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Analysis of WIUM Online Education Management System User Satisfaction Using PIECES Framework

Winda Ebina Br Bangun[1], Jay Idoan Sihotang[2]*
[1,2]Sistem Informasi / Fakultas Teknologi Informasi, Universitas Advent Indonesia
*e-mail: jay.sihotang@unai.edu

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ABSTRACT

WIOEM is a web and android application designed to quickly share information with users and help solve problems at the Salemba Adventist College. This information system is used by users for various purposes that are able to support the performance of teachers and parents in improving services to students. The various functions in this information system will affect user satisfaction or dissatisfaction with the system. So that there is a need for improvement and development of the system in the future. WIOEM information system analysis was carried out to determine the advantages and disadvantages that exist in the system based on the PIECES method. The purpose of this research is to get an overall picture of system performance, information, level of economic value, security, efficiency, and system services. From each aspect that is analyzed will be used as a recommendation for improvement of the WIOEM information system. The method used in this research is descriptive quantitative. The data collection technique uses a questionnaire distributed through the Google Forms platform. The results of this study indicate that the WIOEM system is in the good category, with an average total satisfaction level of 4.18. With each Performance indicator achieving a value of (4.31), Information (4.23), Economic (4.04), Control (4.11), Efficiency (4.25) and Service achieving a value of (4.17).

Keywords: *WIOEM, PIECES, Information System, User Satisfaction.*

INTRODUCTION

Technological developments are increasing rapidly and have an impact on various aspects of human life. Everyone's activities cannot be separated with the help of technology. Because many human jobs can be facilitated by technological devices, several educational institutions use information systems to support academic activities and ensure that the process of managing information is fast and convenient. The current use of information systems is not only limited to business activities but also penetrated the world of education, this is indicated by the increasing number of school managers using websites as a means of introducing the schools they manage [1]. Implementing an academic information system in schools as the utilization of an education management information system is the right choice, seeing that academic activities are routine activities so it is necessary to implement information systems there so that data is computerized properly and can provide optimal academic services for its users [2].

WIOEM (WIUM online education management system) helps Salemba Adventist High School manage student data, employee data, financial data and financial reporting, facilitates the exchange of student grade data between teachers and homeroom teachers or makes student reports,

speeds up and helps and facilitates recording of student behavior. It provides guidance, advice, and parents information about students' academic progress online, generates school accreditation reports, and easily monitors teacher performance by principals and teacher evaluations by students. The WIOEM information system needs to be given intensive attention, because problems are still found in the WIOEM information system which results in the system being slow, inaccessible or less efficient. Initial pre-study observation on September 19, 2022, using the web based services namely www.webpagetest.org and www.gmetrix.com. The results found that the speed of the system is 2.1 seconds and the speed or loading index reaches 5.7 seconds. The results of this speed are included in the good category but still need to re-evaluate the system to support better system performance. The PIECES method can be used to analyze information systems. PIECES is a method that can be used to assess whether a system is compatible with its intended purpose, which is able to describe system performance barriers, information completeness, system economic value, access control, level of efficiency and system services [3].

One study proved that user satisfaction or dissatisfaction can be feedback for system developers [3]. Research [4] says that the PIECES method can be used to determine student satisfaction with SIAKADU, with the aim of correcting things that don't suit user needs. According to [5] the PIECES method as a model for system analysis and evaluation is carried out in detail and efficiency. The results are presented in the form of system strengths and weaknesses that can be identified and used as a reference for the system. The use of the PIECES System as a tool for analyzing the system in detail and thoroughly so that the results of the research can be used as material for consideration or reference for maintaining system user satisfaction to encourage organizational progress going forward [6]. The previous research on WIOEM not focusing on user satisfaction, but on WIOEM information security using ITIL v3 [7]. Therefore, it is important to conduct research related to the analysis of user satisfaction with the WIOEM using the PIECES method in Salemba Adventist High School. The research objective is to evaluate or get an overview of system performance (performance), information (information), level of economic value (economic), security (control), efficiency (efficiency), and system services (service). The analysis of each attribute is used as a recommendation or input to the WIOEM system developer so that it is better in the future and helps organizations see the level of user satisfaction with WIOEM.

