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"Strategizing IR4.0 in Conquering Covid-19 and Beyond"

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Preface

This e-book describes the research papers presented at the International Conference on Emerging Computational Technologies (ICECoT 2021), organised by Faculty of Computer and Mathematical Sciences (FSKM), UiTM Cawangan Melaka. The main discussions of the conference is on the technological advances that help shape the skills that are required to cope with the Fourth Industrial Revolution (IR 4.0). Considering that this is our first attempt at organising a conference, we are therefore greatly honoured that the Universitas Negeri Semarang (UNNES), Indonesia, Mahasarakham University (MSU), Thailand and University of Hail (UoH), Saudi Arabia have all agreed to become our partners by contributing several reseach papers as well as providing reviewers to assess the quality of the papers.

Out of the numerous research works that had been submitted and reviewed, the Editorial Board have selected 22 papers to be published in the e-book. The discussions of these papers pertain to the use of technologies within the broad spectrum of Computer Science, Computer Networking, Multimedia, Information Systems Engineering, Mathematical Sciences and Educational Technology. It is hoped that the research findings that are shared in this e-book can benefit those who are interested in the various areas of computational technologies; such as graduate students, researchers, academicians and the industrial players, to name a few.

As the Project Manager, I would like to thank all of the committee members from the bottom of my heart for their tireless efforts in ensuring the success of ICECoT 2021. Without their continual support and excellent teamwork, this conference would not have come to fruition. In fact, holding this major event has been a good learning experience for us all, and I sincerely believe that our future conferences will become more outstanding if the same spirit is maintained.

Dr. Noor Aishikin Adam
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Information System IAPS 4.0 using Fuzzy Logic Decision Support System for Study Program Accreditation

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***Abstract*— *Instrumen Akreditasi Program Studi* (IAPS) is an instrument and guideline for study program accreditation formulated by the National Accreditation Board for Higher Education (BAN-PT). The change from IAPS 3.0 to IAPS 4.0 makes every study program in all universities in Indonesia have problems in the form of adjusting accreditation application procedures and assessment simulations that need to be adjusted to changes in the Study Program Accreditation Instrument. From these problems, we made a concept and system design that adopted the rules of the IAPS 4.0 assessment by involving relevant stakeholders and will be tested in each study program that is applying for accreditation. The research method focuses on two parts, namely the system development method with the Waterfall model and the Decision Support System (DSS) method using the Fuzzy Logic method. This method has advantages: it is more efficient in computational problems, works best for linear techniques, works best for optimization and adaptive techniques, and ensures continuity of the output surface. The IAPS 4.0 Information System design using the Fuzzy Logic DSS for Study Program Accreditation is expected to be the right and effective solution for universities in providing solutions to existing problems.**

Keywords—decision support system (DSS), fuzzy logic, information system, instrumen akreditasi program studi (IAPS)

I. INTRODUCTION

Accreditation is a form of evaluation or assessment to determine the appropriateness and quality of a university or study program that is carried out and has been determined by the National Accreditation Board for Higher Education (BAN-PT). The feasibility and quality of study programs or tertiary institutions are assessed based on the criteria established by the National Higher Education Standards to determine and reflect their quality and feasibility. The form of quality assessment relates to accountability, licensing, licensing by certain bodies. This accreditation also aims to ensure the feasibility and quality of study programs or tertiary institutions to protect the interests of students and society. Assessment in the context of accreditation is based on clear and complete standards as a benchmark for conducting assessments. The assessment also requires an operational explanation of the procedures and steps taken to achieve a systemic and systematic assessment. The quality of a study program or college is measured from several standards as a measure of assessment or what is commonly called an instrument. Accreditation is assessed by certain experts and those who have understood the nature of the field of science and the nature of management as a team or group of assessors based on the instruments that have been made (National Accreditation Board for Higher Education 2019b) (National Accreditation Board for Higher Education 2019a) [1][2].

