APPLICATION OF DECISION SUPPORT SYSTEM IN SELECTION PIONIR ATHLETE USING AHP-TOPSIS METHOD (CASE STUDY : SPORTS COMPETITION ON (PIONIR)UIN MALANG)

UNDERGRADUATE THESIS

Created by:

ABDULLAHI MOHAMED SHEIKH ADAN
NIM. 14650110

JURUSAN TEKNIK INFORMATIKA

FAKULTAS SAINS DAN TEKNOLOGI

UNIVERSITAS ISLAM NEGERI MAULANA MALIK IBRAHIM

MALANG

2019

APPLICATION OF DECISION SUPPORT SYSTEM IN SELECTION PIONIR ATHLETE USING AHP-TOPSIS METHOD (CASE STUDY : SPORTS COMPETITION ON (PIONIR)UIN MALANG)

UNDERGRADUATE THESIS

A Thesis is submitted to Fakultas Sains dan Teknologi, Universitas Islam Negeri Maulana Malik Ibrahim Malang for the Requirements for the Degree of Bachelor of Computer (S.Kom)

Created by:

ABDULLAHI MOHAMED SHEIKH ADAN
NIM. 14650110

JURUSAN TEKNIK INFORMATIKA

FAKULTAS SAINS DAN TEKNOLOGI

UNIVERSITAS ISLAM NEGERI MAULANA MALIK IBRAHIM

MALANG

2019

APROVAL PAGE

APPLICATION OF DECISION SUPPORT SYSTEM IN SELECTION PIONI R ATHLETE USING AHP-TOPSIS METHOD (CASE STUDY : SPORTS COMPETITIONS ON (PIONIR) UIN MALANG)

UNDERGRADUATE THESIS

Created by:
ABDULLAHI MOHAMED SHEIKH ADAN
NIM. 14650110

Has been Checked and approved for the examination
Date ; 17 September 2019

Supervisor I	Supervisor II
Dr. Suhartono, M.Kom	Dr. M. Faisal, M.T
NIP. 196805192003121001	NIP. 1974501 200501 1 007

Assessed and approved by:
Head of Department Information Technology
Faculty of Science and Technology
Universitas Islam Negeri Maulana Malik Ibrahim Malang

Dr. Cahyo Crysdian
NIP. 1974024 200901 1 008

iii

CONFIRMATION PAGE

APPLICATION OF DECISION SUPPORT SYSTEM IN SELECTION PIONIR ATHLETE USING AHP-TOPSIS METHOD (CASE STUDY : SPORTS COMPETITIONS ON (PIONIR) UIN MALANG)

UNDERGRADUATE THESIS

Created by:

ABDULLAHI MOHAMED SHEIKH ADAN
NIM. 14650110

Has been Conducted in the presence of the board of undergraduate thesis examiners and stated accepted as one of the requirements to obtain the title Bachelor of Computer.(S.kom)

Date: 27 September 2019

Board of Examiners:			**Signature:**
Main Examiner	:	**Fachrul Kurniawan, M.MT** **NIP.19771020 200912 1 001**	( )
Chief Examiner	:	**Fresy Nugroho, M.T** **NIP.19710722 201101 1 001**	( )
Secretary Examiner	:	**Dr. Suhartono, M.Kom** **NIP.19680519 200312 1 001**	( )
Examiner Member	:	**Dr. M.Faisal, M.T** **NIP.1974501 200501 1 007**	( )

Authorize,
Head of Department of Information Technology
Faculty of Science and Technology
Universitas Islam Negeri Maulana Malik Ibrahim Malang

Dr. Cahyo Crysdian
NIP. 1974024 200901 1 008

iv

LETTER OF STATEMENT

I undersigned below:

Name : Abdullahi Mohamed Sheikh Adan
NIM : 14650110
Department : Teknik Informatika
Facultuy : Sains dan Teknologi

States that an undergraduate thesis mentioned above is my original work except for the quotations and statements whose resources are acknowledged on the references. Any shortcoming in this present work, therefore,are entirely my own responsibility.
Moreover, this work is not plagiarism result and if it is found that this statement is false, my academic records will attest to invalidation and I will be responsible fot that as well.

Malang, October 2019

Signed by,

Abdullahi Mohamed Sh. Adan
NIM. 14650110

v

MOTTO

(قُلْ هَلْ يَسْتَوِي الَّذِينَ يَعْلَمُونَ وَالَّذِينَ لَا يَعْلَمُونَ إِنَّمَا يَتَذَكَّرُ أُولُو الْأَلْبَابِ)

Say, "Are those who know equal to those who do not know?" Only they will remember [who are] people of understanding.

It is no secret that a good education has the power to change a life and you will not the same person that you would be before you begin learning.

vi

TRIBUTE PAGE

First of all...
Gratitude to Allah SWT.
A sprinkling of your affection has given me strength.
That you gave finally this simple thesis can be resolved. and
The Holy Prophet Muhammad,
Peace and blessings of Allah be upon him (Pbuh)

I offer this simple work to all those whom I love

Dear Mom &Dad,
Thank you for being there whenever I needed it, and even when I thought I didn't need it. Thank you for teaching me respect, confidence, and proper etiquette. Thank you for letting me find my own way. Thank you for acknowledging how hard I've worked, but also know that I would not be here without you.
Love, Your Son Nabil .
Hopefully this will be the first step to make You happy
Amen Ya 'Allah,,,.

To My Beloved brother Abdihafid who helped me alot to focus My study

To My uncle Mr Abdisalam who was the reason to study here(Indonesia)

Thank You for every advice and help you give to me.

Dear Siblings,

Growing up, I have realized that you are the most precious people in my life
and I wanted you all to know how thankful I am for all the things you say and do.
Love You.

Dear best friend,
Thank you for making ordinary moments extraordinary.
A simple day can become special because of you.
A short stop at a coffee or tea shop will always bring out the best stories.
You never fail to make me laugh. There's never a dull moment with you.

vii

PREFACE

بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

Assalamu alaikum Wr. Wb.

In the name of Allah, the Most Merciful, the All-Inclusive. All the praise and thanksgiving of the writer extends the presence of Allah SW who has bestowed mercy, reconcile, so that the author can finish the thesis entitled "Application of Decision Support System in Selection Pionir Athlete Using AHP-TOPSIS Method (Case Study : Sports Competitions on (PIONIR) Uin Malang)". May these blessings and good greetings continue to flow to our prophet Mohamed who followed mankind from the time of darkness to the bright days of Islam

Furthermore, the author gives thanks as a prayers and hope 'to all those who have helped the completion of this thesis, Writer gives thanks to.....

1. Dr. Suhartono, M.Kom, as a supervisor I who has taken the time to guide, motivate direct and provide input in the work of this thesis.
2. Dr. M. Faisal, M.T, , as a supervisor II who has provided advice and guidance in the preparation of this thesis report
3. Dr. Cahyo Crysdian, as the head of the Informatics Engineering department, and the Guardian lecturer who always gives input and direction to the author from the beginning of the lecture to the completion of this thesis.
4. All of Informatics Engineering lecturers and all My Friends Class of 2014
   Which provides scientific guidance and all support to the author so far.
5. All My Somali Friends Who helped me to success this university and special My department Colleagues Thank you so much.
   May Allah the Almighty give you an appropriate response to the services and guidance that you have given me.

The Author hope, this thesis can provide benefits to the readers, especially for writers personally Amin.

Malang 1 October 2019

Author

viii

TABLE OF CONTENTS

TITLE PAGE.....i
SUBMISSION PAGE.....ii
APPROVAL PAGE.....iii
CONFIRMATION PAGE.....iv
STATEMENT PAGE.....v
MOTTO.....vi
TRIBUTE PAGE.....vii
PREFACE.....viii
TABLE OF CONTENTS.....ix
LIST OF FIGURES.....xi
LIST OF TABLES.....xii
ABSTRACT.....xiv
ABSTRAK.....xv
الملخص.....xvi
CHAPTER I INTRODUCTION.....1
1.1 Research Background.....1
1.2 Research Questions.....4
1.3 Research Objectives.....4
1.4 Research Scopes.....4
1.5 Research Benefits.....5
CHAPTER II LITERATURE REVIEW.....6
2.1 Pekan Ilmiah, Olahraga, Seni, dan Riset (PIONIR).....6
2.1.1 Athlete Selection.....7
2.1.2 PIONIR Athlete Selection Procedure.....7
2.2 Fuzzy Multiple Attribute Decision Making (FMADM) Algorithm.....8
2.2.2 Technique For Order Preference By Similarity To Ideal Solution (TOPSIS)Algorithm.....14
2.3Related Research.....17
CHAPTER III RESEARCH METODOLOGY.....25

3.1 Research design..... 25
3.1.1 Object of research..... 25
3.2 Research procedure..... 30
3.2.1 Understanding Systems and Literature Studies..... 30
3.2.2 Determination of Criteria and Weighting..... 30
3.2.3 Weight Determination Process with AHP method..... 31
3.2.4 The Process of Appraising Athletes with the TOPSIS Method..... 40
3.3 Implementation..... 43
CHAPTER IV RESULTS AND DISCUSSION..... 43
4.1 System implementation..... 43
4.1.1 Hardware Requirements..... 43
4.1.2 Software Requirements..... 44
4.2.1 Interface Implementation..... 44
4.2.2 Login page..... 44
4.2.3 Main page..... 45
4.2.4 Admin Main Page..... 46
4.2.4.1 The Main Criteria Page..... 46
4.2.4.2 The Main Contest Page..... 48
4.2.4.3 Main Page Of AHP..... 52
4.2.4.4 Main page Input athletes..... 54
4.2.4.5 The Main Page Selection Process..... 56
4.2.4.6 The Main Report Page..... 57
4.2.5 Students Main Page..... 58
4.3 Analysis Of The Results..... 59
4.4 Based on the Calculation of System Accuracy..... 67
4.5 Integration in Islam..... 67
CHAPTER V CONCLUSIONS AND RECOMMENDATIONS..... 68
5.1 CONCLUSION..... 68
5.2 RECOMMENDATIONS..... 69
LIST OF REFERENCES..... 70

LIST OF FIGURES

Figure 2. 1 Hierarchy Structure of AHP.....10
Figure 3. 1 Flowchart AHP-TOPSIS Method..... 25
Figure 3. 2 Block Diagram System..... 26
Figure 3. 3 Pairwise comparation of matrix criteria.....27
Figure 3. 4 Flowchart of TOPSIS Method Athlete Selection process.....28
Figure 4.1 Display of Admin and Student Login Pages.....45
Figure 4.2 Criteria Page Views..... 46
Figure 4.3 Display Page Add the WEIGHTING of Criteria..... 47
Figure 4.4 Add Sub Page Display Criteria..... 48
Figure 4.5 Display Page Contest..... 48
Figure 4.6 The Edit page view or View to the Data of the Participants 49
Figure 4.7 Page View Add Data.....51
Figure 4.8 page view Add Data.....52
Figure 4.9 Page View Criteria Pairs..... 53
Figure 4.10 Page Views Guide Charging the Value of Criteria..... 54
Figure 4.11 Athlete Input page views.....55
Figure 4.12 Display Page Add New Athletes.....56
Figure 4.13 Display Page Selection Process..... 57
Figure 4.14 page View Repor.....58
Figure 4.15 Page View Report Student That Passes Selection..... 59
Figure 4.16 Display Example Data of Participants and Criteria Values..... 59
Figure 4.17 Display Criteria AHP-TOPSIS..... 60
Figure 4.18 Eigen Value Display..... 61
Figure 4.19 Display Selection Result..... 61
Figure 4.20 Accuracy Graph of results.....67

LIST OF TABLES

Table 2. 1 Pairwise Comparison Scale..... 11
Table 2. 2 Value of random index..... 14
Table 2. 3 Related research..... 17
Table 3. 1 Amxn comparison matrix..... 32
Table 3. 2 Pairing Criteria Matrix..... 33
Table 3. 3 Amount of Value in each column..... 33
Table 3. 4 Normalized pairing criteria matrix..... 33
Table 3. 5 Normalized pairing criteria matrix..... 34
Table 3. 6 Weight Product..... 35
Table 3. 7 Calculation of λ to find λmax..... 35
Table 3. 8 Index Random of AHP method..... 36
Table 3. 9 Value vector for weighting criteria..... 36
Table 3. 10 Weight criteria..... 36
Table 3. 11 The weight of the results of the Physical subcriteria..... 37
Table 3. 12 The weight of the results of the Techniques subcriteria..... 37
Table 3. 13 The weight of the results of the Psychological subcriteria..... 37
Table 3. 14 Decision matrix..... 38
Table 3. 15 Normalized decision matrix..... 38
Table 3. 16 Sub-criteria weight..... 38
Table 3. 17 The normalized decision matrix is weighted..... 38
Table 3. 18 Ideal positive and negative solutions..... 39
Table 3. 19 Alternative Distance with Ideal Solutions..... 42
Table 3. 20 Preference value..... 43
Table 4.1. Implementation of hardware used..... 43
Table 4.2 Implementation of the software used..... 44
Table 4.3 Results of Calculations from the System..... 66

ABSTRACT

ABDULLAHI MOHAMED SHEIKH ADAN. 2019. Application of Decision Support System In selection Pionir Athlete Using AHP-TOPSIS Method (Case Study : Sports Competition on (Pionir)Uin Malang), Thesis. Department of Informatics, Faculty of Science and Technology, State Islamic University (UIN) Maulana Malik Ibrahim Malang..

Supervisor: (I) Dr. Suhartono,M.Kom ,(II) Dr. M. Faisal, M.T

Keywords: AHP-TOPSIS methods, Decision Support System, Athlete Selection PIONIR

PIONIR is a event for national level scientific, sports, arts and research competitions. In the past they used it manually and it was difficult compared to those who use the computer, Therefore any institution that uses a computer to manage its information system will have more value than a manually processed system. So that it can be said that an information system that uses a computer will have high efficiency and productivity. than the manual processed system.

In this Research a case will be raised that is looking for the best alternative based on the criteria that have been determined by using the AHP method then looking for solutions with the TOPSIS method. This method was chosen because it was able to select the best alternative from a number of alternative.

The accuracy of the program is obtained 84.61% with the total amount of data is 130 and the amount of data that has the same result is 110.

ABSTRAK

ABDULLAHI MOHAMED SHEIKH ADAN. 2019. Application of Decision Support System In selection Pionir Athlete Using AHP-TOPSIS Method (Case Study : Sports Competition on (Pionir)Uin Malang), Thesis. Department of Informatics, Faculty of Science and Technology, State Islamic University (UIN) Maulana Malik Ibrahim Malang.

Supervisor: (I) Dr. Suhartono,M.Kom ,(II) Dr. M. Faisal, M.T

Kata kunci: Metode AHP-TOPSIS, Sistem Pendukung Keputusan,Seleksi Atlet PIONIR

PIONIR adalah acara, kompetisi ilmiah, olahraga, seni, dan penelitian tingkat nasional.

Di masa lalu mereka menggunakannya secara manual dan itu sulit dibandingkan dengan mereka yang menggunakan komputer, Oleh karena itu setiap lembaga yang menggunakan komputer untuk mengelola sistem informasinya akan memiliki nilai

lebih dari sistem yang diproses secara manual. Sehingga dapat dikatakan bahwa sistem informasi yang menggunakan komputer akan memiliki efisiensi dan produktivitas yang tinggi. dari sistem yang diproses secara manual.

Dalam penelitian ini akan dimunculkan suatu kasus yaitu mencari alternatif terbaik

berdasarkan kriteria yang telah ditentukan dengan menggunakan metode AHP kemudian mencari solusi dengan metode TOPSIS. Metode ini dipilih karena mampu memilih alternatif terbaik dari sejumlah alternatif. Akurasi program diperoleh 84,61% dengan jumlah total data adalah 130 dan jumlah data yang memiliki hasil yang sama adalah 110.