METHODS

Research Framework

In research, a research framework is needed to get the expected results. The first stage is the stage of literature study to increase basic knowledge in this research. The next stage of data collection was by distributing questionnaires to WIOEM users at the Salemba Adventist High School using a Likert scale. And finally at the stage of measurement and analysis of data obtained from questionnaires that have been distributed to respondents, to get conclusions about the PIECES components that must be improved.

PIECES Framework

Researchers wrote this study by tracing several sources of previous writings such as scientific journals. Relevant information is used by researchers in writing this study. The PIECES method is used to analyze and evaluate user satisfaction [4]. The PIECES Framework [8] component consists of:

1. *Performance.*
   Performance analysis and WIOEM performance are measured by speed, accuracy and the amount of data discovery produced, where the amount of production is the amount of work that can be completed over a certain period.
2. *Information*
   Analyze whether the information on the system is clear and correct on the WIOEM system.
3. *Economic*
   Analysis of the application of the system from the fees or rates incurred. There are benefits to be gained from using WIOEM in managing operational costs. Such as reducing the use of paper, because it can be accessed electronically, so it saves time and is more economical.
4. *Control*
   In the control section to determine the level of supervision and control of the security of the WIOEM information system, to avoid unauthorized users.
5. *Efficiency*
   Analysis of the system whether it is efficient or not, seen from the collection of information that is able to support decision making so that activity reports are scheduled in real time.
6. *Service*
   Analysis of how the service is from the system, what are the problems related to service, because some attribute over service is very important in order to operate the system properly.

Population and Sample

The population and samples were taken from WIOEM users at the Salemba Adventist High School with a total number of respondents of 9 people from the total of 12 Teachers at the school. The questionnaire will be filled out by active WIOEM users who are teachers at the Salemba Adventist High School. And this research was conducted in the Odd Semester of the 2022/2023 Academic Year.

Data Collection and Measurement Method

The techniques used to obtain information are observation and questionnaires. Observations are used to get information that is happening in the field. The activities that are observed are the flow of application usage, and the features in the application. The questionnaire is used to measure the expectations of the respondents by giving statements to the respondents using the Google form platform. Questionnaire statements relate to the PIECES method.

Measuring perceptions or calculating values from the results of the questionnaire using a Likert Scale [9] where respondents choose one of the 5 answer choices from each category which has a score as shown in the table 1.

Table 1. Likert Scale [9]

Answer	Criteria	Score
Strongly Agree	SA	5
Agree	A	4
Neutral	N	3
Disagree	D	2
Strongly Disagree	SD	1

Calculating the average value of each questionnaire statement will be an assessment of customer satisfaction. Where each statement in each PIECES Indicator will be calculated using formula (1) [10] as shown below:

$$AS = \frac{QSS}{QS} \quad (1)$$

Explanation:
AS = Average Satisfaction
QSS = Questionnaire Score Summary
QS = Questionnaire Score

To determine the level of satisfaction that is defined through the Likert scale [11], you can use formula (1) above, and the results of this calculation will refer to the table of satisfaction levels in Table 2.

Table 2. Satisfaction Levels [11]

Scale	Satisfaction Score Category
4,92 – 5	Very Satisfied
3,4 – 4,91	Satisfied
2,6 – 3,39	Neutral
1,8 – 2,59	Dissatisfied
1,00 – 1,79	Very Dissatisfied

Data Analysis Method

Researchers conducted an analysis of WIOEM user satisfaction using the PIECES method. Researchers chose this method to measure whether WIOEM users are satisfied with information system services or not. The measurement method uses formula (1) which is applied to each answer given by the respondent in each indicator. Later the measurement results will be compared with table 2. So, it is hoped that the results from the study will show the level of satisfaction with using the WIOEM Application from a teacher administration perspective.