As an overall direction, BAN-PT has formulated study program accreditation instruments and guidelines namely, the *Instrumen Akreditasi Program Studi* (IAPS). The instruments that have been established in 2008-2011 are then enforced until 2019 (IAPS 3.0). This instrument must be adjusted for several reasons, namely 1) the instrument needs adjustments to the latest regulations related to accreditation, 2) there is a shift in higher education organizations towards increasing external efficiency 3) is applied for recognition between quality assurance agencies, 4) is needed to improve quality accountability of the accreditation process, and 5) needed to develop a comprehensive quality assurance framework through the integration of the Internal Quality Assurance System (SPMI) and the External Quality Assurance System (SPME) (National Accreditation Board for Higher Education 2019b).

Therefore, the IAPS 3.0 is subject to a change to the IAPS 4.0. Comprehensively, BAN-PT has formulated study program accreditation instruments and guidelines, namely 1) academic texts, 2) criteria and procedures, 3) guidelines for preparing self-evaluation reports, 4) guidelines for preparing study program performance reports, 5) assessment guidelines, 6) evaluation matrix self-evaluation reports and study program performance reports, 7) field assessment guidelines, and 8) guidelines for using the on-line college accreditation system application (SAPTO) (National Accreditation Board for Higher Education 2019a).

With the changing of IAPS from IAPS 3.0 to IAPS 4.0, it is necessary to have an information system that can accommodate IAPS 4.0 equipped with a data mining method in the form of a DSS that can predict the results of the study program accreditation assessment. With this method, the system built will be able to make decisions based on existing data and become new information (Giovani, Mudjihartono, and Pranowo 2011). The concept and design of the system will adopt the rules of the IAPS 4.0 assessment by involving relevant stakeholders and will then be tested in each study program [2][3].

The IAPS 4.0 was developed to build a culture of higher education quality, especially in the implementation and development of study programs (National Accreditation

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Board for Higher Education 2019b). IAPS 4.0 triggered a shift like accreditation from rule-based accreditation to principle-based accreditation with the following characteristics. 1) A paradigm shift in accreditation from input-process to output-process. 2) Clarity of the logical framework starting from planning, implementation, to evaluation, and its relevance to institutional development plans. 3) Shifting of responsibility from the head/coordinator of the study program (program unit) to the head of the relevant Study Program Management Unit (source unit), thus showing the magnitude of the relevant management leadership responsibilities (leader responsibility) in the accreditation process [2].

A Decision Support System (DSS) is a further development of a management information system designed to be interactive with its users. The interactive nature is intended to facilitate integration between components in a flexible decision-making process. According to [4], DSS is an information system at the management level of an organization designed to assist organizational decision making. DSS is an information system whose data is processed in the form of decision-making for end users[4]. Therefore DSS requires decision models and special databases that are different from the Data Processing system [5][6]. DSS is suitable for evaluating the performance of an institution. Some Researches used DSS to determine the accreditation of an institution [7][8][9]. The researchers explained that using the manual methods for accreditation assessment is less effective, takes a long time and the results are not objective. So, we need a system with an effective method that helps for decision-making in the accreditation assessment. One of them is DSS with a fuzzy method

The most related study used the fuzzification method for DSS. The method is used by managerial parties to help determine some decisions [10]. The Fuzzy Inference System method was introduced by Takagi-Sugeno-Kang in 1985. The Sugeno fuzzy inference system rules are a toolbox for building fuzzy logic systems based on the Sugeno Method. The main system characteristic is flexibility, which means the system makes it easy for users to modify data systems (dynamic systems), can be used in any type of platform (portability), and also works for multiple operating systems [11][12].

Some previous research has succeeded in proving the effectiveness of using the fuzzification method to determine rankings as well as decision making. The research [11] explained that the fuzzification method produces efficient output with easier work. One of the advantages of fuzzification is proved by [13]. This research explained that the fuzzification method gives higher prediction accuracy than other methods. The other research [14] suggested for a further better result than DSS can use a variation of the fuzzy algorithm.