الملخص

عبدالله محمد شيخ . 2019. تطبيق نظام دعم القرار في اختيار PIONIR ATHLETE باستخدام طريقة (أهبي توب سيس)

المشرف: الدكتور سوهارتونو والدكتور م. فيصل

الكلمات الرئيسية:أساليب نظام دعم القرار ، اختيار الرياضي ،طريقة AHP-TOPSIS.

.**بيونير** هو برنامج للمسابقات العلمية والرياضية والفنية والبحثية على المستوى الوطني في الماضي استخدموه يدويًا وكان من الصعب مقارنة بأولئك الذين يستخدمون جهاز الكمبيوتر ، وبالتالي فإن أي مؤسسة تستخدم جهاز كمبيوتر لإدارة نظام المعلومات الخاص بها سيكون لها قيمة أكبر من نظام معالج يدويًا. بحيث يمكن القول أن نظام المعلومات الذي يستخدم الكمبيوتر سيكون له كفاءة وإنتاجية عالية. من نظام معالجتها يدويا.

في هذا البحث ، سيتم رفع قضية تبحث عن أفضل بديل استنادًا إلى المعايير التي تم تحديدها باستخدام طريقة (AHP) ثم البحث عن حلول باستخدام أسلوب (TOPSIS)

تم اختيار هذه الطريقة لأنها كانت قادرة على اختيار أفضل بديل من عدد من البديل.

تم الحصول على دقة البرنامج 84.61٪ مع إجمالي كمية البيانات 130 وكمية البيانات التي لها نفس النتيجة 110.

CHAPTER I

INTRODUCTIONTION

1.1 Research Background

Globalization or globalisation is the process of interaction and integration among people, companies, and governments worldwide . It cannot be denied that one of the main causes of the globalization era that came faster than expected by all parties was due to the rapid development of information technology (Indrajit, 2002). The development of information technology in this era can be arguably growing rapidly, especially in the internet. The internet can make it easier for someone to do any activity (Febrian, 2003), such as doing business and trading, corresponding, working, socializing, listening to music, taking courses or lectures, and looking for desired information. Therefore, an institution that uses a computer to manage its information system will have more value than a manually processed system. So that it can be said that an information system that uses a computer will have high efficiency and productivity.

PIONIR is a event for national level scientific, sports, arts and research competitions. This activity was followed by PTKI students (UIN, IAIN, STAIN and PTKIS) under the Ministry of Religion. Through this event, it is expected to produce young researchers who are experts in their fields and able to contribute to the development of the nation. In addition, PTKI can also be a place to join athletes in sports and artists who are needed at national and international events.

There are four categories competition: Scientific, Sports, Arts and Research Fields. The Scientific Field consists of 4 competitions, namely: (1). Arabic debate, (2). English debate, (3). Musabaqah Qur'anic Paper (MMQ) and (4). Musabaqah Qiraatul Kutub (MQK). There are 10 Sports contested : (1). Futsal, (2). Volly ball, (3). Table Tennis, (4). Badminton, (5). Chess, (6). Wall Climbing, (7). Sepak Takraw, (8). Pencak Silat, (9). Basketball and (10). Karate. In addition, there are 8 Art contested : (1). Musabaqah Tilawah Al-Qur'an (MTQ), (2). Musabaqah Hifdzil Qur'an (MHQ), (3). Calligraphy, (4). Pop Solo Islami, (5). Muslim Design and Fashion Show, (6). Al-Qur'an and (7) poetry. Marawis, (8). Musabaqah Syahril Qur'an (MSQ). while 2 Research contested include: (1). Writing and (2). Student Innovative Work. To determine a student who is supposed to pass an athlete selection especially on sports competitions, a decision support system is needed. One method that can be used in the Decision Support System (DSS) is *Analitical Hierarchi Process* and *Technique For Orthers References by similarity to Ideal Solution (AHP-TOPSIS)*.

Competing with goodness includes worship. because it is a positive thing that affects goodness or benefit, every competition in goodness is beneficial, by working hard to get the best results in obtaining goodness is just trying hard the best in worship. Allah SWT has said in Q.S Al Baqarah: 148.

وَلِكُلّٖ وِجۡهَةٌ هُوَ مُوَلِّيهَاۖ فَٱسۡتَبِقُواْ ٱلۡخَيۡرَٰتِۚ أَيۡنَ مَا تَكُونُواْ يَأۡتِ بِكُمُ ٱللَّهُ جَمِيعًاۚ إِنَّ ٱللَّهَ عَلَىٰ كُلِّ شَيۡءٖ قَدِيرٞ ١٤٨

“And every one has a direction to which he should turn, therefore hasten to (do) good works; wherever you are, Allah will bring you all together; surely Allah has power over all things”. (Q.S Al Baqarah: 148)

Abu al-Aliyah said: "The Jews have their own qibla and Christians also have their own qibla. And Allah Ta'ala has given instructions to you O Muslims, to face the real Qiblah. "

Similar things are also narrated by Mujahid, Atha ', adh-Dhahhak bin Anas, and as-Suddi. In another narration Mujahid and Hasan al-Basri said: "All the people have been ordered to pray by facing the Ka'bah."

Here Allah Almighty. said: Ainamaa takuunuu ya'ti bikumullaaHu jamii'an innallaaHa ‘alaa kulli syai-in qadiir (" Wherever you are, Allah will surely gather you all (on Judgment Day).

Surely Allah is omnipotent over all things. "Meaning, Allah Ta'ala is able to gather you from the ground even though your body has been scattered

In this Research a case will be raised that is looking for the best alternative based on the criteria that have been determined by using the AHP method then looking for solutions with the TOPSIS method. This method was chosen because it was able to select the best alternative from a number of alternatives, in this case the intended alternative is the student who passed the selection based on the specified criteria. The study was conducted by looking for weight values for each attribute, then the process of sorting candidates who will determine the optimal alternative, such as students passing the selection of PIONIR athlete UIN Maulana Malik Ibrahim Malang.

1.2 Research Questions

Based on the research background, the problem statement or research question in this research is the accuracy of (AHP-TOPSIS) method in selection process of PIONIR athlete UIN Malang?

1.3 Research objectives

The purpose of this research to calculate the accuracy of *Analytical Hierarchy Process-Technique or Order Preference by Similarty to Ideal Solution* (AHP-TOPSIS) method for decision making in the athlete selection process of PIONIR UIN Malang.

1.4 Research scopes

Avoiding the widespread problems that exist, as well as the limitations of knowledge and abilities by researchers, the limitation of the problem in this study is:

1. Application of decision supporting system made with the scope of selection PIONIR athletes at UIN Malang.
2. The application that will be built is only for sports competitions. There are Futsal, Volly ball, Table Tennis, Badminton, Chess, Wall Climbing, Sepak Takraw, Pencak Silat, Basketball and Karate competition.
3. The data that used in this research is data of students participating in the selection of PIONIR athletes UIN Malang in 2018.

1.5 Research benefits

The expected benefits of this research are :

1. Decision support system of selection PIONIR athletes UIN Malang were built using the Analytical Hierarchy Process-Technique for Order Preference by Similarity To Ideal Solution (AHP-TOPSIS) method which can determine the right target students and are entitled to national tournaments representing UIN Malang based on predetermined criteria.
2. Assist the selection committee of PIONIR athletes UIN Malang in selecting candidates for athletes to obtain effective and objective assessment results.
3. Assist the selection committee of PIONIR athletes UIN Malang in selecting athletes quickly and accurately.

CHAPTER II

LITERATURE REVIEW

2.1 Pekan Ilmiah, Olahraga, Seni, dan Riset (PIONIR)

PIONIR is a venue for national level scientific, sports, arts and research competitions. This activity was followed by PTKI students (UIN, IAIN, STAIN and PTKIS) under the Ministry of Religion. PIONIR is held in a multi-event held every 2 (two) years. This activity was followed by PTKI students (UIN, IAIN, STAIN and PTKIS) under the Ministry of Religion. Through this event, it is expected to produce young researchers who are experts in their fields and able to contribute to the development of the nation. In addition, PTKI can also be a place to join athletes in sports and artists who are needed at national and international events.

There are four categories competition: Scientific, Sports, Arts and Research Fields. The Scientific Field consists of 4 competitions, namely: (1). Arabic debate, (2). English debate, (3). Musabaqah Qur'anic Paper (MMQ) and (4). Musabaqah Qiraatul Kutub (MQK). There are 10 Sports contested : (1). Futsal, (2). Volly ball, (3). Table Tennis, (4). Badminton, (5). Chess, (6). Wall Climbing, (7). Sepak Takraw, (8). Pencak Silat, (9). Basketball and (10). Karate. In addition, there are 8 Art contested : (1). Musabaqah Tilawah Al-Qur'an (MTQ), (2). Musabaqah Hifdzil Qur'an (MHQ), (3). Calligraphy, (4). Pop Solo Islami, (5). Muslim Design and Fashion Show, (6). Al-Qur'an and (7) poetry. Marawis, (8). Musabaqah Syahril Qur'an (MSQ). while 2 Research contested include: (1). Writing and (2). Student Innovative Work. To determine a student who is supposed to pass selection athlete,

a decision support system is needed. One method that can be used in the Decision Support System (DSS) is *Analitical Hierarchi Process* and *Technique For Orthers References by similarity to Ideal Solution (AHP-TOPSIS)*.

2.1.1 Athlete Selection

Selection according to KBBI is a method and procedure in selecting people for a purpose. In a championship, participants are required to depart as a team, this team is called a contingent. The contingent contains several athletes who are divided into certain categories. Each contingent will make a selection to form a team that will be competed in a championship. In addition to the selection held for the purpose as a form of preparation for the championship. Selection of athletes is also held by certain academies or agencies. Athletes who pass the selection will be coached and trained in a training camp, before finally being included in various championships.

2.1.2 PIONIR Athlete Selection Procedure

Through Tri Dharma of University, students are directed and guided so that they have intellectual sensitivity, moral awareness, social and culture. The office of Student affairs and alumni of UIN Maulana Malik Ibrahim Malang have a responsibility to prepare a strong generation to increase the critical power, responsiveness and visionary power of students towards the problems of the nation and religion. Graduates are expected to be able to compete in work with the title "Ulama who have an intellectual-professional attitude and intellectuals who are ulama-professional".

general requirements of participants that participating in the selection PIONIR Athlete are :

1. Indonesian citizens.
2. Athletes / participants are registered as active undergraduate (Diploma) or Diploma students, as evidenced by KTM, KRS, and certificates as active students from the relevant PTK leadership.
3. Athletes / participants must be registered by one university.
4. Athletes / participants must fill in their personal and university biodata
5. Athletes / participants can only participate in one of the branches of the race.
6. Athletes / participants must visit the spirit of fair play, do no acts of violence and submit to the rules of competition.
7. The contingent leader must fill out and submit a form containing the number of athletes / participants in each branch that is followed.
8. The contingent leader must submit a list of names and color photographs of size 4 x 6 (2 pieces) for each athlete / participant.
9. The age of athletes / participants on May 18 2015 is a maximum of 25 years.

2.2 *Fuzzy Multiple Attribute Decision Making* (FMADM) Algorithm

Fuzzy Multiple Attribute Decision Making FMADM is a method used to find optimal alternatives from a number of alternatives with certain criteria. The essence of FMADM is to determine the weight values for each attribute, then proceed with a ranking process that will select the alternatives that have been given. Basically, there are 3 approaches to finding attribute weight values, namely

subjective approaches, objective approaches and integration approaches between subjective & objective. Each approach has strengths and weaknesses. Subjective approach, weight value is determined based on the subjectivity of the decision makers, so that several factors in the alternative ranking process can be determined freely. In the objective approach, the weight value is calculated mathematically so that it ignores the subjectivity of the decision maker (Kusumadewi, 2007).

There are several methods that can be used to solve FMADM problems (Kusumadewi, dkk, 2006):

a. *Simple Additive Weighting Method* (SAW)

b. *Weighted Product* (WP)

c. *Technique for Order Preference by Similarity to Ideal Solution* (TOPSIS)

d. *Analytic Hierarchy Process* (AHP)

e. *Preference Ranking Organization Method For Enrichment Evaluation* (PROMETHEE).

2.2.1 *Analytic Hierarchy Process* (AHP) Algorithm

According to Bourgeois (2005) AHP is generally used with the aim of setting priorities of various alternatives / choices that exist and those choices are complex or multi criteria. In general, by using AHP, the priorities generated will be consistent with the theory, logical, transparent, and participatory (Bourgeois, 2005). The Analytical Hierarchy Process is one method to help decision makers in making decisions according to the criteria or conditions that have been determined, and the criteria for decision making are various criteria. The Analytical Hierarcy

Process (AHP) method is multi-criteria because it uses many criteria in the preparation of a priority decision support system (Risma, 2016). The AHP hierarchy structure can be seen in the following figure.

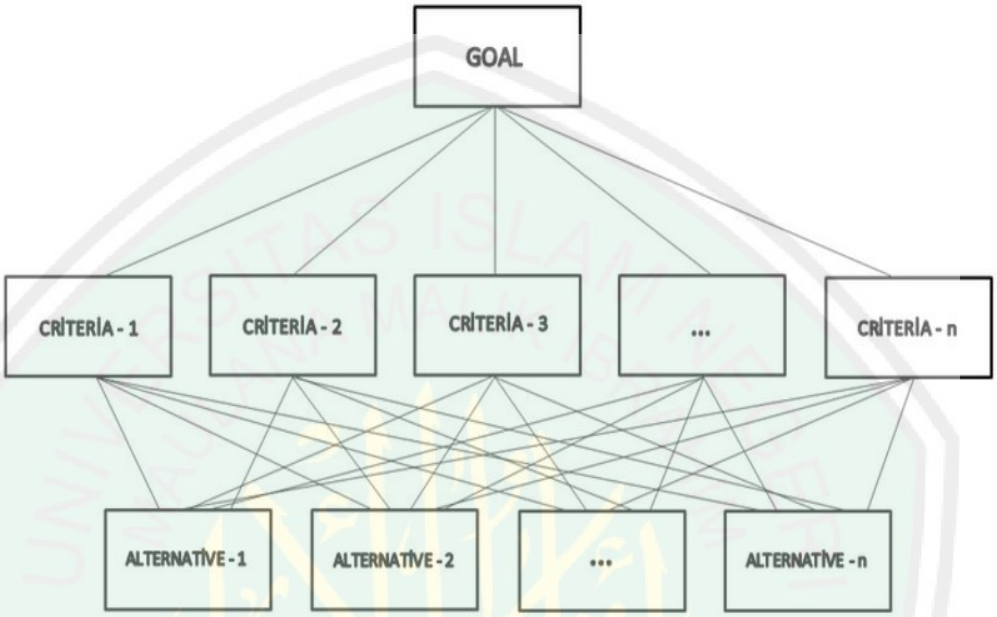


Figure 2. 1 hierarchy structure of AHP

Some principles that need to be understood in solving problems using the AHP method, among others (Kosasi, 2002):

a. *Decomposition*, that is breaking the whole problem into elements, to the smallest.

b. *Comparatif judgement*, this principle makes judgments about the relative importance of two elements at a certain level in relation to the above levels. This assessment is the core of AHP, because it will affect the priority of elements. the results of this study are more easily presented in the form of a matrix *pairwise comparation.*

c. *Synthesis of priority,* from the pairwise comparation matrix eigenvector (feature) to get local priority, because pairwise comparation matrices

are at the local level, so doing globally must be synthetic among local priorities. Procedures for synthesizing differ according to the shape of the hierarchy.

d. *Local consistency,* consistency has two meanings. The first is that similar objects can be grouped according to their uniformity and relevance. Second is the level of relations between objects based on certain criteria.