RESULTS AND DISCUSSION

Validity and Reliability Test

The validity and reliability tests aim to measure the validity of the data, whether the questionnaire is valid or not, and to find out whether the respondents' answers remain stable from the questionnaire statements [12]. Usually, the validity test is carried out to find out whether the statements on the questionnaire are effective in generating data. A questionnaire is said to be valid if the statements on the questionnaire can reveal the aspects being measured. A statement is declared valid when $r_{count} > r_{table}$, but if $r_{count} < r_{table}$ then the statement is declared invalid. From all of PIECES indicators that were used in the questionnaire, all of the statements were valid as shown on Table 3,4,5,6,7,8 below.

Table 3. *Performance* Indicator Validity Test Results

No	Statement	Rcount	Rtable 5%	Information
1.	The WIOEM system can operate the commands according to the menu in a short time.	0,674	0,666	Valid
2.	The menu available in the WIOEM system can bring up information according to what you want.	0,704	0,666	Valid

Table 4. *Information* Indicator Validity Test Results

No	Statement	Rcount	Rtable 5%	Information
1.	The WIOEM system displays accurate and relevant information.	0,709	0,666	Valid
2.	Reports on the WIOEM system are easy to read and understand.	0,845	0,666	Valid
3.	The WIOEM system can produce information according to needs.	0,908	0,666	Valid
4.	The data stored in the WIOEM system corresponds to what is entered into the WIOEM system.	0,918	0,666	Valid
5.	The information that the WIOEM system generates is timely.	0,738	0,666	Valid

Table 5. *Economic* Indicator Validity Test Results

No	Statement	Rcount	Rtable 5%	Information
1.	The WIOEM system minimizes the use of paper for recording financial transactions.	0,707	0,666	Valid
2.	The WIOEM system helps schools to save budget and resources in system development.	0,671	0,666	Valid

Table 6. *Control* Indicator Validity Test Results

No	Statement	Rcount	Rtable 5%	Information
1.	The WIOEM system allows users to be flexible in changing passwords.	0,945	0,666	Valid
2.	The WIOEM system can only be accessed by authorized users.	0,897	0,666	Valid
3.	The WIOEM system feels safe from viruses and cyber-attacks that try to retrieve user data.	0,847	0,666	Valid

Table 7. *Efficiency* Indicator Validity Test Results

No	Statement	Rcount	Rtable 5%	Information
1.	The WIOEM system makes it easy for users to operate the system.	0,967	0,666	Valid
2.	The WIOEM system has good maintainability and runs smoothly.	0,967	0,666	Valid
3.	The WIOEM system makes it easier for teachers to convey information to students.	0,967	0,666	Valid
4.	The WIOEM system has a responsive display and can be accessed from a computer, cell phone or personal gadget.	0,818	0,666	Valid
5.	The WIOEM User Interface has good color contrast making it easier for users to make menu choices (features).	0,967	0,666	Valid

Table 8**.** *Service* Indicator Validity Test Results

No	Statement	Rcount	Rtable 5 %	Information
1.	The WIOEM system is frequently updated or updated to maintain service quality.	0,769	0,666	Valid
2.	The WIOEM system is trusted to do the work requested (reliability).	0,848	0,666	Valid
3.	The WIOEM feature can be used easily.	0,899	0,666	Valid
4.	The WIOEM system can generate useful reports for users.	0,900	0,666	Valid
5.	The services available on the WIOEM system are very good.	0,900	0,666	Valid

The questionnaire is said to be reliable, if the results remain the same even though repeated measurements have been made. The reliability test is carried out if you have previously conducted a validity test, if the data is not valid then there is no need to perform reliability. Methods in the reliability test include retesting, the Flanaga formula, Cronbach's alpha, the KR formula (Kuder-

Richardson) and Hoyt's Anova. The Cronbach's alpha testing technique used in testing the reliability of the questionnaire in this study was carried out using all respondents who were used as respondents to test the validity and reliability. And if the results of the alpha coefficient > significance value of 0.6 then it is called reliable [13]. Following are the results of the reliability of all indicators. The reliability test results are shown in Table 9.