Sugeno fuzzy output is defuzzification. Sugeno fuzzy system improves the weakness of pure fuzzy system to add a simple mathematical calculation as part of THEN. In this change, the fuzzy system has a Weighted Average Values in the IF-THEN fuzzy rules section [12].

The general formula for fuzzification of the Takagi-Sugeno-Kang Fuzzy Inference System method is as follows in Eq. (1):

$$\mu[x,a,b,c] = \begin{cases} 0; x \le a \; atau \; x \ge c \\ \frac{(x-a)}{(b-a)}; a \le x \le b \\ \frac{(c-x)}{(c-b)}; b \le x \le c \end{cases} \quad (1)$$

The general Eq. (2) for defuzzification of the Takagi Sugeno-Kang Fuzzy Inference System method is as follows:

$$WA = \frac{\alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \cdots + \alpha_n Z_n}{\alpha_1 + \alpha_2 + \alpha_3 + \cdots + \alpha_n} \quad (2)$$

II. METHOD

The design and construction of the system design in this study will be made in the Computer Laboratory, Department of Electrical Engineering, State University of Semarang. For system testing, it will be carried out at the Faculty of Engineering, Semarang State University by asking for input from the Study Program Manager, Quality Assurance Group, and Deputy Dean 1 for Academic Affairs, Faculty of Engineering, Semarang State University. This study uses two methods, namely the Waterfall model for system development, and the DSS method using Fuzzy Logic [6].

The Waterfall model system development method includes several stages of the method, namely: 1) Requirements Analysis; 2) Design; 3) Preparation of Program Code; 4) Testing, and 5) Support or Maintenance [15]. Application of the Waterfall Model in the IAPS 4.0 Information System Design using the Fuzzy Logic DSS for Study Program Accreditation with the following stages:

A. Requirements Analysis

IAPS 4.0 Information System Design using Fuzzy Logic DSS has supporting needs that can be categorized into three parts, namely 1) Software Requirements; 2) Hardware Requirements, and 3) Support Requirement [3].

1) Software requirement

In making this information system, some supporting software is needed. Microsoft Visio software is used in system design to create flowcharts and other supporting diagrams such as Data Flow Diagrams (DFD) and Use Case Diagrams. Sublime Text and Notepad++ software are used by programmers to help write Web-based program code: PHP, HTML, JavaScript in a fast and structured manner which will then be tested on the Google Chrome browser. XAMPP and MySQL are used as database systems that store all data that will be used by the system. CorelDraw, Adobe Photoshop, and Adobe Illustrator software are used by system designers to design the system interface design.

2) Hardware requirement

has a very important role in the manufacturing and testing the system to be made, some of the hardware requirements include Processor, Motherboard, RAM, Graphic Card, SSD, DVD Rom and Power Supply CPU are assembled first and then used as a manufacturing device as well as a system testing device that will be made. Mouse and Keyboard are used as input devices into a computer system to operate the system being created. Monitors are used as display devices so that users can view and use the system. The Drawing Pad is used by designers to assist in making the design of the information system interface. Wifi Access Points, Switch Hubs, RJ45 Connectors, and UTP cables are used to build

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computer networks so that the system can be implemented and tested on a client-server basis.

3) Support requirement

in the form of Accreditation Instrument data, Assessment Weight, and PS Assessment Rubric (IAPS 4.0) are needed as study materials that will be used to design and test the system being made.

B. Design

1) System features

The IAPS 4.0 Information System uses the Fuzzy Logic DSS for Accreditation of Study Programs that will be created which will have the following features: 1) Able to digitize the IAPS 4.0 entry assessment data that has been made conventionally into a database system; 2) Can change the method of assessment which was originally a manual entry using paper to become a form using a system that is already integrated with the account of each study program; 3) Can make a well-documented accreditation assessment system that can be given an assessment proposal from the level of the study program, the Quality Assurance Group (GPM) of the Faculty of Engineering, and Deputy Dean 1 of the Faculty of Engineering, Semarang State University; and 4) Can print the results of the study program accreditation assessment from the respective authorities within the Faculty of Engineering and Semarang State University.