The stages of problem solving using the AHP method :

1. Compilation of pairwise comparison matrices

   Represent the level of importance between criteria based on the AHP preference scale.

$$A = [a_{im}] = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ \frac{1}{a_{12}} & 1 & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \dots & 1 \end{bmatrix} \quad \text{.....(2.1)}$$

   For example C_1,C_2, C_3,..., C_n is a set of elements, where a_{im} state the number of pairwise comparison matrix elements C_I dan C_m. In the pair comparison matrix obtained based on the AHP preference scale giving numerical values for various preference levels used AHP shown in Table 2.1.

Table 2. 1 Pairwise Comparison Scale

Intensity of Interest	Information
1	Both criteria are equally important
3	One criteri is slightly more important than the other criteria
5	One criteri is more important than the other criteria

7	One criteri is clearly more important than the other criteria
9	The criteri is absolutely important than the other criteria
2,4,6,8	Value value between two consideration values of adjacent criteria
The opposite	If activity x gets one number compared to activity y, then y has the opposite value of x.

2. Normalization of decision matrices

Each matrix column is summed, then each element in the matrix is divided by the total column value. After that, determine the average row of a matrix or vector that contains a set of n weights of $w_1, w_2, \cdots, w_n$. The total value of each matrix column must be 1 (one). Normalization of the decision matrix given by.

$$A_w = \begin{bmatrix} \frac{a_{11}}{\sum a_{i1}} & \frac{a_{12}}{\sum a_{i2}} & \cdots & \frac{a_{1n}}{\sum a_{in}} \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \frac{a_{n1}}{\sum a_{i1}} & \frac{a_{n2}}{\sum a_{i2}} & \cdots & \frac{a_{nn}}{\sum a_{in}} \end{bmatrix} \quad \text{.....(2.2)}$$

3. Analysis of consistency

First is to get the weight of each alternative. the eigenvector of the A matrix is determined by calculating C*i* as the average then C*i* as the average value in the line "i" from the A*w* matrix which will be calculated for the column vector C where the value of Ci indicates the degree of importance as in equation 2.3.

$$C = \begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ \vdots \\ c_n \end{bmatrix} = \begin{bmatrix} \frac{a_{11}}{\frac{\sum a_{i1}}{n}} + & \frac{a_{11}}{\frac{\sum a_{i1}}{n}} + & \cdots & \frac{a_{1n}}{} + \frac{\sum a_{in}}{n} \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ \frac{a_{n1}}{\frac{\sum a_{i1}}{n}} & \frac{a_{n2}}{\frac{\sum a_{i2}}{n}} & \cdots & \frac{a_{nn}}{\frac{\sum a_{in}}{n}} \end{bmatrix} \quad \text{.....(2.3)}$$

The second is control the value of consistency weights (*CI*). to do consistency vectors are calculated (A x C Matrics). then xi will be calculated through the multiplication of the A matrix and the C matrix. to calculate CI can be seen in the equation 2.4.

$$A \times C = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ \vdots & \vdots & \cdots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} = \begin{bmatrix} C_1 \\ C_2 \\ \vdots \\ \vdots \\ C_n \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ \vdots \\ x_n \end{bmatrix} \quad \text{.(2.4)}$$

The Third is calculating λ_{max} with equation 2.5.

$$\lambda\, max = \sum_{i=1}^{n} \frac{xi}{Ci} \quad \text{.....(2.5)}$$

Where λ_{max} is the eigenvalue of the paired comparison matrix, then calculates the consistency index (CI) with the equation 2.6.

$$CI = \frac{\lambda_{max} - \mathrm{n}}{n - 1} \quad \text{.....(2.6)}$$

Where n are the number of criteria.

Another consistency analysis that must also be calculated is CR (*Consistency Ratio*). In general, if CR=$\frac{CI}{IR} \leq 0{,}1$ then the pairwise comparison matrix is consistent so that the calculation results are declared correct (Kusrini, 2007) . The acceptable level of consistency is determined by comparing CI to random random

index, RI which is a consistency index of randomly made pairwise comparison matrices.

Where RI: Random Index $\left(RI = \frac{1{,}98\times(n-1)}{n}\right)$.

Table 2. 2 *Value of random index*

Matrix Size (N)	Value of RI	Matrix Size (N)	Value of RI
1,2	0	9	1,45
3	0,58	10	1,49
4	0,90	11	1,51
5	1,12	12	1,53
6	1,24	13	1,55
7	1,32	14	1,57
8	1,41	15	1,59

2.2.2 *Technique For Order Preference By Similarity To Ideal Solution (TOPSIS)* Algorithm

Technique For Order Preference By Similarity To Ideal Solution or what is also known as TOPSIS is one of the multi-criteria decision making methods that was first introduced by Yoon and Hwang in 1981. (Julianti, Irawan M.I dan Mukhlas I, 2011). TOPSIS is based on a concept where a good chosen alternative not only has the shortest distance from a positive ideal solution, but also has the longest distance from a negative ideal solution. The concept is simple and easy to understand, its computation is efficient and has the ability to measure the relative performance of simple mathematical decision alternatives.

Steps to do the TOPSIS procedure:

1) Determine normalized decision matrices.

In determining normalized decision matrices, the value of each criterion (xij) for all alternatives is summed, then the value of each criterion is divided by the number of criteria.

2) Calculate the weighted normalized decision matrix.

Before determining this matrix, we have previously determined the intensity value of the importance of each criterion. From this value of intensity of interest based on the results of the first step, we can determine the weighted normalized decision matrix.

3) Calculate the matrix of positive ideal solutions and matrix ideal nagative solutions.

The next step is to determine the matrix of positive ideal solutions and the matrix of negative ideal solutions based on equations 2.7 and 2.8.

$A^{+}= (y_1^{+},_2^{+},y_3^{+},\ldots,y_n^{+})$;.....(2.7)

$A^{-}= (y1^{-},2^{-},y_3^{-},\ldots,y_n^{-})$; .....(2.8)

4) Calculating the distance between the values of each alternative with a matrix of positive ideal solutions and a matrix of ideal negative solutions.

Next to find the distance between alternatives with a matrix, the ideal positive solution can use equation 2.9.

$$D_i^{+} = \sqrt{\sum_{j=1}^{n} \left(y_i^{+} - y_{ij}\right)^2}; \quad \text{.....(2.9)}$$

The distance between alternative A and the negative ideal solution is formulated by equation 2.10:

$$D_i^- = \sqrt{\sum_{j=1}^{n} \left(y_{ij} - y_i^-\right)^2}; \quad \text{.....(2.10)}$$

5) Calculate preference values for each alternative.

The final step of the TOPSIS calculation is to find the preference value for each alternative given according to equation 2.11.

$$V_i = \frac{D_i^-}{D_i^- + D_i^+}; \quad \text{.....(2.11)}$$

A larger Vi value indicates that alternative Ai is chosen as the first rank.

2.3 Related Research

The related research can be seen in Table 2.3

Table 2.3 Related research

No	Researcher	Year	Title	Results
1	Pema Wangchen Bhutia, Ruben Phipon from Institute of Technology Sikkim, India.	2012	Appication of AHP and TOPSIS method for supplier selection problem	This research is aimed at selecting suppliers that best fit the specified criteria, namely product quality, service quality, delivery time and price. Research that has been published in this International Journal uses the AHP method to evaluate the weight of the criteria mentioned earlier. Then the criteria we have evaluated will be processed with the TOPSIS method to rank supplier ratings.
2	Alfian Anhar from Brawijaya University	2013	TOPSIS Combination Method (*Technique for*	The researcher used the method to rank 4 alternative tourism on the island of Bali, including Dreamland, Tanah Lot, Kuta and

			Order Preference by Similarity to Ideal Solution) with AHP (*Analytical Hierarchy Process)* in Determining the Best Tourist Sites on the Island of Bali	UluWatu. The criteria used are Landscape, Security, Comfort, Cleanliness, Cost and Transportation. The researcher used input from 96 correspondents to determine the weight of each criterion. The weight is included in the TOPSIS modeling table, then it will be converted into AHP modeling tables. After obtaining the results of the AHP modeling table, the weight values will be evaluated using AHP. Then after the weights have been tested, the weight of the criteria will be used to determine the weighted matrix of each alternative that will be used to rank the tourist attractions.
3	Annisa Arfani Yusuf from Gorontalo University	2013	The comparative Analysis of Combined AHP and TOPSIS Methods with the	The study compared the accuracy of the 2 AHP-TOPSIS and TOPSIS methods. The case used by researchers is the acceptance of PPA scholarships and receipt of BBM scholarships. The criteria for recipients of PPA and BBM

			TOPSIS Method	scholarships consist of 12 criteria, namely GPA, semester, achievement, amount of parents' income, family condition, recipients of government scholarships, age, parental status, dependents of parents, college siblings, entry pathways, and student levels. In PPA scholarships, the priority order of criteria starts from GPA, semester, achievement, and the amount of income of parents. While the priority order of criteria for BBM scholarships starts from the amount of parents' income, achievements, and semester. Then proceed with the sequence of family conditions to the level of students for PPA and BBM scholarships. AHP-TOPSIS method gets a greater accuracy value of 100%, while the TOPSIS method gets an accuracy value of 73.075%.
4	Estining Nur Sejati	2013	Comparative Analysis	This study compares the three SPK methods, namely AHP,

	Purnomo from State University of Sebelas Maret		Using AHP, TOPSIS and AHP-TOPSIS Methods in Case Studies of Decision Support Systems Accepting Acceleration Programs	TOPSIS, and AHP-TOPSIS by taking a case study on the selection of student acceleration learning programs in Wonogiri 1 Public Middle School based on four criteria, namely UASBN (National Standardized Final Examination), the value of TPA (Academic Potential Test), psychological test scores (IQ), and achievement scores in the form of a charter. This study applies a comparative analysis using Hamming Distance and Euclidean Distance. The parameters used are the results of school ranking and student report card rankings to see the suitability of the results with school provisions and student report card grades to see the level of success and also as a parameter to determine the recommendation method. The results obtained are for the Hamming Distance of the three methods against the results of school ranking, the AHP-TOPSIS method is obtained as the

				best sequence with a percentage of 96.02%. For the Hamming Distance parameter, the three methods against the accelerated student report card rankings were obtained that the TOPSIS method became the best method with a percentage of 84.21%. Referring to the results of the Euclidean Distance of the three methods towards report cards, the AHP method is the best method with a value of 0.47367.
5	K. Batu Tunay and Ilyas Akhisar from Marmara University Turkey.	2014	Performance Evaluation and Ranking of Turkish Private Banks Using AHP and TOPSIS	Research using AHP and TOPSIS methods can also be used in evaluating and ranking bank performance. Research uses criteria from professional observers. The researcher uses the AHP method to calculate capital ratios, weight the criteria and also search for weighted matrices, then it will be processed using TOPSIS for sorting Bank ranks.

6	Rizky Bangkit P L, Rekyan Regasari M P and Wayan Firdaus Mahmudy from Brawijaya University.	2014	The decision support system for choosing the right athlete to enter the pencak silat team using the *simple additive weighting* (SAW) method	In solving problems, researchers used the Simple Addictive Weighting method. This study received an accuracy of 80% with the results of reality. In the system, this study uses 14 criteria without conducting a match test. Input criteria weights also use the random search method, not input from professional experts.
7	Jakti Kinayung Prasojo, Rekyan Regasari Mardi Putri, Sutrisno from Brawijaya University.	2015	Implementation of *Analytical Hierarchy Process - Technique For Order Preference By Similarity To Ideal Solution* (AHP-	This research is a form of evaluation of a system that has been made before using the Simple Addicticve Weighting (SAW) method. Input method weighting criteria, cases used as discussion and also the criteria used are the same as previous research. By using the AHP-TOPSIS method, researchers found greater accuracy of 87% than using only one method, which in

			TOPSIS) to Determination of Selection of Pencak Silat Athletes	the previous study used the Simple Addictive Weighting (SAW) method which had an accuracy of 80%.
8	Beşikçi, Kececi, Arslan, & Turan	2016	An application of fuzzy-AHP to ship operational energy efficiency measures	Subsequent research addresses the energy efficiency of ships. The researcher used the fuzzy AHP method to prioritize operational energy. The advantage of fuzzy methods is to set priorities using fuzzy numbers. Some decision-making techniques based on Fuzzy AHP help in choosing the best decision-making strategy using the weighting process through pairwise matrix comparisons. The researcher proposes for other decision making techniques to support fuzzy AHP such as TOPSIS.

9	Wahyu Joko Samudro from State Islamic Univesity of Maulana Malik Ibrahim Malang	2018	Decision Support System for Pencak Silat Athlete Selection Using the Fuzzy AHP-TOPSIS Methods	This research is a follow-up study from a study conducted by Jakti Kinayung Prasojo et al. The difference is, this study combines the AHP method with the Fuzzy method in the criteria weighting process. Determination of criteria also with literacy studies not by taking training data. Input weighting criteria, previous research using random search method, namely randomizing the values to obtain consistent values, while in this study using input values directly from experts who with the supervised method will be converted into an AHP comparison matrix.

.

CHAPTER III

RESEARCH METODOLOGY

3.1 Research design

3.1.1 Object of research

This research aims to build a decision support system that can help users in this case the selection committee of State Islamic University of Malang. The Decision Support System will be built using a combination of AHP-TOPSIS methods. Determination of criteria and weighting criteria by expert opinion. This research is expected to be able to provide recommendations for PIONIR athletes who pass the selection with high accuracy..

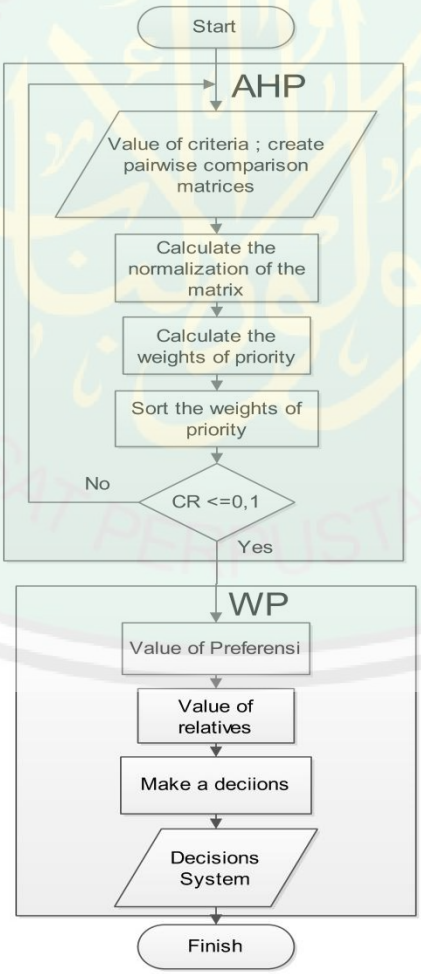


Figure 3. 1 Flowchart AHP-TOPSIS method

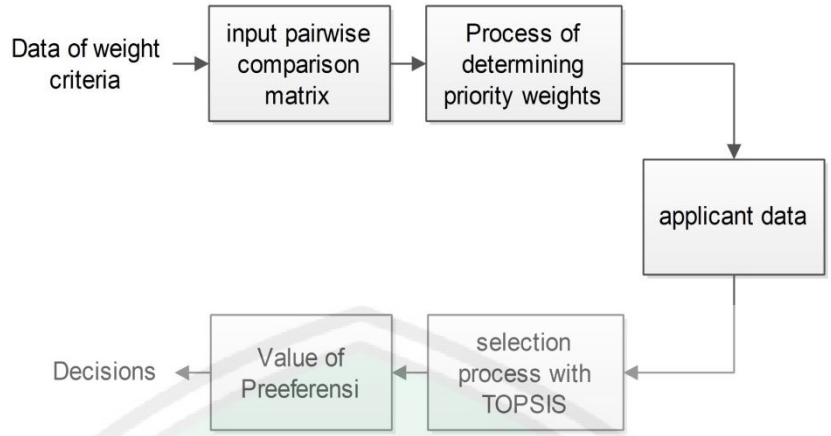


Figure 3.2 block diagram system

System workflow can be seen in Figure 3.1 and 3.2. first, the staff of student affairs input data criteria. then the inputted criteria are processed by the paired criteria comparison method, the criterion value is converted into a pairwise comparison matrix. the final process of the pairing criteria comparison method is the consistency ratio test. if the consistency ratio matches the requirements, the comparison process of paired criteria produces weights for each criterion. The weights that have been obtained are then stored in the database. the next process after obtaining the weight on each criterion, is ranking of the alternatives available, in this case students are scholarship applicants. Ranking using the TOPSIS method. the TOPSIS process starts from normalizing the registrant's data on the criteria and output of the TOPSIS is the result of a system decision, namely students who are entitled to receive scholarships.

