0,107143 & 0,128205 & 0,142857 & 0,108108 \\ 0,142857 & 0,131579 & 0,142857 & 0,107143 & 0,102564 & 0,114286 & 0,108108 \end{bmatrix}$$

Step 3: Determine the normalized weight by multiplying the normalized matrix in step 2. The weights used for multiplication in step 3 are **0.15 , 0.2 , 0.1 , 0.1 , 0.15 , 0.15 , 0.15.**

This weight value is obtained from Table 2 which has been determined in the previous step. The results of all the criteria that can be obtained so as to form a matrix are as follows:

$$\begin{bmatrix} 0,021429 & 0,026316 & 0,014286 & 0,014286 & 0,019231 & 0,021429 & 0,020270 \\ 0,012857 & 0,021053 & 0,011429 & 0,010714 & 0,015385 & 0,017143 & 0,020270 \\ 0,017143 & 0,015789 & 0,005714 & 0,007143 & 0,015385 & 0,012857 & 0,020270 \\ 0,017143 & 0,021053 & 0,011429 & 0,014286 & 0,015385 & 0,012857 & 0,012162 \\ 0,012857 & 0,015789 & 0,005714 & 0,007143 & 0,015385 & 0,012857 & 0,012162 \\ 0,012857 & 0,026316 & 0,014286 & 0,010714 & 0,019231 & 0,017143 & 0,016216 \\ 0,017143 & 0,021053 & 0,011429 & 0,014286 & 0,015385 & 0,017143 & 0,016216 \\ 0,017143 & 0,026316 & 0,011429 & 0,010714 & 0,019231 & 0,021429 & 0,016216 \\ 0,021429 & 0,026316 & 0,014286 & 0,010714 & 0,015385 & 0,017143 & 0,016216 \end{bmatrix}$$

Step 4: Determine the value of the optimum function by adding up the value of the criteria for each alternative from the result of multiplying the matrix with the weights. The following is the result of the calculation for the optimum function value.

$$\begin{bmatrix} 0,137245 \\ 0,108850 \\ 0,094302 \\ 0,104314 \\ 0,081908 \\ 0,116763 \\ 0,112653 \\ 0,122477 \\ 0,121488 \end{bmatrix}$$

So that the results obtained at the optimum function value if added as a whole is 0.100000

Step 5: Determine the highest ranking level of each alternative by dividing the value of the alternative to alternative 0 (A0). The results are as follows:

0.137245. 0.108850. 0.094302. 0.104314. 0.081908. 0.116763. 0.112653. 0.122477. 0.121488.

From the results of these calculations, it can be obtained the results of the ranking levels of each alternative. The results of the calculation of the highest ranking level of all alternatives. The values for each are sorted from the highest value to the lowest value as shown in Table 11.

Table 11. Rankings

(Ai)	School Name	Value (Ki)	Rank
A0	-	0,137245	-
A1	**SMAN 1**	0,108850	5
A2	**SMAN 2**	0,094302	7
A3	**SMAN 3**	0,104314	6
A4	**SMAN 4**	0,081908	8
A5	**SMAN 5**	0,116763	3
A6	**SMAN 6**	0,112653	4
A7	**SMKN 1**	0,122477	1
A8	**SMKN 2**	0,121488	2

In Table 12, it is known that all alternative data that have been processed using the Additive Ratio Assessment (ARAS) method have different values (Ki). The results of determining the best SMA and SMK based on the highest score.

Table 12. Highest - Lowest Ranking Results

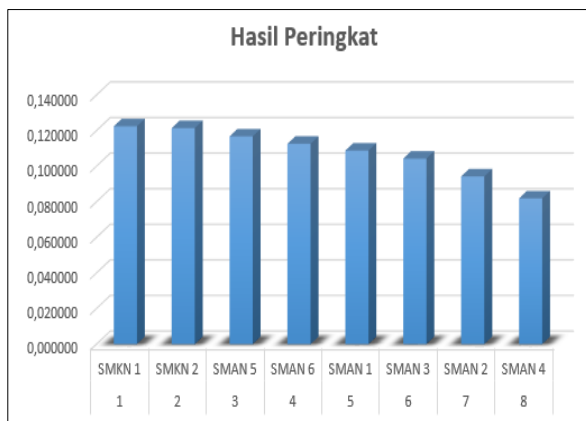| (Ai)	School Name	Value (Ki)	Rank	Results
-	**-**	**-**	**-**	
A7	**SMKN 1**	**0,122477**	**1**	Recommendation
A8	**SMKN 2**	**0,121488**	**2**	Recommendation
A5	**SMAN 5**	**0,116763**	**3**	Recommendation
A6	**SMAN 6**	**0,112653**	**4**	Recommendation
A1	**SMAN 1**	**0,108850**	**5**	Recommendation
A3	**SMAN 3**	**0,104314**	**6**	No
A2	**SMAN 2**	**0,094302**	**7**	No
A4	**SMAN 4**	**0,081908**	**8**	No

Figure 1. Graph of Ranking Results

Figure 1 shows the results of the best SMA and SMK assessments based on the highest-lowest scores.
The value (Ki) that will be recommended is alternative data that gets the highest score, there are 5 schools, namely **SMKN 1, SMKN 2, SMAN 5, SMAN 6 and SMAN 1** as the best SMA and SMK in the UPTD Education Area, Pinggir District.

CONCLUSION

In this study the decision support system for determining the best SMA and SMK carried out data analysis and calculation process using ARAS. ARAS implementation is very helpful to assist in decision making. There are 8 alternative data consisting of several SMA and SMK, then there are 7 criteria used in this study. Based on calculations using the ARAS method, the decision for the 5 Best Schools became a recommendation because it had the highest score.

SPECIAL THANK'S TO

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