2) IAPS 4.0 information system process design

using Fuzzy Logic DSS for Study Program Accreditation is illustrated using the Use Case diagram as shown in Fig. 1.

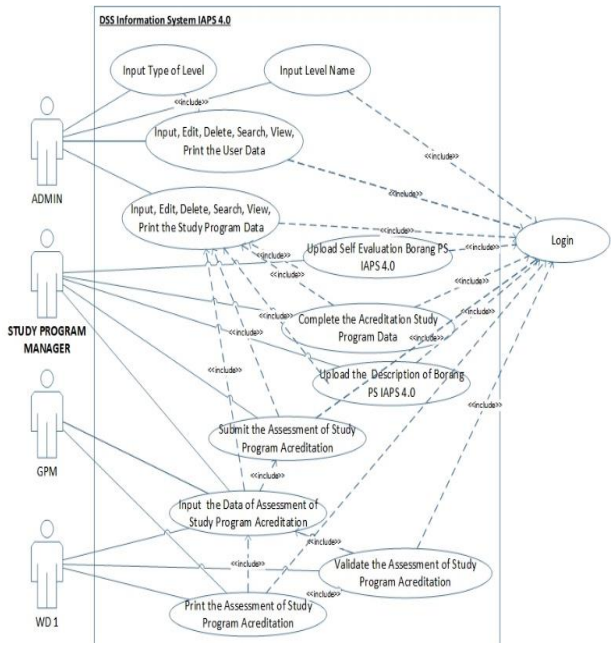

Fig. 1. Use case diagram of information system

From the use case diagram presented, it can be observed that four actors who play a role in the system to be created, the four actors are Admin, Study Program Manager, Quality Assurance Group (GPM), and Deputy Dean for Academic Affairs (WD1).

3) Design of the rules

The design of this rule applies the fuzzy logic method regarding the rules applied in making the system referring to the Regulation of the National Accreditation Board for Higher Education Number 5 of 2019 concerning Study Program Accreditation Instruments in the Assessment Guidelines section. In the assessment guidelines there are four elements and are divided into 14 criteria as follows in Table 1 [1]:

TABLE I. ELEMENT, CRITERIA, AND ASSESMENT ITEMS

Element/ Criteria	Element Weight	Criteria Weight
A. External Condition	1.0	1.0
B. Institution Profile	1.0	1.0
C. Criteria:	92.0	
1. Vision, Mission, Goals, and Strategy		3.1
2. Governance System, Governance and Cooperation		6.1
3. Students		9.2
4. Human Resources		12.3
5. Finance, Facilities, and Infrastructure		6.1
6. Education		18.4
7. Research		4.6
8. Community Service		1.5
9. Tridharma Outcomes and Achievements		30.7
D. Analysis and Determination of Development Programs	6.0	
1. Performance Analysis and Outcomes		1.5
2. SWOT Analysis or Relevant Analysis		2.0
3. Development Program		1.5
4. Program Sustainability		1.0
Total Weight	**100**	**100**

Table I explained that the characteristics and assessment weight of the criteria to be assessed have been determined by dividing the 15 criteria into 69 Assessment Items. Assessment Items range from 0 to 4.0, while the weight of the assessment has been determined by the BAN-PT assessment guidelines. The calculation of Accreditation Value uses an accumulation system (total) from the calculation of the average assessment per assessment Items multiplied by the weight per criterion. After obtaining the total value results, the assessment results will provide a decision on the results of the accreditation of the related study program using the following rules explained in Table II [1] with addition terms:

*) Terms Accreditation Needed:

a) Score of Assessment Items No. 12 ≥ 2.0
b) Score of Assessment Items No. 20 ≥ 2.0
c) Score of Assessment Items No. 38 ≥ 2

*) Terms Accreditation Ranked (Excellent):

a) Score of Assessment Items No. 18 ≥ 3.5
b) Score of Assessment Items No. 19 ≥ 3.5
c) Score of Assessment Items No. 60 ≥ 3.5
d) Score of Assessment Items No. 61 ≥ 3.5