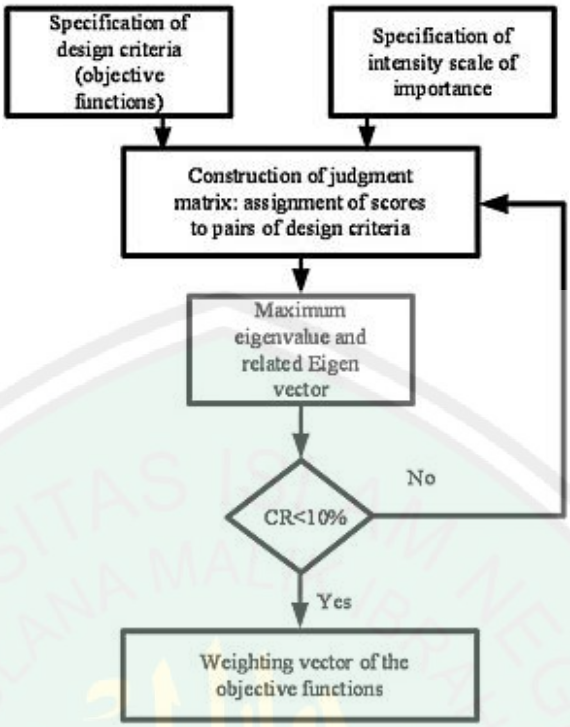


Figure 3.3 flowchart of AHP Algorithm

The depicted AHP algorithm is shown in Figure 3.3. first compilation of pairwise comparison matrices, Represent the level of importance between criteria based on the AHP preference scale. then, Normalization of decision matrices. Each matrix column is summed, then each element in the matrix is divided by the total column value. After that, determine the average row of a matrix or vector that contains a set of n weights, then analysis of consistency. the eigenvector of the A matrix is determined by calculating Ci. if Ci<10% value is true. and proceed to the next process.

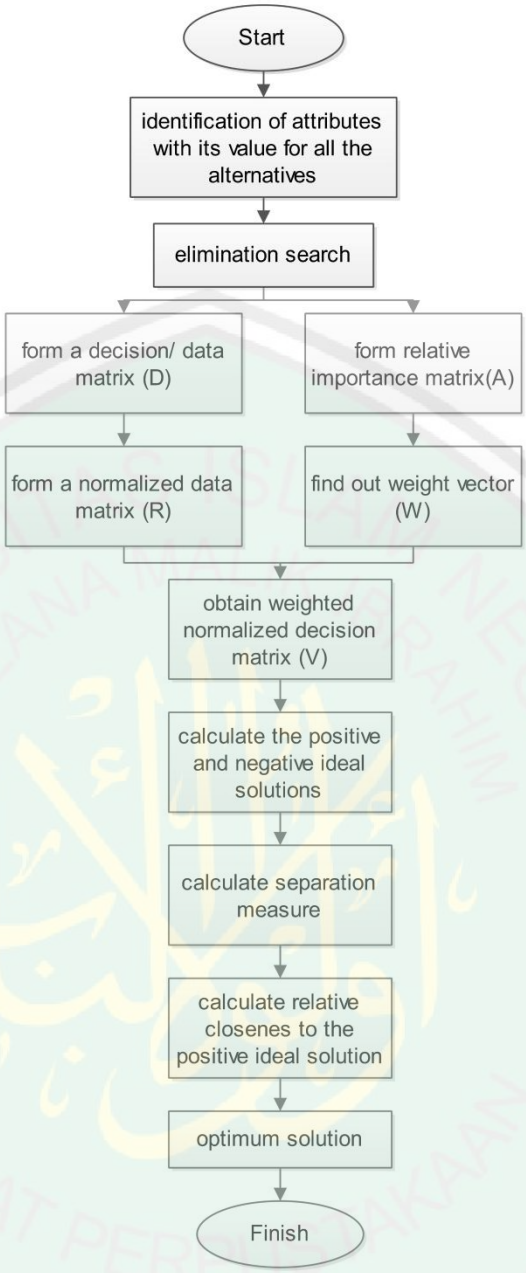


Figure 3.4 flowchart of TOPSIS Algorithm

Steps to do the TOPSIS procedure. first, determine normalized decision matrices. In determining normalized decision matrices, the value of each criterion (xij) for all alternatives is summed, then the value of each criterion is divided by the number of criteria.the second calculate the weighted normalized decision matrix. before determining this matrix, we have previously determined

the intensity value of the importance of each criterion. from this value of intensity of interest based on the results of the first step, we can determine the weighted normalized decision matrix. then calculate the matrix of positive ideal solutions and matrix ideal nagative solutions. and then, calculating the distance between the values of each alternative with a matrix of positive ideal solutions and a matrix of ideal negative solutions. the last process is calculate preference values for each alternative to get optimum solution.

3.1.2 System Requirements Analysis

The process of building a decision support system using the AHP-TOPSIS method, the following must be fulfilled by the system.

1. The system must get the criteria, subcriteria, criteria value and initial weight of the subcriteria entered into the system
2. The system must be able to calculate the AHP method to find the criteria weight and the weight of the appropriate subcriteria by using criteria, subcriteria, criterion values and initial subcriteria weights obtained from experts in the previous process
3. The system must be able to perform calculations using the TOPSIS method with input from the user in the form of the athlete's value which then produces a preference value that can be used in the ranking process.

3.1.3 Data acquisition

Data acquisition is a system that is useful for collecting and preparing data, in case there are 2 data, namely Primary and Secondary data, as follows :

a. Primary data

literature studies are carried out in the process of determining criteria, subcriteria and the initial weight of the subcriteria that will be used in the decision support system. also carried out direct observation of the selection procedure for the athlete.

the athlete's data and athlete's value data were obtained by conducting a case study of athlete selection directly using the system that had been built.

b. Secondary data

Secondary data is carried out if the primary data is still not enough to conduct research data searches. Conducted by question and answer to resource persons and also trackers through various other media.

3.2 Research procedure

3.2.1 understanding systems and literature studies

At this stage, the researcher conducted a literature study on the decision support system using the AHP-TOPSIS method by gathering the required information in the form of a book containing related theories and journals related to this research.

At this stage also, direct observation of the pre-existing athlete selection system is directly involved in athlete selection.

3.2.2 Determination of criteria and weighting

Determining criteria, a literature study of science research and journals was carried out, specifically the determination of norms and research instruments in testing the ability of an athlete. These norms and instruments will later be used

to obtain the ability data of each athlete by conducting direct and non-match tests. These norms and instruments will be used as criteria in this decision support system.

3.2.3 Weight determination process with AHP method

The criteria weighting process using the Analytical Hierarchy Process (AHP) method. Previously, each criterion would get the value of experts based on the intensity of their interests, then from that value, a comparison of the intensity of interest matrix was arranged.

1. Input assessment criteria

One of the obstacles encountered in building a decision support system is the frequent problems in entering values to compile a decision comparison matrix. Accuracy is needed in entering each value which will be tested for its consistency. In the AHP method, the weight of the criteria can be used if the weight has a high consistency value.

To overcome this problem, the supervised method is used to determine the specific logic framework to provide an assessment of the criteria. Admin is only required to rate each criterion on a scale of 1 to 4, including not too important with a value of 1, less important with a value of 2, important with a value of 3 and very important with a value of 4. Furthermore, from that value a comparison matrix is created value A_{mxn}.

Simulated that the physical value is 3, the technique is worth 3, the psychic is worth 2 and the strategy is worth 4. Then a comparison matrix is formulated with the formula A_{mxn} below :

$$A_{mxn} = m - n \quad \text{.....(3.1)}$$

Where

A_{mxn} is the value of the matrix row to m and column to n

m is the value of the line parameter

n is the value of the column parameter

From the calculation above, a matrix is arranged as shown in Table 3.1

Table 3. 1 A*mxn* comparison matrix

	Physical (3)	Techniques (3)	Psychological (2)	Strategy (4)
Physical (3)	0	0	1	-1
Techniques (3)	0	0	1	-1
Psychological (2)	-1	-1	0	-2
Strategy (4)	1	1	2	0

After compiling the assessment comparison matrix in Table 3.1, the next step is to develop a pair of criteria matrices from the value comparison matrix that has been produced previously. If the values in the paired criteria matrix are assumed to be B_*mxn*, then the B_*mx* value can be obtained from the following supervised logic framework.

- If $Amxn$ is 1 then $Bmxn$ is 3
- If $Amxn$ is 2 then $Bmxn$ is 5
- If $Amxn$ is 3 then $Bmxn$ is 7
- If $Amxn$ is -1 then $Bmxn$ is 0.33
- If $Amxn$ is -2 then $Bmxn$ is 0.2
- If $Amxn$ is -3 then $Bmxn$ is 0.14
- If $Amxn$ is 0 then $Bmxn$ is 1

It is hoped that the difficulties often encountered in compiling a consistent comparison matrix can be avoided in this pattern.

2. Compile the pairing criteria matrix

From the supervised logic framework to change the comparison value to the intensity value of the comparison in the previous process, a pair of criteria matrix is arranged. The values in Table 3.2 are values that are intended for simulation.

Table 3. 2 Pairing Criteria Matrix

	Physical	Techniques	Psychological	Strategy
Physical	1,00	1,00	3,00	0,33
Techniques	1,00	1,00	3,00	0,33
Psychological	0,33	0,33	1,00	0,20
Strategy	3,00	3,00	5,00	1,00

3. Normalized pairing criteria matrix

From the paired criteria matrix, the system will then form a normalized paired criteria matrix. The first step is to add all the values in each column. The results can be seen in Table 3.3.

Table 3. 3 Amount of Value in each column

	Physical	Techniques	Psychological	Strategy
Result	5,3300	5,3300	12,0000	1,8600

To compile a normalized paired criteria matrix, each value in the paired criteria matrix is divided by the number of column values. The results can be seen in Table 3.4.

Table 3. 4 Normalized pairing criteria matrix

0,1876	0,1876	0,2500	0,1774
0,1876	0,1876	0,2500	0,1774
0,0619	0,0619	0,0833	0,1075

0,5629	0,5629	0,4167	0,5376

4. Calculation weight each criteria

After compiling a criteria matrix in pairs, the system will then calculate the weight of each criterion. The trick is to calculate the average value of each row in the normalized paired criteria matrix.

Table 3. 5 Normalized pairing criteria matrix

Physical	0,1876	0,1876	0,2500	0,1774	average	0,2007
Techniques	0,1876	0,1876	0,2500	0,1774	average	0,2007
Psychological	0,0619	0,0619	0,0833	0,1075	average	0,0787
Strategy	0,5629	0,5629	0,4167	0,5376	average	0,5200

5. Test consistency weight criteria

The weight must still be tested for consistency by the system before it can be used. If the Consistency Ratio (CR) is smaller than 0.1, then the weight is considered accurate and can be used in the next process. The formula for looking for CR is as follows.

$$CR = CI/RI \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.2)$$

To calculate Consistency Ratio the first step that must be done is to find Weight Product. This value is the result of multiplication of each row of the paired criteria criteria (before normalization) in Table 3.2 with the weight of each criteria.

Such as to calculate the Weight Product of physical weight. The values in the first row of the paired criteria matrix are 1, 1, 3 and 0.33.

W_{fisik} = (1 x 0.2007) + (1 x 0.2007) + (3 x 0.0787) + (0.3 x 0.5200) the result is 0.0809. This calculation continues until completing all lines in the paired criteria matrix (Table 3.3). The results can be seen in Table 3.6.

Table 3. 6 Weight product

	Products
Physical	0,8089
Techniques	0,8089
Psychological	0,3151
Strategy	2,1173

After getting a product value, then look for the value λmax. The first step is to find the value of each criteria by dividing the Product value by the criteria weight. After getting the value of λ from each criterion, then it is to find the average of all λ. That average yield value is called λmaks.

Table 3. 7 Calculation of λ to find λmax

Weights	**Products**	**Λ**
0,2007	0,8089	4,0313
0,2007	0,8089	4,0313
0,0787	0,3151	4,0054
0,5200	2,1173	4,0718
	λmaks	4,0350

After λmax is found, the next step is to find the CI value with the following formula.

$$CI = \frac{(\lambda maks - n)}{(n-1)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.3)$$

where n is the number of criteria.

From the formula, it is known that CI is 0.0117. The next step is to divide it by the Random Index value. The Random Index value can be seen in Table 3.8.

Table 3. 8 Index random of AHP method

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

because the system uses 4 criteria, the RI value is 0.9. Then the value of the Consistency ratio is the result of 0.0117 with 0.9 ie 0.01. because the CR value is smaller than 0.1, the weight of the criteria is considered accurate and can be used.

6. Determining values of weight vector

After obtaining a probability comparison value, then it is to determine the value of the weight vector by finding the minimum value of each criterion. The results can be seen in Table 3.9.

Table 3. 9 Value vector for weighting criteria

	Physical	Techniques	Psychological	Strategy
W'	0,47032	0,47032	0,05514	1

7. Normalization values of weight vector

The final step in fuzzy pross, before getting the weight values of each criteria to normalize the value of the weight vector of criteria by dividing the value of the weight vector of each criterion by the whole number of values of the vector weighting criteria. Weighed the criteria that can be used on decision support systems. results can be seen in Table 3.10.

Table 3. 10 Weight criteria

	Physical	Techniques	Psychological	Strategy
W	0,2357	0,2357	0,0276	0,5011

8. Determine the subcriteria value

After completing the consistency of the value, the next step is to calculate the weight of the subcriteria from the weight of the criteria that have been tested for accuracy. Following are the values of each weight, each sub-criteria after the criterion value is changed with the weight of the results of the system calculations that have been tested.