*) Terms Accreditation Ranked (Very Good):

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a) Score of Assessment Items No. 18 ≥ 3.0
b) Score of Assessment Items No. 19 ≥ 3.0
c) Score of Assessment Items No. 60 ≥ 3.0
d) Score of Assessment Items No. 61 ≥ 3.0

TABLE II. THE RULE FOR ASSESMENT RESULT

No	Accredi-tation Score (AS)	Terms Accredi-tation Needed *)	Terms Accreditation Ranked		Status	Rank
			Excel-lent **)	Very Good ***)		
1	AS ≥ 361	√	√	-	Accre-dited	Excel-lent
2	AS ≥ 361	√	X	-		Very Good
3	301 ≤ AS < 361	√	-	√		Very Good
4	301 ≤ AS < 361	√	-	X		Good
5	200 ≤ AS < 301	√	-	-		Good
6	AS ≥ 361	X	√/ X	√/ X	Not Accre-dited	-
7	AS < 361	√/ X	-	-		-

4) Design of system display

The IAPS 4.0 Information System uses the Fuzzy Logic DSS for Accreditation of Study Programs, which has several forms of display plans. Differences in the appearance of the interface are distinguished based on the level of users who enter the system. Fig. 2 is a display design for logging into the system. For the first user level, namely Administrator, the display is focused on management features and settings. Administrators at the highest level have different rights from other users as shown in Fig. 3. In the management feature, there is a menu to view, search, add, delete, or change existing data. This management process scheme is also implemented in other management features that can be accessed by the Administrator Level, WD1, and GPM in Fig. 4. One of the features presented to the Study Program Manager is the Assessment of the IAPS 4.0 Study Program that is managed, to then be able to propose and monitored by User Level above it (GPM, WD1) in Fig. 2.

C. Programming Code

Making program code for execution using the scripting language PHP, HTML, and JavaScript following the design made. PHP is a server-side scripting language, a programming language used to develop static websites, or dynamic websites or Web applications. PHP stands for Hypertext Pre-processor, previously called Personal Home Pages. HTML stands for Hypertext Markup Language. HTML allows a user to create and organize paragraph sections, headings, links or links, and block quotes for web pages and applications. JavaScript is a web programming language that is Client Side Programming Language. Client-Side Programming Language is a type of programming language whose processing is carried out by the client. The client application in question refers to web browsers such as Google Chrome and Mozilla Firefox.

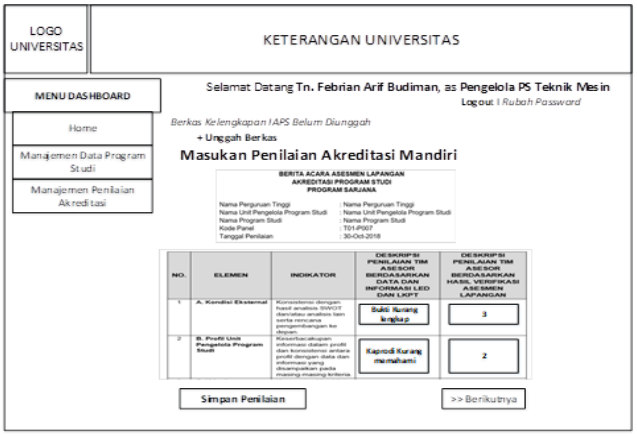

Fig. 2. Example design of study program page display

Making program code for system display using CSS. CSS is a Cascading Style Sheet language and is usually used to adjust the appearance of elements written in markup languages, such as HTML. CSS serves to separate content from its visual appearance in the browser. CSS plays an important role in the appearance of a web-based system. HTML and CSS are closely related. Since HTML is a markup language (the foundation of a site) and CSS improves styling (for all aspects related to the appearance of a website), these two programming languages must go hand in hand.