Table 3.11 The weight of the results of the physical subcriteria

Subkriteria	F01	F02	F03	F04	F05	F06	F07	F08	F09	F10
Initial Weight	0,1250	0,1250	0,1250	0,1250	0,1250	0,0417	0,0417	0,0417	0,1250	0,1250
Valid Weight	0,0295	0,0295	0,0295	0,0295	0,0295	0,0098	0,0098	0,0098	0,0295	0,0295

Table 3. 12 The weight of the results of the techniques subcriteria

Subkriteria	C21	C22	C23	C24
Initial Weight	0,2500	0,2500	0,2500	0,2500
Valid Weight	0,0589	0,0589	0,0589	0,0589

Table 3. 13 The weight of the results of the psychological subcriteria

Subkriteria	C31
Initial Weight	1,0000
Valid Weight	0,0276

Table 3. 14 Decision matrix

Kholil	6	9	9	7	7	8	8	7	7	8	9	8	7	9	6	9
Haris	6	8	8	6	8	7	7	6	8	7	5	5	5	6	8	7
Amin	7	7	7	7	9	6	9	6	9	6	8	8	7	8	9	9
Bakhtiar	8	8	6	6	7	5	9	6	5	7	5	5	5	7	9	6

Table 3. 15 Normalized decision matrix

	F01	F02	F03	F04	F05	F06	F07	F08	F09	F10	T01	T02	T03	T04	P01	S01
Kholil	0,44	0,56	0,59	0,54	0,45	0,61	0,48	0,56	0,47	0,57	0,64	0,6	0,58	0,59	0,37	0,57
Haris	0,44	0,5	0,53	0,46	0,51	0,53	0,42	0,48	0,54	0,5	0,36	0,37	0,41	0,4	0,49	0,45
Amin	0,51	0,44	0,46	0,54	0,58	0,45	0,54	0,48	0,61	0,43	0,57	0,6	0,58	0,53	0,56	0,57
Bakhtiar	0,59	0,5	0,4	0,46	0,45	0,38	0,54	0,48	0,34	0,5	0,36	0,37	0,41	0,46	0,56	0,38

Table 3. 16 Sub-criteria weight

F01	F02	F03	F04	F05	F06	F07	F08	F09	F10	T01	T02	T03	T04	P01	S01
0,0295	0,03	0,03	0,03	0,03	0,01	0,01	0,01	0,03	0,03	0,059	0,059	0,059	0,059	0,028	0,501

Table 3. 17 The normalized decision matrix is weighted

	F01	F02	F03	F04	F05	F06	F07	F08	F09	F10	T01	T02	T03	T04	P01	S01
Kholil	0,013	0,017	0,018	0,016	0,013	0,006	0,005	0,006	0,014	0,017	0,038	0,035	0,034	0,035	0,01	0,287
Haris	0,013	0,015	0,016	0,014	0,015	0,005	0,004	0,005	0,016	0,015	0,021	0,022	0,024	0,023	0,014	0,223
Amin	0,015	0,013	0,014	0,016	0,017	0,005	0,005	0,005	0,018	0,013	0,034	0,035	0,034	0,031	0,015	0,287
Bakhtiar	0,017	0,015	0,012	0,014	0,013	0,004	0,005	0,005	0,01	0,015	0,021	0,022	0,024	0,027	0,015	0,191

Table 3. 18 Ideal positive and negative solutions

A+	0,017	0,017	0,018	0,016	0,017	0,006	0,005	0,006	0,018	0,017	0,038	0,035	0,034	0,035	0,015	0,287
A-	0,013	0,013	0,012	0,014	0,013	0,004	0,004	0,005	0,01	0,013	0,021	0,022	0,024	0,023	0,01	0,191

3.2.4 The process of Appraising Athletes with the TOPSIS Method

The process of weighting the value of athletes with the weight of subcriteria by the Technique For Order Preference By Similirity to Ideal Solution (TOPSIS) method. In the process of determining the value of the athlete's test results, the system receives input values for each of the athletes of each athlete. This value is used in the TOPSIS method calculation process in this decision support system. The following are the details of the TOPSIS method calculation process.

a) Arrange decision matrix

After getting input from the user, the system will arrange a decision matrix from the value of the athlete. The decision matrix can be seen in Table 3.10. In this TOPSIS process, alternative and fictitious values will be used to facilitate the simulation and explanation process.

b) Arranging normalized decision matrices

After arranging the decision matrix, the next step is to carry out the normalization process. The formula is as follows:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad \text{.....(3.4)}$$

where rij is the normalization of the matrix

xij is the data value in line I and column j

$\sqrt{\sum_{i=1}^{m} x_{ij}^2}$ akar root of the number of rows i and column j and squared

The results can be seen in Table 3.11.

c) Arranging the weighted normalized decision matrix

Then the system will call the weight of the subcriteria obtained from the AHP FUZZY process. weight of criteria is shown in Table 3.17. After calling the sub-criteria value from the previous process, then multiplying the normalized decision matrix by weighting each subcriteria. The results can be seen in Table 3.13.

d) **Arrange ideal negative solutions**

After determining the weighted normalized decision matrix, the next step is to look for Ideal Positive Solutions and Ideal Negative Solutions for each Sub-Criteria. Ideal Positive Solution is the highest value of each subcriteria, while the Ideal Negative Solution is the lowest value of each subcriteria. In full, can be seen in Table 3.14.

e) Calculating the alternative distance of each solution

Next is to calculate the distance of each alternative with positive ideal solutions and negative ideal solutions. The formula used to calculate the distance between alternatives with a positive ideal solution can be seen in equation 3.5, while to calculate the alternative distance with a negative ideal solution can be seen in equation 3.6.

$$D_i^+ = \sqrt{\sum_{j=1}^{n} (y_i^+ - y_{ij})} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.5)$$

D_i^+ is the distance of the alternative with a positive ideal solution

$\sqrt{\sum_{j=1}^{n}(y_i^+ - y_{ij})}$ is the root of the max number minus value min

$$D_i^- = \sqrt{\sum_{j=1}^{n}(y_{ij} - y_i^-)} \quad \text{..... (3.6)}$$

D_i^- is the distance of the alternative with the ideal negative solution

$\sqrt{\sum_{j=1}^{n}(y_{ij} - y_i^-)}$ is the root of the max number minus value min

Table 3. 19 Alternative distance with ideal solutions

	D+	D-
Kholil	0,0087	0,0996
Haris	0,0693	0,0331
Amin	0,0093	0,0988
Bakhtiar	0,0273	0,0083

Distances of each alternative to the positive and negative ideal solution closeness index and ranking of criteria, Criteria D + D −

f) Calculate the preference value of each alternative

After getting an alternative distance with a negative ideal solution or a negative ideal solution, the next is to calculate the value of the preference. The formula in equation 3.6.

$$V_n = \frac{D_i^-}{D_i^- + D_i^+} \quad \text{..... (3.7)}$$

V_n is an alternative preference value to n

D_i^- is the alternative distance with a negative ideal solution

$D_i^{\mp}$ is the alternative distance with a negative ideal solution

Table 3. 20 Preference value

	V
Kholil	0,9198
Haris	0,3229
Amin	0,9140
Bakhtiar	0,2337

This preference value will be used as a reference to make the final assessment in the form of selection and ranking.

3.3 Implementation

Implementation is the stage in building applications that are arranged at the design stage. The application of the AHP-TOPSIS method will be carried out using the criteria and assessment criteria that have been obtained in the athlete selection test simulation.

CHAPTER IV

RESULTS AND DISCUSSION

4.1. System implementation

The implementation phase of this system is the design translation stage based on the results of the analysis. Put in certain programming languages and the application of the system to be built on an application. The purpose of implementing this system is to examine the system that has been designed whether it is in accordance with the design target. The system that has been designed is tested first to find out whether there are problems with the system and can be resolved as soon as possible without any shortcomings.

The technology used to build this system is a website-based technology that provides information on decision support for determining pointers using the AHP-TOPSIS algorithm. The specifications used to build this system are as follows:

4.1.1. Hardware requirements.

The hardware requirements used to run this website application are as follows:

Table 4.1. Implementation of hardware used

Hardware	Specification
Processor	**AMD** A4-5000 APU with Radeon(TM) 1.50 GHz
RAM	512 GHz
Harddisk	500 GB
Screen	14 Inch

4.1.2. Software requirements

The software requirements used to build this application are as follows:

Table 4.2 Implementation of the software used

Software	Specification
Operating system	Windows 10 64bit
Web browser	Mozila firefox, google chrome
Web editor	Dreamweaver
Web server	Xamp

4.2. Interface implementation

Interface implacement is the display of the application that was created. Next is the application interface for determining PIONIR athletes using the AHP-TOPSIS algorithm in UIN-Malang as follows:

4.2.1. *Login page*

The login page is the first page of this system that is used as security from data or each account. To be able to access the login page by opening the website address http://localhost/pionir/C_login using the Google Chrome web browser or Mozilla Firefox. The login page is implemented in Figure 4.1 below:

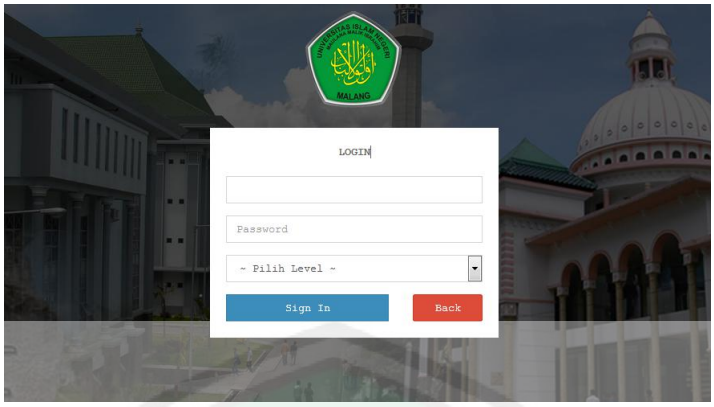


Figure 4.1 Display of admin and student login pages

On the login menu there are two choices of level of access, for admin and access for students. For admin logins use the username "admin", password "admin", and select the level "admin". Whereas For login students use the student username and password that has been given.

4.2.2. Main page

The main page is the main display page if the user has successfully logged on the login page. The main page consists of two pages namely the main page for admin access and the main page for student access, each of which has a different menu.

4.2.3. Admin main *page*

On the admin main page there are 6 main menus, namely Criteria, Contest, AHP, Input athletes, Selection process, and Report.

4.2.3.1. The main criteria page

On the main page is used as a Criteria for filling the weighting criteria page AHP-TOPSIS. On this page will be featuring the criteria and the values of the weighting criteria. Following is the display of the main page criteria:

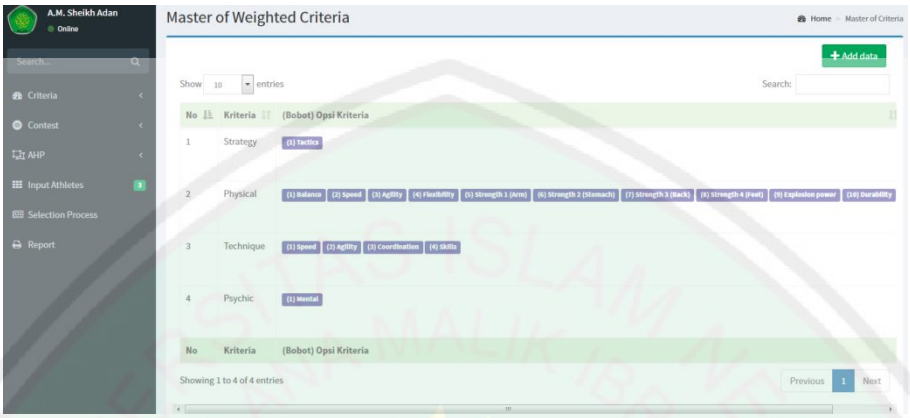


Figure 4.2 criteria page views

On the page there is a single criterion i.e. button Add button data. The add data button is used to perform addition on the weighting criteria AHP-TOPSIS. Subsequent to the appearance of the page to add data weighting criteria AHP-TOPSIS can be seen atFigure 4.3. the following:

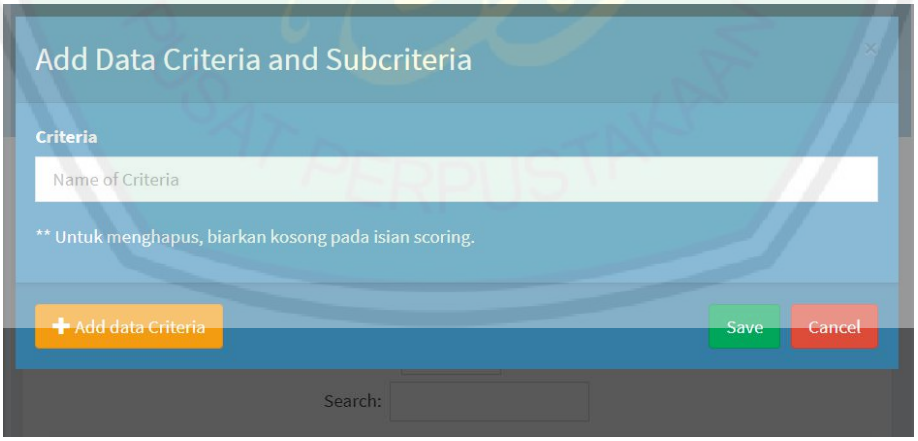


Figure 4.3 display page Add the WEIGHTING of criteria

There is one input i.e. name criteria will be inputed. Then the button save to storage. The Add button data Criteria used to sub criteria and data by the close

button to close the add page weighting criteria. For the display of the sub criteria can be viewed at Figure 4.4 the following:

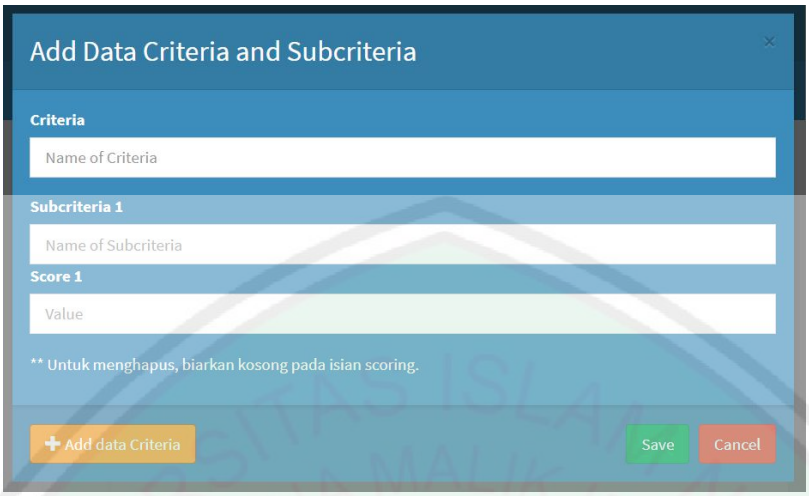


Figure 4.4 Add sub page display criteria

4.2.3.2. The main contest page

On this page contain information about PIONIR participant data consisting of the names, quotas, opened, closed, the selection is closed. As shown in Figure 4.5:

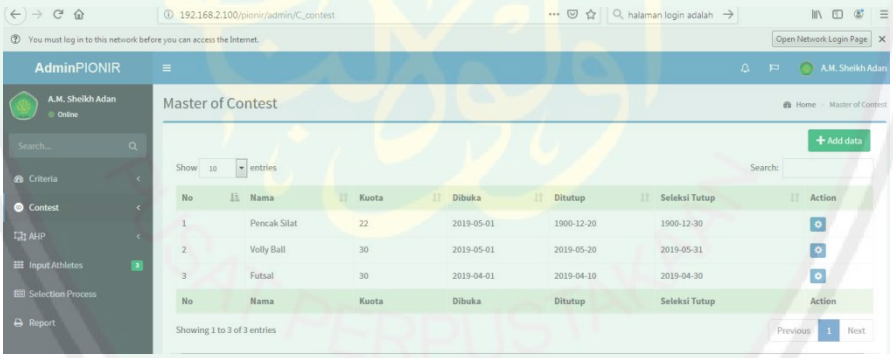


Figure 4.5 display page contest

On the page there are two Contest button main button Add data and the edit button or the view. The add data button is used to perform the addition of data on participants of the pioneers and the edit button or the view used for menampilakan data participants who are already stored in the database. Next to the display of the 19th View or edit on the page shown in Figure 4.6 Contest:

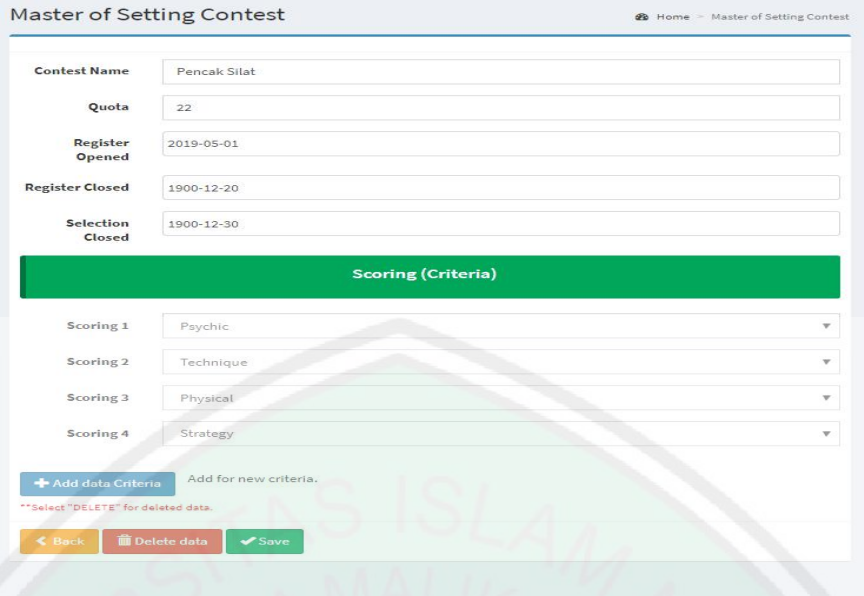


Figure 4.6 the Edit page view or view to the data of the participants

On the Edit or View Data page participants have four main buttons, namely the Add criterion button is used to add criteria for assessment, the delete data button is used to delete data that is being viewed from the database, for the save button used to save to database on data changed the contents and the back button are used to return to the main page of the criteria. On the page Edit and View data there are also input that must be entered and may not be empty during the storage process, namely the name of the participant, quota, registration time, closing time and selection time.