D. Testing

There are two kinds of information system testing made, namely testing the implementation of the user directly and testing the system logic. Direct implementation testing of the user is a real test in the field of the user concerned. This test aims to align the flow of systems thinking with users in the field so that the desired goals can be achieved. In this test, it is usually found that there is a meeting point for standard operating procedures between the systems created and the implementation directly in the field. An illustration of testing in the field can be seen in Fig. 3.

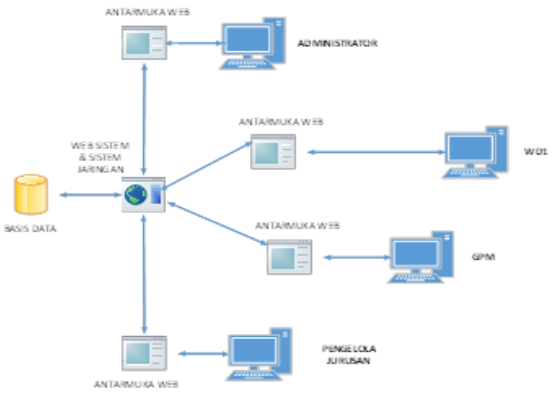

Fig. 3. Design of testing process

E. System Support And Maintenance

System support and maintenance are carried out after the system has gone through the testing phase and is declared ready and suitable for real implementation in the field. System support will be adjusted according to field conditions to support software and hardware requirements. This support can vary from one user to another because it is related to the environment and conditions of the equipment used.

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System maintenance is carried out regularly and continuously. There are two types of system maintenance including the maintenance of the information system itself and the maintenance of a database as a data storage area. System maintenance focuses on program code errors and programming logic errors, while database maintenance focuses on data backup so that at any time a system failure still has a data backup to be restored [16].

III. RESULT

A. *The Result of Implementation System*

The results that have been achieved in this study include the realization of interface design into the web programming language PHP, CSS, and HTML. The system interface is made according to the design by taking into account the comfort of the system user. Fig. 4 and Fig. 5 are the example of the display of the stages of the system that have been worked on.

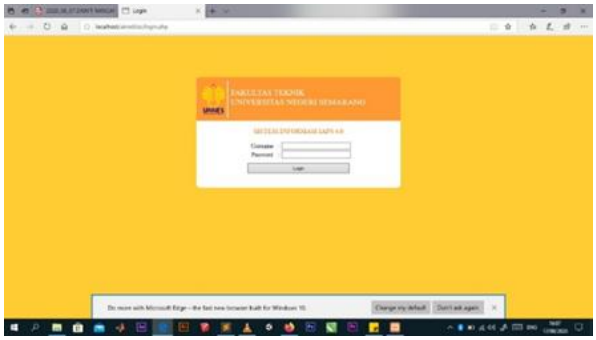

Fig. 4. Login page

Fig. 5. The page for study program administrator

B. *System Testing*

In testing the manufacture of this system, test data is obtained as in the following Table III:

TABLE III. THE DATA TESTING

No	Element/ Criteria/ Assessment Items	Score (0 - 4.0)	Average Score	Weight	Criteria Score
1	A	4	4	1	4
2	B	4	4	1	4
3	**C**/ C.1/ C.1.4	4	3,67	3,1	11,38
4		3			
5		4			
6	C.2/ C.2.4/ C.2.4a	4	3,63	6,1	22,14
7	C.2.4b	4			
8	C.2.4c	3			
9		4			
10	C.2.5	3			
11	C.2.6	4			
12	C.2.7	3			
13	C.2.8	4			
14	C.3/ C.3.4/ C.3.4.a	4	4	9,2	36,8
15	C.3.4.b	4			
16	C.3.4.c	4			
17	C.4/ C.4.4/ C.4.4.a	4	3,33	12,3	40,96
18		4			
19		4			
20		3			
21		4			
22		3			
23		2			
24	C.4.4.b	3			
25		4			
26		2			
27		3			
28		3			
29		3			
30	C.4.4.c	4			
31	C.4.4.d	4			
32	C.5/ C.5.4/ C.5.4.a	4	3,67	6,1	22,39
33		4			
34		4			
35		3			
36		3			
37	C.5.4.b	4			
38	C.6/ C.6.4 C.6.4.a	4	3,6	18,4	66,24
39	C.6.4.b	4			
40	C.6.4.c	3			
41	C.6.4.d	3			
42		4			
43	C.6.4.e	4			
44	C.6.4.f	3			
45	C.6.4.g	3			
46	C.6.4.h	4			
47	C.6.4.i	4			
48	C.7/ C.7.4/ C.7.4.a	4	4	4,6	18,4
49	C.7.4.b	4			
50	C.8/ C.8.4/ C.8.4.a	4	4	1,5	6
51	C.8.4.b	4			
52	C.9/ C.9.4/ C.9.4.a	4	3,57	30,7	109,6
53		4			
54		4			
55		4			
56		3			
57		3			
58		3			
59		4			
60		2			
61		4			
62		4			
63		4			
64	C.9.4.b	4			
65		3			
66	**D**/ D.1	4	4	1,5	6
67	D.2	4	4	2	8
68	D.3	4	4	1,5	6
69	D.4	4	4	1	4
TOTAL WEIGHT & ACREDITATON SCORE				**100**	**365,91**

From the test data presented in Table III, it can be seen that the score column is the assessment result entered by the

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user, while Weight is the weight that has been determined according to the guidebook. To get a score for each criterion, the average calculation of all the Assessment Items values for that element is calculated and then multiplies by the weight. For example, we can observe Criterion C.1 where the mean value is obtained from the following calculations [1]:

$$Average\ Score = \sum_{1}^{n} Elemen_n\ /n$$

$$= (Kriteria_3 + Kriteria_4 + Kriteria_5)/3$$

$$= (4 + 3 + 4)/3$$

$$= 3.67$$

After obtaining the criterion mean score, the next step is to multiply the average value of the criteria by the weight of the criteria as in the example of C.1 as follows:

$$Criteria\ Score = Average\ Score\ x\ Weight$$

$$Criteria\ Score = 3.67\ x\ 3.1$$

$$Criteria\ Score = 11.38$$

All calculation results for each Assessment Item per criteria can be seen in Table III. After all the Assessment Items are calculated, the Accreditation Score is calculated by adding up all the Assessment Items that have been obtained from the next calculation process. In this case, according to the data in Table bb, an Accreditation Score of 365.91 is obtained.

Based on Table II, the score obtained can be analyzed. The score obtained shows the results of the accreditation assessment calculation. The score is in the value range of more than 361 so it qualifies for accreditation. Apart from that, the score analysis also needs to pay attention to additional terms. So that it will be known whether the required requirements for ranking study programs are met. If fulfilled, the criteria for Table II are used as a reference for making a decision on the Status and Ranking of the Study Program. In the example score given, the final decision for the accreditation of the study program is Accredited Very Good.

C. Planning Development of This Research

The plan for the next stage in this research is to improve the realization of the system based on the design that has been made. Making database relations is very necessary to make data linkages on a built system. The following sections will be carried out: 1) The dashboard section and all the features of the Head of the Study Program; 2) The dashboard section and all the features of the Head of the Department; 3) The dashboard section and all the features of the Quality Assurance Group, and 4) The dashboard and all Faculty's features (WD1).

IV. CONCLUSION

This research resulted in several conclusions. In the system created there are several levels of users including Admin, Faculty Officials, Quality Assurance Group, Head of Department, and Head of Study Program. The system created has a data management feature, a Study Program Data management feature, a User Data management feature that can be adjusted dynamically, and an Access Rights Data management feature that can be adjusted dynamically. The system created has a validation feature for accreditation applications to avoid mistakes in the implementation of accreditation. Further research improvements will be made by comparing the accuracy of the accreditation assessment with several DSS methods.

REFERENCES

[1] BAN-PT, Peraturan badan akreditasi nasional perguruan tinggi - akreditasi program studi. Indonesia, 2019.