The Add data page is used to process the addition of PIONIR participant data. On page Add data there are three main buttons, namely the add criteria button to add participant assessment criteria data, the save button is used to store data into the fund database back button to return to the Criteria main page. In addition to the Add data page there are also input that must be filled in during the storage process, namely the name of the participant, quota, registration time, closing time and

selection time. Next for the Add data page display on the contest page shown in Figure4.7 below:

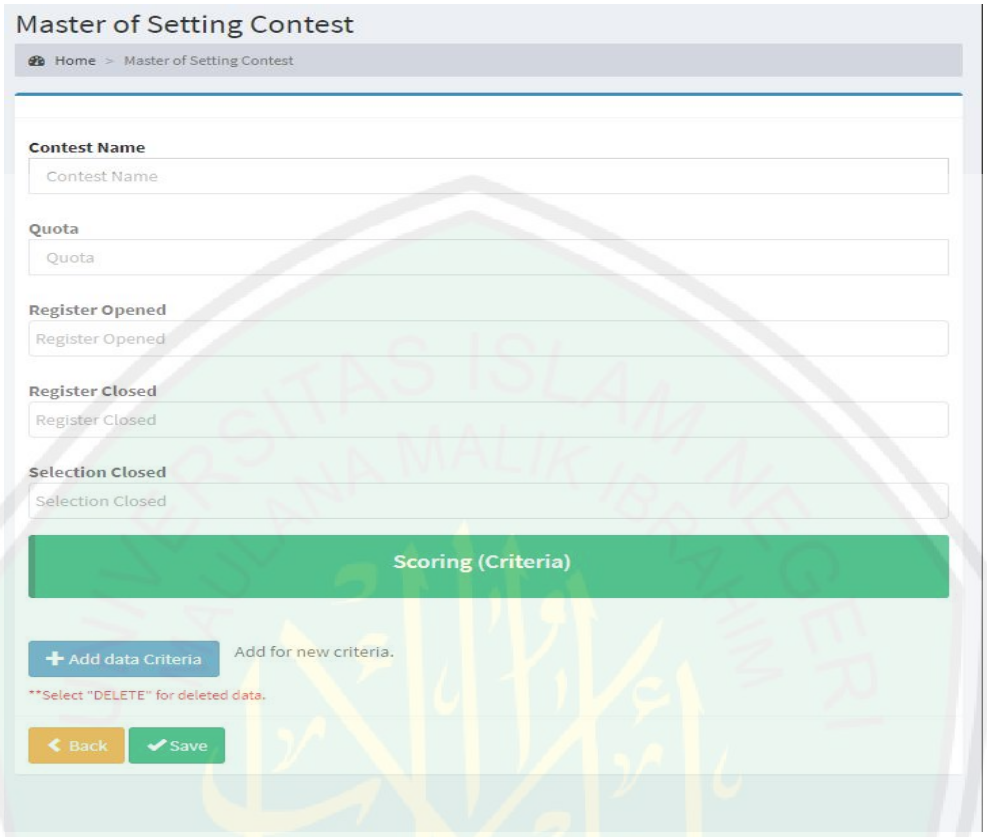


Figure 4.7 page view Add Data

4.2.3.3. Main Page Of *AHP*

On the AHP Main page contains information about the criteria data paired from what will be used in the AHP algorithm namely Name, Quota, Opened, and Closed. As shown in Figure 4.8 here is a display of AHP's main page:

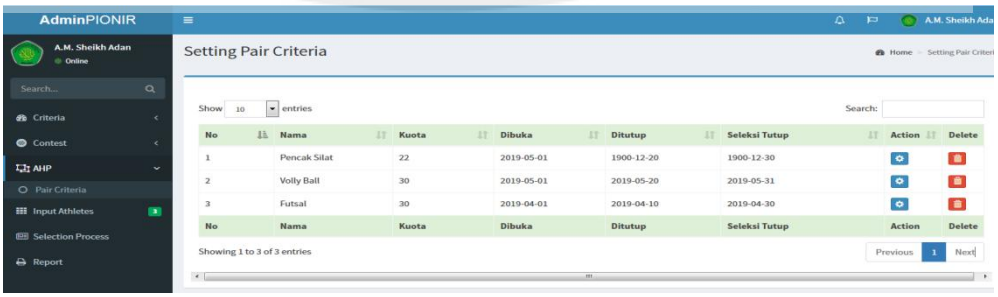


Figure 4.8 page view Add data

on the AHP Main Page there are two main buttons, namely the view button is used to view data that has been stored in the database and the delete button is used to delete data from the database. On the View Page There are two main buttons, namely the Guide button is used to display the instructions for filling in the criteria assessment as shown in Figure 4.10 and the save button in the paired criteria that is used to store the data criteria in pairs into the databe. Next for the View page display is shown in Figure 4.10.

Figure 4.9 page View criteria Pairs

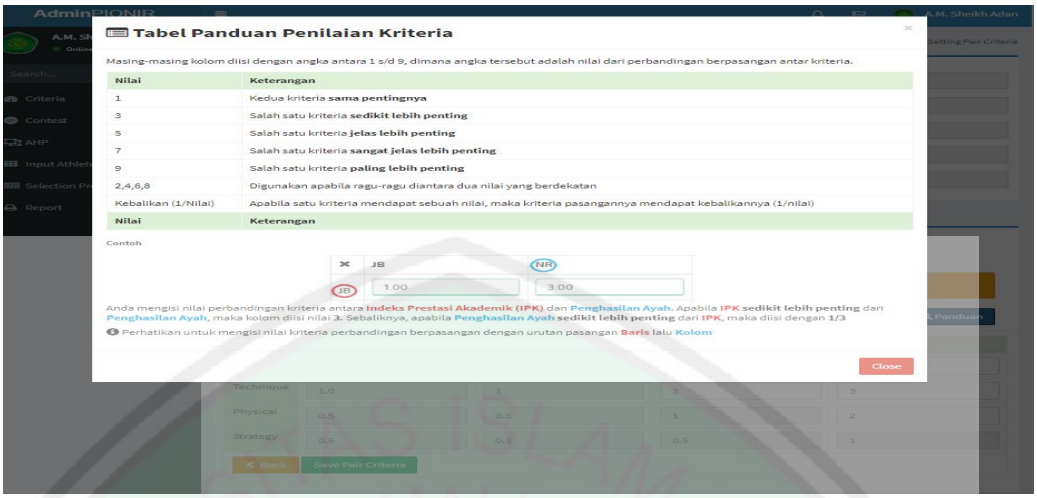


Figure 4.10 Page views guide charging the value of criteria

4.2.3.4. Main page input athelete

On main page Aahletes input is used to display branch data from PIONIR consisting of names, quotas, opened, closed and when the selection is clopsed. on the main page the athlete input consists of two main buttons namely the data add button and the see list of athletes. the appearance of the main input athletes page is shown in Figure 4.11 the following :

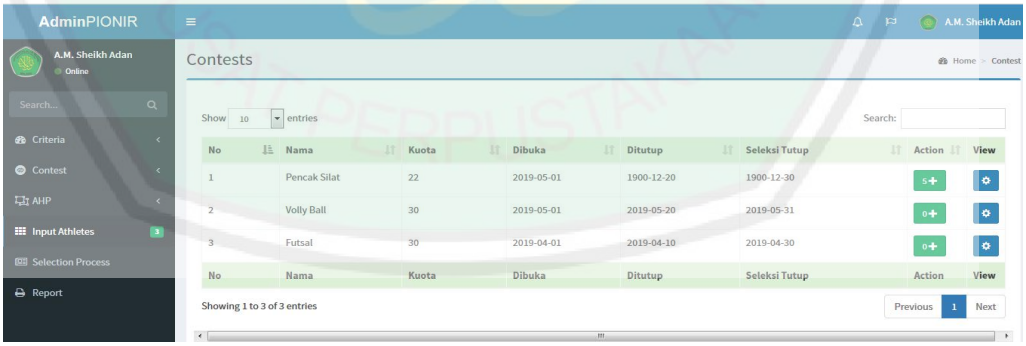


Figure 4.11 Athlete Input page views:

Add data button athletes are used to add new athlete data. The display of pages added to athletes' data is shown in Figure 4.12. On the page, add athlete data, there are inputs that must be recorded at the time of the storage process, namely nim, name, place of birth, date of birth, cellphone number, gender, faculty and department. bring the criteria to be chosen are physical, technical and strategy. In addition to the input and options on the athlete's data add page, there are also two main buttons, namely the Save button for the storage process and the Cancel button to return to the main page of the athlete's input.

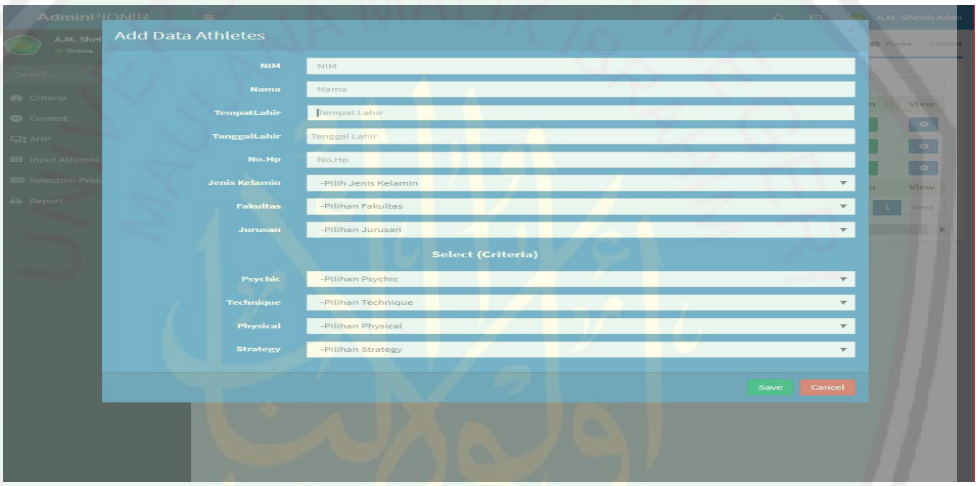


Figure 4.12 display page add new athletes

4.2.3.5. The main page selection process

The main page selection process is a page for displaying and also conducting a selection process using the AHP-TOPSIS algorithm. the data displayed on the page of the selection process are nim, name, faculty, department, vector S value and vector V value. In addition, this page will display information from participants who passed the selection or also who did not pass the selection according to the filter type selected trial. Participants who pass the selection will be given a check in green and participants who do not pass the selection will be given a red cross. In addition, the status button of the participants is used to change the status of the participants. Next is the display of the main selection process shown in Figure 4.13 below:

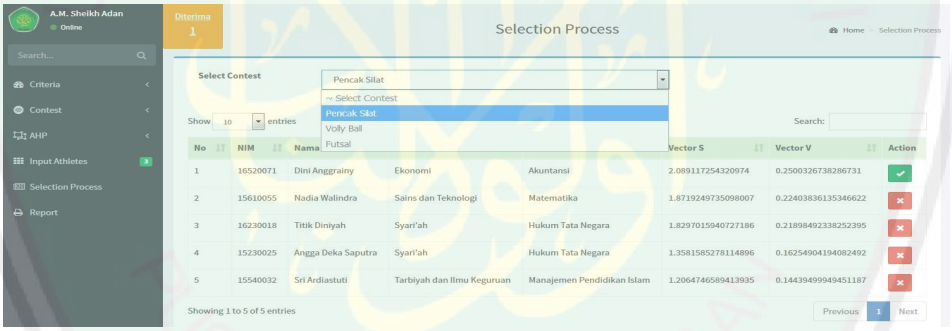


Figure 4.13 display page selection process

4.2.3.6. The main eport page

The main report page is used to display the data of participants who have passed the selection according to the race filter chosen, the data are specified namely nim, name, faculty, department and type of race. In addition, there are also two main buttons, the PDF and Export Excel print buttons. The PDF print button is used to print participant data that passes into PDF files while the export Excel button is used to store participant data that passes the selection into the Excel format file. The following is the display of the main page of the report shown in Figure 4.14 below:

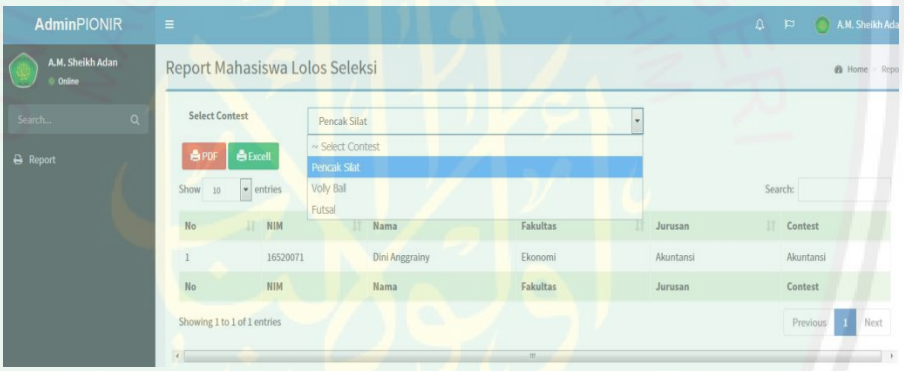


Figure 4.14 page View Report

4.2.4. Students main page

Student's main page is a page that is displayed after the login process with access as a student has been successful. On the main page of the student contains the report menu which is used to display the data of participants who have passed the selection according to the race filter selected, the data are specified namely nim, name, faculty, department and type of race. In addition, there are also two main buttons, the PDF and Export Excel print buttons. The PDF Print button is used to print participant data that passes into the PDF file while the export Excel button is used to store participant data that passes the selection into the Excel format file. The following is the display of the main page of the report shown in the following Figure 4.15

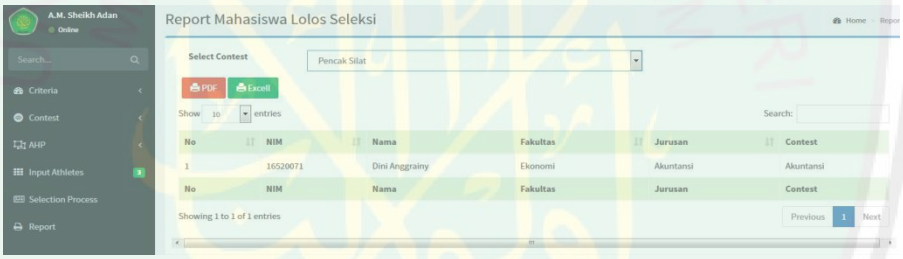


Figure 4.15 Page view report student passes selection.

4.3. Result analysis

Result analysis is used with the aim to find out whether the application has matched the results after the program testing process has been carried out at the system implementation stage. At the trial stage, the participant data filling process is carried out and the criteria value data from the participants. The data will be used to determine whether or not the participant passes the selection for the race that is followed. The sample data will be typed as shown in Figure 4.16

below:

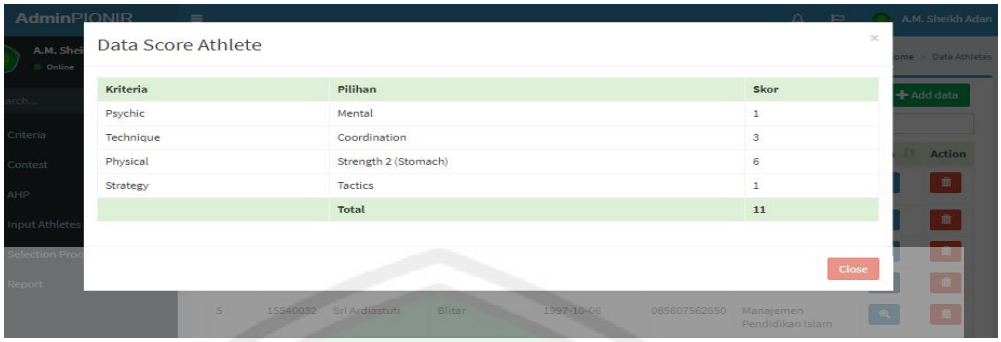


Figure 4.16 Display example data of participants and participant criteria values

Then the data will be selected by using the matching criteria in the AHP-TOPSIS algorithm, the criteria data as shown in Figure 4.17. From the criterion data eigen value data will be generated as shown in Figure 4.18. Then a selection process is carried out with other data stored in the database and the selection results are shown in Figure 4.19

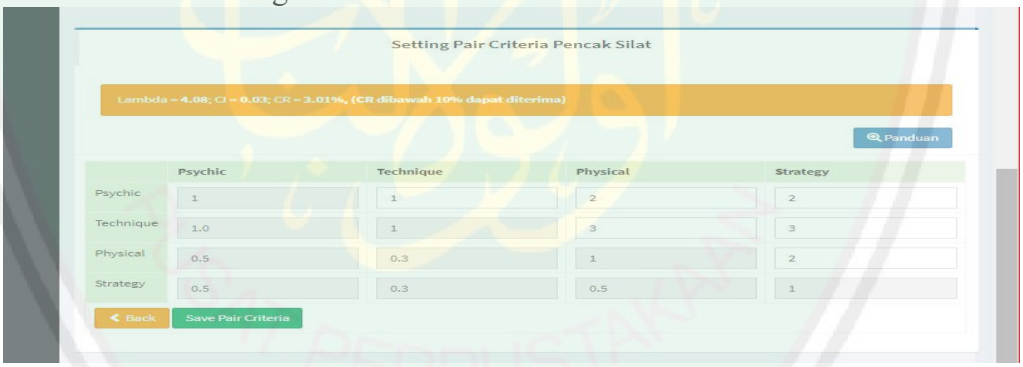
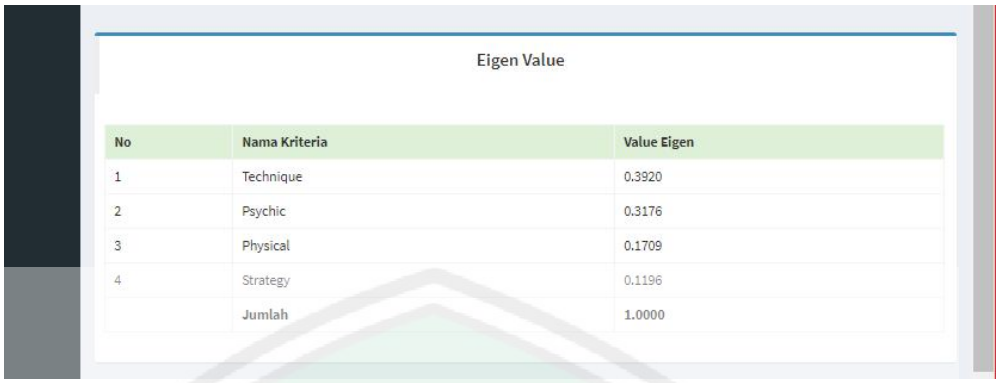


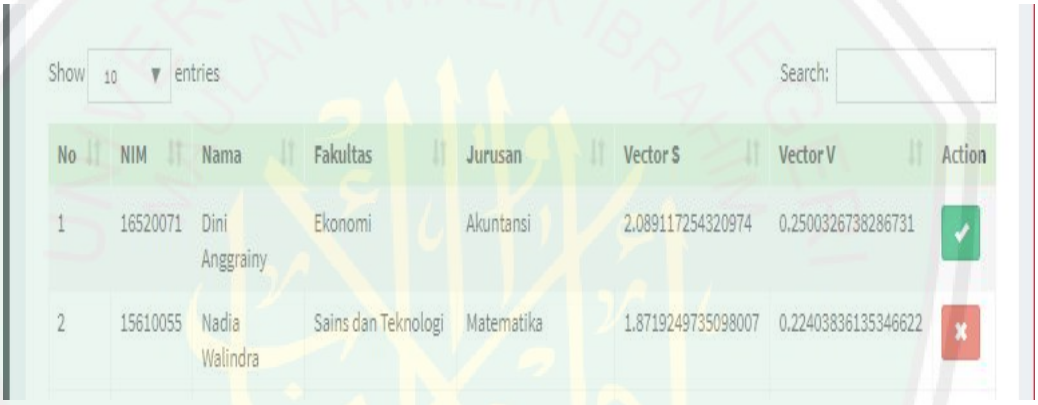
Figure 4.17 Display criteria AHP-TOPSIS



Eigen Value

No	Nama Kriteria	Value Eigen
1	Technique	0.3920
2	Psychic	0.3176
3	Physical	0.1709
4	Strategy	0.1196
	Jumlah	1.0000

Figure 4.18 Eigen value display



Show 10 entries Search:

No	NIM	Nama	Fakultas	Jurusan	Vector S	Vector V	Action
1	16520071	Dini Anggrainy	Ekonomi	Akuntansi	2.089117254320974	0.2500326738286731	✓
2	15610055	Nadia Walindra	Sains dan Teknologi	Matematika	1.8719249735098007	0.22403836135346622	✗

Figure 4.19 Display selection result

Next is to conduct a thorough examination of the data that has been obtained, the testing is done by comparing the results of the initial data with the data from the program calculation using the AHP-TOPSIS algorithm, this is done to get accuracy from the programs that have been made. The results of calculations from this system are shown in Table 4.3 below:

Table 4.3 Results of calculations from the system

No	ID No	Category	Name	Department-Faculty	STATUS DATA	APPLICATION RESULTS	RESULTS
1	17520032	Futsal	Rasyadan Arsyi Fakhruzzaman	Akuntansi Ekonomi	YES	YES	SAME
2	17520092	Futsal	Rizky Inayat	Akbari Akuntansi Ekonomi	YES	NO	NOT
3	17520130	Futsal	Rifky Ihsan	Achyar Akuntansi Ekonomi	YES	TES	SAMAE
4	18520127	Futsal	Bintang widia oktavianto	Akuntansi Ekonomi	YES	YES	SAME
5	16510013	Futsal	M.Maufiqil hilmi Manajemen	Ekonomi	YES	YES	SAME
6	16510170	Futsal	Abdur Rohman Fathur Manajemen	Ekonomi	YES	YES	SAME
7	17510077	Futsal	M. Auliyaun Nurusyifa Manajemen	Ekonomi	YES	YES	SAME
8	17510089	Futsal	Crisdian Yulianto Manajemen	Ekonomi	YES	YES	SAME
9	18510223	Futsal	Alvin R. Hakim Manajemen	Ekonomi	YES	YES	SAME
10	18510229	Futsal	Mochamad Syaifudin Zuhri	Manajemen Ekonomi	YES	YES	SAME
11	18510239	Futsal	Zarobbi Maulana Putra Manajemen	Ekonomi	YES	YES	SAME
12	18540009	Futsal	DICKY ALVINDO HERDIYANTO	Perbankan Syari'ah Ekonomi	YES	YES	SAME
13	18540017	Futsal	Wahyu Agung Panji Subekti	Perbankan Syari'ah Ekonomi	YES	NO	NOT
14	14320121	Futsal	Mohammad rofiuddin	Sastra Inggris Humaniora	YES	YES	SAME
15	16320205	Futsal	Mochamad Riski Pratama	Sastra Inggris Humaniora	YES	YES	SAME
16	17320184	Futsal	Rizqi Fatkhur Rokhim	Sastra Inggris Humaniora	YES	YES	SAME
17	18170010	Futsal	Aida Sopia Manajemen	Pend. Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
18	18170038	Futsal	Okik Mahhendra	Manajemen Pend. Islam Ilmu Tarbiyah dan Keguruan	YES	NO	NOT
19	18170038	Futsal	Okik Mahhendra	Manajemen Pend. Islam Ilmu	YES	YES	SAME

				Tarbiyah dan Keguruan			
20	15110064	Futsal	Muhammad Kurnadi Bonesaputra Rukman	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
21	17110027	Futsal	Achmad Wariz Kurniawan	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
22	17110104	Futsal	Muh. Farihun Najah	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
23	18110047	Futsal	Lutfi Uzlifatul Jannah	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	NO	NOT
24	18110053	Futsal	Moyang Bangun Sanjaya	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
25	18140114	Futsal	SUGENG FARIZAL RAMADHANA	Pend. Guru MI Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
26	18140115	Futsal	Muhammad Rafif Giffary	Pend. Guru MI Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
27	17130127	Futsal	IBNU ATHO' ILLAH	Pend. IPS Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
28	15410140	Futsal	Ibrahim Hasan	Psikologi Psikologi	YES	YES	SAME
29	18410225	Futsal	muhammad fitroh	faidzin Psikologi Psikologi	YES	YES	SAME
30	18610101	Futsal	Rio Anggoro Ragildi	Matematika Sains dan Teknologi	YES	YES	SAME
31	18680016	Futsal	Mohamad arviano arighy	Perpustakaan dan Ilmu Informasi Sains dan Teknologi	YES	YES	SAME
32	14650006	Futsal	Fathurrahman	Teknik Informatika Sains dan Teknologi	YES	YES	SAME
33	15210084	Futsal	Muhammad Fadhlul	Al Ahwal Al	YES	NO	NOT

			ilmi	Syakhsiyyah Syari'ah			
34	17210028	Futsal	Amangtu sadidan	Al Ahwal Al Syakhsiyyah Syari'ah	YES	YES	SAME
35	17210166	Futsal	Luthfi Taqiuddin	Al Ahwal Al Syakhsiyyah Syari'ah	YES	YES	SAME
36	18210050	Futsal	HARI AKHMAD BATISTUTA	Al Ahwal Al Syakhsiyyah Syari'ah	YES	YES	SAME
37	12220093	Futsal	Ainun najih fadlli	Hukum Bisnis Syari'ah Syari'ah	YES	NO	NOT
38	15220068	Futsal	MUHAMMAD NASHRUDIN AL AMIN	Hukum Bisnis Syari'ah Syari'ah	YES	YES	SAME
39	16220145	Futsal	Muhammad Nur Aqil Tryansyah	Hukum Bisnis Syari'ah Syari'ah	YES	YES	SAME
40	17220049	Futsal	Afandi Fadillah Na'im	Hukum Bisnis Syari'ah Syari'ah	YES	YES	SAME
41	17220062	Futsal	RIFQI RIDLWAN NASIR	Hukum Bisnis Syari'ah Syari'ah	YES	NO	NOT
42	17220186	Futsal	Arman Safril Adam	Hukum Bisnis Syari'ah Syari'ah	YES	YES	SAME
43	18230023	Futsal	DWI SILVIA AMERTA	Hukum Tata Negara Syari'ah	YES	NO	NOT
44	17320073	Pencak Silat Seni Ganda Putra	Muhammad Ardy Rahmawan Sastra	Inggris Humaniora	YES	YA	SAME
45	17110040	Pencak Silat Seni Ganda Putra	Brilian Imaduddin Irhan	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
46	17610114	Pencak Silat Seni Ganda Putra	M. Fajrul Falakh	Matematika Sains dan Teknologi	YES	YES	SAME
47	17610114	Pencak Silat Seni Ganda Putra	M. Fajrul Falakh	Matematika Sains dan Teknologi	YES	YES	SAME
48	17220148	Pencak Silat Seni	Mukhammad Munir Hukum	Bisnis Syari'ah	YES	YES	SAME

		Ganda Putra		Syari'ah			
49	17000007	Pencak Silat Seni Ganda Putri	Nadhifah Zhafarina	Akuntansi Ekonomi	YES	YES	SAME
50	16000007	Pencak Silat Seni Ganda Putri	Shonia Meihdasari Kurnia Putri	Bahasa dan Sastra Arab Humaniora	YES	YES	SAME
51	16520109	Tenis Meja Tunggal Putra	Muhamad maulani habibi	Akuntansi Ekonomi	YES	YES	SAME
52	18230042	Tenis Meja Tunggal Putra	Imam rifai	Hukum Tata Negara Syari'ah	YES	YES	SAME
53	17110047	Tenis Meja Tunggal Putra	Faqih Miftachul Huda	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
54	18110062	Tenis Meja Tunggal Putra	Mohammad Zainul 'Ibad Romadhon	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	NO	NOT
55	16130132	Tenis Meja Tunggal Putra	Akhmad Asfahani yusuf	Pend. IPS Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
56	18110080	Tenis Meja Tunggal Putri	Nurul Hapizo	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
57	18170046	Tenis Meja Tunggal Putri	Lutvia Nur Indahsari Manajemen	Pend. Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
58	18310159	Tenis Meja Tunggal Putri	Sabilla Setia Wida	Bahasa dan Sastra Arab Humaniora	YES	YES	SAME
59	18320225	Tenis Meja Tunggal Putri	Offi Maria Ulpah	Sastra Inggris Humaniora	YES	YES	SAME
60	16520084	Basket	Gusti Fahmi Saputra Wijiyanto	Akuntansi Ekonomi	YES	YES	SAME
61	15510008	Basket	DEWI NUR ZULAIKAH	Manajemen Ekonomi	YES	YES	SAME
62	17510145	Basket	Muhammad Yudha Fadillah	Manajemen Ekonomi	YES	YES	SAME
63	17510176	Basket	alfira nor amalia	Manajemen Ekonomi	YES	YES	SAME

64	18510190	Basket	Mohammad khudri febriansyah	Manajemen Ekonomi	YES	YES	SAME
65	18510228	Basket	Ahmad Denny Pramudya Ananta	Manajemen Ekonomi	YES	NO	NOT
66	17110176	Basket	Muhammad Bayu Khairil Anwar	Pend. Agama Islam Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
67	16150068	Basket	Maulana Yusuf Qardhawi	Pend. Bahasa Arab Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
68	16150103	Basket	Achmad Fadila Aan Purwanto	Pend. Guru MI Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
69	17130133	Basket	M Ainul Yaqin P	end. IPS Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
70	17180011	Basket	M. Fadel Ihza Islami Tadris	Bahasa Inggris Ilmu Tarbiyah dan Keguruan	YES	YES	SAME
71	18930094	Basket	Mohammad Fathur Roziq	Farmasi Kedokteran dan Ilmu-Ilmu Kesehatan	YES	NO	NOT
72	18910024	Basket	Ajwadussafwatulloh Luthfi Al Jabbar	Pend. Dokter Kedokteran dan Ilmu-Ilmu Kesehatan	YES	YES	SAME
73	18410051	Basket	Sulhan wahid	Psikologi Psikologi	YES	YES	SAME
74	18410191	Basket	Aditya Wahyu Pratama	Psikologi Psikologi	YES	YES	SAME
75	18410236	Basket	Tegar Dhananjaya widyoyoko	Psikologi Psikologi	YES	YES	SAME
76	17610012	Basket	Rizaldi Afkahul Rachman	Matematika Sains dan Teknologi	YES	YES	SAME
77	14660069	Basket	Nyi Rd Ermia P R	Teknik Arsitektur Sains dan Teknologi	YES	YES	SAME
78	14650036	Basket	DINDA OCKTA N	Teknik Informatika Sains dan Teknologi	YES	NO	NOT
79	17210029	Basket	M. Robby Gatami	Al Ahwal Al Syakhsiyyah	YES	YES	SAME