[2] BAN-PT, “Instrumen akreditasi program studi pengantar,” llDikti, no. April, 2018, [Online]. Available: https://lldikti8.ristekdikti.go.id/wp-content/uploads/2019/05/Instrumen-Akreditasi-Program-Studi-4_0-materi-Prof-Johni.pdf.

[3] T. S. Sukamto, L. E. Nugroho, and W. W. Winarno, “Desain sistem informasi akreditasi program studi berbasis website di Indonesia,” Semin. Nas. Apl. Teknol. Inf. Agustus, pp. 1907–5022, 2016.

[4] H. Al Fatta, Analisis dan perancangan sistem informasi untuk keunggulan bersaing perusahaan dan organisasi modern. CV Andi Offset, 2007.

[5] S. Maharsi, “Pengaruh perkembangan teknologi informasi terhadap bidang akuntansi manajemen,” J. Akunt. dan Keuang., vol. 2, no. 2, pp. 127–137, 2000, doi: 10.9744/jak.2.2.pp.127-137.

[6] M. Z. A, Aryanfar., A, Gholami., M, Pourgholi., “Multi-criteria wind potential assessment using fuzzy decision-making framework: A case study of Iran,” Wind Energy, no. March, pp. 1–23, 2021, doi: 10.1002/we.2640.

[7] I. Asidik, Kusrini, and Henderi, “Decision support system model of teacher recruitment using algorithm C4.5 and Fuzzy Tahani,” J. Phys. Conf. Ser., vol. 1140, no. 1, 2018, doi: 10.1088/1742-6596/1140/1/012030.

[8] M. Syaukani and A. Kadir, “Design a group decision support system model to determine accreditation of early childhood education institutions,” IOP Conf. Ser. Mater. Sci. Eng., vol. 1007, no. 1, 2020, doi: 10.1088/1757-899X/1007/1/012039.

[9] F. Saeed and A. Dixit, “Quality assurance council at higher education institutions in Yemen,” 2015 IEEE 3rd Int. MOOCs, Innov. Technol. Educ., vol. 978-1–4673, pp. 163–168, 2015.

[10] S. Andriyani and N. A. Wulandari, “Decision support system for handling public welfare assurance using Fuzzy Tahani reasoning,” in International Conference on Social, Sciences and Information Technology, 2020, pp. 365–370.

[11] Sukenda, Y. Puspitarani, A. P. Wahyu, and B. Yustim, “Fuzzy logic implementation using the Tsukamoto Method as a decision support system in scholarship acceptance,” Turkish J. Comput. Math. Educ., vol. 12, no. 11, pp. 1411–1417, 2021.

[12] Murnawan, R. A. E. Virgana, and S. Lestari, “Comparison of Sugeno and Tsukamoto fuzzy inference system method for determining estimated production amount,” Turkish J. Comput. Math. Educ., vol. 12, no. 8, pp. 1467–1476, 2021.

[13] A. M. Rajeswari, A. S. Anushiya, K. S. A. Fathima, S. S. Priya, and N. Mathumithaa, “Fuzzy decision support system for recommendation of crop cultivation based on soil type,” Proc. 4th Int. Conf. Trends Electron. Informatics, ICOEI 2020, no. June, pp. 768–773, 2020, doi: 10.1109/ICOEI48184.2020.9142899.

[14] B. Derebew, S. Thota, P. Shanmugasundaram, and T. Asfetsami, “Fuzzy logic decision support system for hospital employee performance evaluation with maple implementation,” Arab J. Basic Appl. Sci., vol. 28, no. 1, pp. 73–79, 2021, doi: 10.1080/25765299.2021.1890909.

[15] M. Kramer, “Lifecycle : An analyses based on the Waterfall Model,” Rev. Bus. Financ. Stud., vol. 9, no. 1, pp. 77–84, 2018.

[16] Y. Lv and W. D. Li, “A predictive maintenance system for multi-granularity faults based on a predictive maintenance system for multi-granularity faults based on AdaBelief-BP neural network and fuzzy decision making abstract, ” Advanced Engineering Informatics, vol. 49, pp. 1–12, 2021.

[17]

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