				Syari'ah			
80	17210080	Basket	Ibrahim Munib	Al Ahwal Al Syakhsiyyah Syari'ah	YES	YES	SAME
81	14220070	Basket	Andi Nisar	Waniaga Hukum Bisnis Syari'ah Syari'ah	YES	YES	SAME
82	17220114	Basket	MUHAMMAD ADLIRRAHMAN	Hukum Bisnis Syari'ah Syari'ah	YES	NO	NOT
83	18230058	Basket	MUHAMMAD LAILUL KODRI	Hukum Tata Negara Syari'ah	YES	YES	SAME
84	11650013	Futsal	Moh Ali Majdi	Saintek	YES	YES	SAME
85	12310065	Futsal	Yavie Ali Firdaus	Humaniora	YES	YES	SAME
86	12220093	Futsal	Ainun Najih Fadlli	Syari'ah	YES	YES	SAME
87	14320121	Futsal	Mohammad Rofi'uddin	Humaniora	YES	NO	NOT
88	15210084	Futsal	Muhammad Fadhlul Ilmi	Syari'ah	YES	YES	SAME
89	13510221	Futsal	Puguh Dwi Cahyo	Ekonomi	YES	NO	NOT
90	15220068	Futsal	Muh. Nashrudin Alamin	Syari'ah	YES	YES	SAME
91	16130132	Tenis Meja	Akhmad Asfahani Yusuf	FITK	YES	YES	SAME
92	14220017	Tenis Meja	Ubaydillah Nurrahman	Syari'ah	YES	YES	SAME
93	16520109	Tenis Meja	M. Maulani Habibi	Ekonomi	YES	YES	SAME
94	11650032	Pencak Silat	Wahyu Joko Samudro	Saintek	YES	YES	SAME
95	11650093	Pencak Silat	Anis Nurul Hidayah	Saintek	YES	YES	SAME
96	14210110	Pencak Silat	Anisah Restikasari MP	Syari'ah	YES	YES	SAME
97	16520116	Pencak Silat	Nadhifah Zhafarina	Ekonomi	YES	YES	SAME
98	15540022	Badminton	Alfajar Assidiq	Ekonomi	YES	YES	SAME
99	16520062	Badminton	Faris Syaefuddin Akbar	Ekonomi	YES	YES	SAME
100	16140048	Badminton	Elok Khoirul Muna Mabni Zain	FITK	YES	NO	NOT
101	15520008	Badminton	Ranie Septiarahmah	Ekonomi	YES	YES	SAME
102	14660006	Catur	Rezha Rezhivani	Saintek	YES	YES	SAME

103	16130022	Catur	A. Farisuddin al Ayubi	FITK	YES	YES	SAME
104	14670042	Catur	Amada Sri Rahayu	FKIK	YES	YES	SAME
105	15220003	Catur	Aldila Putra Setyawan	Syari'ah	YES	YES	SAME
106	14510103	Volly Ball Putra	Ichwan Ilham	Ekonomi	YES	YES	SAME
107	14410142	Volly Ball Putra	Franky Subari	Psikologi	YES	YES	SAME
108	15410213	Volly Ball Putra	Rinaldy Risa Darmawan	Psikologi	YES	YES	SAME
109	13510202	Volly Ball Putra	Falich Yusron	Ekonomi	YES	YES	SAME
110	15510239	Volly Ball Putra	Pipin Setyo Utomo	Ekonomi	YES	YES	SAME
111	15510207	Volly Ball Putra	M. Risky Rendy Ferdian	Ekonomi	YES	NO	NOT
112	15510229	Volly Ball Putra	Yuwana Argatra Ma'ruf	Ekonomi	YES	YES	SAME
113	16140116	Volly Ball Putra	Heri Agus Susanto	FITK	YES	YES	SAME
114	15110170	Volly Ball Putra	Muhamad Hailala Ulil Faizin	FITK	YES	YES	SAME
115	15160034	Volly Ball Putri	Putri Wulan Sari	FITK	YES	YES	SAME
116	16510186	Volly Ball Putri	Galuh Panggalih Dewanti	Ekonomi	YES	YES	SAME
117	16510185	Volly Ball Putri	Viola Putri Permadani	Ekonomi	YES	NO	NOT
118	16410178	Volly Ball Putri	Shalma Chintya Kristi	Psikologi	YES	YES	SAME
119	15540072	Volly Ball Putri	Kurnia Prika Nurwijaya	Ekonomi	YES	YES	SAME
120	14130139	Volly Ball Putri	Rey Anggyanna	FITK	YES	YES	SAME
121	15140139	Volly Ball Putri	Tiara Putri Maharani	FITK	YES	YES	SAME
122	14130097	Volly Ball Putri	Ajeng Eka Prastuti	FITK	YES	YES	SAME
123	16520122	Volly Ball Putri	Tifa Nusrotul Azizah	Ekonomi	YES	YES	SAME
124	14660108	Karate	Nur Kharismawardani	Saintek	YES	NO	NOT
125	13310079	Basket Ball	Maulana Ismail Azis	Humaniora	YES	YES	SAME
126	14220070	Basket Ball	Andi Nisar Waniaga	Syari'ah	YES	YES	SAME
127	12510069	Basket Ball	Krisna Andika Putra	Ekonomi	YES	YES	SAME
128	14410023	Basket Ball	Muhammad Imam Fakhrurri	Psikologi	YES	NO	NOT

129	13510182	Basket Ball	Andi Ismail Marasabessy	Ekonomi	YES	YES	SAME
130	14220068	Basket Ball	Tri Deri Maulana Zebua	Syari'ah	YES	YES	SAME

Based on the test results shown in Table 4.3 it is obtained:

$$System\ Accuracy = \frac{\text{Same Amount of Results}}{\text{Amount of TEST data}} x\ 100\ \%$$

$$= \frac{110}{130} x\ 100\ \%$$

$$= 84.61\%$$

4.4. Based on the calculation of system accuracy, The accuracy of the program is obtained 84.61% with the total amount of data is 130 and the amount of data that has the same result is 110. the accuracy Graph of the results system testing can be shown in Figure 4.20. shown on the graph in red is the result of testing with FALSE status and in blue is the test result with TRUE status.

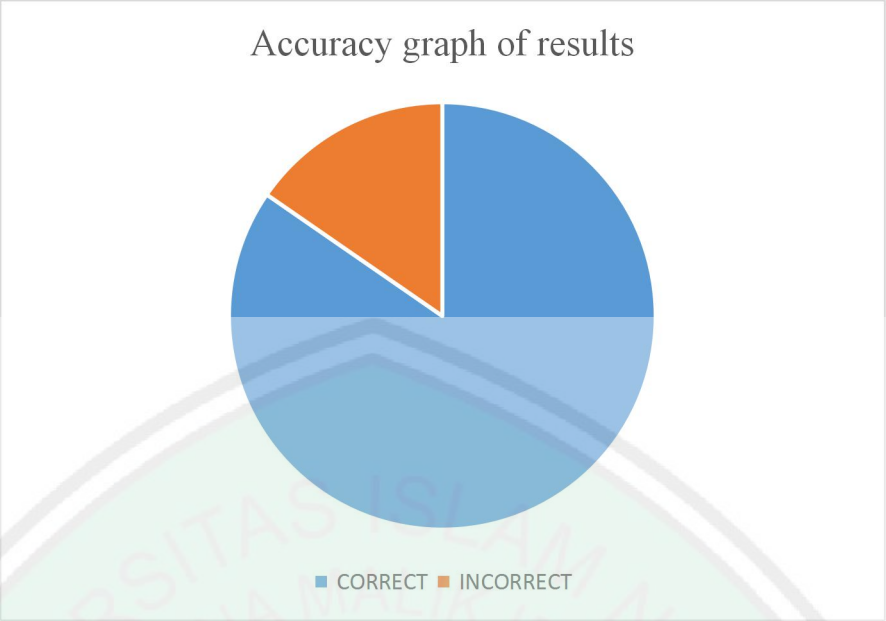


Figure 4.20 Accuracy graph of results

4.5. Integration in Islam

Manual selection requires a lot of processing time, from which it is followed by increasing costs and labor. In view of Islam time is a matter that gets the most attention. Allah S.W.T said:

وَالْعَصْرِ (2) إن الإنسَانَ لَفِي خُسْرٍ **(3) إِلاَّ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ وَتَوَاصَوْا بِالْحَقِّ وَتَوَاصَوْا بِالصَّبْرِ (1)**

Meaning:

"For the sake of time. Indeed, man is truly in a loss. Except those who believe and do charity prayer and exhort each other so that they obey the truth and advise one another so that they can be patient "(QS. Al' Ashr 1-3).

In the verse shows how important time is owned by every human being. The system created is used to replace the selection process that is done manually

with the aim of not using a lot of processing time, so as not to waste a lot of time and be able to use the time well.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1. CONCLUSION

After analyzing, designing and implementing a decision support system in determining selection of PIONIR athletes by using the AHP-TOPSIS method, the conclusions that can be drawn from this study are as follows:

1. This research succeeded in building a decision support system to determine selection of athletes in a computerized case study of UIN Malang sports competition, and the need for data input functions, processes data processing, and data output on the system goes well.
2. This study successfully implemented the AHP-TOPSIS method for determine the weight of the criteria based on and display the results of the final selection of athletes in the UIN Malang sports competition.
3. This research succeeded in displaying the results of the calculation of the data system of students who passed the selection in the form of tables of names, names, categories, faculties, data status, application results, and results in UIN Malang students using AHP-TOPSIS method.
4. The AHP-TOPSIS method has an accuracy of program 84.61% with the total number of data is 130 and the amount of data that has the same result is 110. With this number, it can be said that this system is quite feasible to be used in the selection process of PIONIR athletes at UIN Malang, because this system only provides recommendations or as a decision support, then the decision on the results of the selection remains with the authorities in the Islamic State University of Malang.

5.2. RECOMMENDATIONS.

This study has limitations on the design of the system being built to determine the selection of athletes at UIN Malang, here are suggestions for research next:

1. Future studies are expected to be able to perfect this research,by adding other features in determining the selection and displaying the results of the selection so that better results can be accounted for.
2. Future studies are expected to use alternative data samples greater than. An alternative amount of data is expected to be greater provide the results of a selection of PEOPLE athletes that are close to reality.
3. Future studies are expected to be able to develop systems that are built by building a decision support system for similar problems are based on Android or IOS mobile and are dynamic.
4. Future research can perfect this research, with using another MCDM problem solving method model, like VIKOR, SAW, PROMETHEE. So we get a comparison with the results that have been made.
5. Future studies can make comparisons with methods other than the AHP-TOPSIS Method for selecting athletes at UIN Malang, to obtain a comparison of their accuracy values.

LIST OF REFERENCES

Al-Jazairi, S. A. (2007). *Tafsir Al-Qur'an Al-Aisar Jilid 2.* Jakarta: Darus Sunnah.

An-Nawawi, I. (2013). *Matan Hadits Arba'in An-Nawawi.* Solo: Insan Kamil.

Aziz, F. F. (2013). Sistem Pendukung Keputusan untuk Menentukan Penerima Beasiswa Keluarga Miskin Pemerintah Kabupaten Lamongan dengan Metode Simple Additive Weighting. *MATICS Journal of Computer Science and Information Technology*, 6.

Bourgeois, R. (2005). *Analytical Hierarchy Process: an Overview.* Bogor: UNCAPSA-UNESCAP.

Gorunescu, F. (2011). Data Mining: Concepts, models and techniques. *Springer Science and Business Media, 12*.

Kosasi, S. (2002). *Sistem Penunjang Keputusan (Decision Support System).* Pontianak.

Kusrini. (2007). *Konsep dan Aplikasi Sistem Pendukung Keputusan.* Yogyakarta: Andi.

Kusumadewi, S. (2007). Diktat Kuliah Kecerdasan Buatan. Jurusan Teknik Informatika, Fakultas Teknologi Industri, Universitas Islam Indonesia.

Kusumadewi, S., Hartati, S., Harjoko, A., & Wardoyo, R. (2006). *Fuzzy Multi-Attribute Decision Making (FUZZY MADM).* Yogyakarta: Penerbit Graha Ilmu.

Kusumawardani, D. (2014). Sistem Pendukung Keputusan Penerima Bantuan Rumah Layak Huni dengan Menggunakan Metode Weighted Product (WP). *Jurusan Teknik Informatika, FASILKOM UDINUS.*

Lewis, J. (1995). Computer System Usability Questionnaire. *World Wide Web (http://www. acm. org/\~{} perlam/guestions. cgi*.

Manupraba, W. (Penyunt.). (2018). *Tafsir Al-Quran Online*. (I. S. Wijayato, Produser, & JavanLabs) Dipetik April 7, 2018, dari Tafsir Al-Quran Online: https://tafsirq.com

Manurung, P. (2010). Sistem Pendukung Keputusan Seleksi Penerima Beasiswa dengan Metode AHP dan TOPSIS (Studi Kasus: FMIPA USU). *Skripsi : Program Studi S1 ilmu komputer Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Sumatra Utara Medan*.

Nugroho, A. (2005). Rational Rose untuk Pemodelan Berorientasi Objek. Dalam *Informatika.* Bandung.

Prasetyo , H. A. (2017). Sistem Pendukung Keputusan Menentukan Produsen Terbaik Dalam Pembuatan Kerudung Pada CV. Hazna Indonesia Menggunakan AHP (Analytical Hierarchy Process) Dan WP (Weighted Product). *Teknik Informatika UNJANI Cimahi* .

Pusat Bahasa, D. (2008). *Kamus Besar Bahasa Indonesia.* Jakarta: Pusat Bahasa.

Qurthubi, S. I. (2008). *Tafsir Al Qurthubi.* Jakarta: Pustaka Azzam.

Rachmatullah, & Setyadi, H. A. (2015, Desember). Implementasi Metode AHP dan WP dalam Sistem Pendukung Keputusan Pemilihan Susu Formula. *Jurnal Ilmiah Go Infotech, 21*.

Rifan, S., Arin, F. Y., & Alamsyah. (2016). Implementasi Metode AHP-WP Pada Sistem Pendukung Keputusan Pemilihan Guru Teladan (Studi Kasus: Yayasan Abadiyah Kuryokalangan). *UNNES Journal of Mathematics* .

Risma, H. D. (2016). Penerapan Metode Analytical Hierarchy Process untuk Menentukan Penerima Bantuan Program Keluarga Harapan (Studi Kasus : Kecamatan Margorejo). *Skripsi : Fakultas Ilmu Komputer*, 7.

Rubin, J. (2008). *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests.*

Saaty, T. L. (2005). *The analytic hierarchy and analytic network processes for the measurement of intangible criteria and for decision-making.* Springer.

Satriani, N. N., Cholissodin, I., & Fauzi, M. A. (2018). Sistem Pendukung Keputusan Penentuan Calon Penerima Beasiswa BBP-PPA Menggunakan Metode AHP-PROMETHEE I Studi Kasus : FILKOM Universitas Brawijaya. *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer, 2*, 2780-2788.

UIN Maulana Malik Ibrahim Malang, B. (2017). *Profile Bagian Kemahasiswaan dan Alumni UIN Malang*. (UIN Maulana Malik Ibrahim Malang) Dipetik Maret 10, 2018, dari Bagian Kemahasiswaan dan Alumni UIN Malang: http://kemahasiswaan.uin-malang.ac.id

Walgito, B. (1997). Psikologi belajar. *Universitas Gajah Mada*.