Table 9. Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	N of Items
0,957	22

Table 10 below shows the results of the questionnaire assessment after testing the validity and reliability. The total number of respondents who filled out the questionnaire was 9 people with the calculation results for each indicator as follows:

Table 10. Questionnaire Assessment Results

Indicator	**SA**	**A**	**N**	**D**	**SD**
Performance	30	40	6	-	-
Information	50	132	6	-	-
Economic	15	44	12	-	-
Control	30	64	6	6	-
Efficiency	55	128	6	-	-
Service	50	116	18	-	-

Calculation of the total score of the questionnaire (QSS) is obtained from adding up each question from each indicator. Where the questionnaire score is obtained from the number of answers multiplied by the weight of the answers. From each indicator starting from the Performance, Information, Economic, Control, Efficiency and Service indicators, the agreed answer is the dominant answer with successive values of 40, 132, 44, 64, 128, and 116. Formula (1) is used to calculate the results of the assessment of each indicator in the questionnaire using the Pieces method, namely:

1. *Performance*

$$\boldsymbol{RK} = \frac{(\mathbf{30} * \mathbf{5}) + (\mathbf{40} * \mathbf{4}) + (\mathbf{6} * \mathbf{3}) + (\mathbf{0} * \mathbf{2}) + (\mathbf{0} * \mathbf{1})}{\mathbf{30} + \mathbf{40} + \mathbf{6} + \mathbf{0} + \mathbf{0}}$$

$$= 4{,}31$$

2. *Information*

$$\boldsymbol{RK} = \frac{(\mathbf{50} * \mathbf{5}) + (\mathbf{132} * \mathbf{4}) + (\mathbf{6} * \mathbf{3}) + (\mathbf{0} * \mathbf{2}) + (\mathbf{0} * \mathbf{1})}{\mathbf{50} + \mathbf{132} + \mathbf{6} + \mathbf{0} + \mathbf{0}}$$

$$= 4{,}23$$

3. *Economic*

$$\boldsymbol{RK} = \frac{(\mathbf{15} * \mathbf{5}) + (\mathbf{44} * \mathbf{4}) + (\mathbf{12} * \mathbf{3}) + (\mathbf{0} * \mathbf{2}) + (\mathbf{0} * \mathbf{1})}{\mathbf{15} + \mathbf{44} + \mathbf{12} + \mathbf{0} + \mathbf{0}}$$

$$= 4{,}04$$

4. *Control*

$$\boldsymbol{RK} = \frac{(\mathbf{30} * \mathbf{5}) + (\mathbf{64} * \mathbf{4}) + (\mathbf{6} * \mathbf{3}) + (\mathbf{6} * \mathbf{2}) + (\mathbf{0} * \mathbf{1})}{\mathbf{30} + \mathbf{64} + \mathbf{6} + \mathbf{6} + \mathbf{0}}$$

$$= 4{,}11$$

5. *Efficiency*

$$\boldsymbol{RK} = \frac{(\mathbf{55} * \mathbf{5}) + (\mathbf{128} * \mathbf{4}) + (\mathbf{6} * \mathbf{3}) + (\mathbf{0} * \mathbf{2}) + (\mathbf{0} * \mathbf{1})}{\mathbf{55} + \mathbf{128} + \mathbf{6} + \mathbf{0} + \mathbf{0}}$$

$$= 4{,}25$$

6. *Service*

$$\boldsymbol{RK} = \frac{(\mathbf{50} * \mathbf{5}) + (\mathbf{116} * \mathbf{4}) + (\mathbf{18} * \mathbf{3}) + (\mathbf{0} * \mathbf{2}) + (\mathbf{0} * \mathbf{1})}{\mathbf{50} + \mathbf{116} + \mathbf{18} + \mathbf{0} + \mathbf{0}}$$

$$= 4{,}17$$

Based on the research results of questionnaire that was given to 9 teachers of the Salemba Adventist High School, the average satisfaction level of users of the WIOEM system using the PIECES method is categorized as satisfied as shown in table 11 below. The categorization of each indicator refers to table 2. Each PIECES variable starting with the Performance indicator (4.31) is classified as satisfied, the Information indicator reaches the satisfied category (4.23), the Economic indicator reaches the satisfied category (4.04), the Control indicator reaches satisfied category (4.11), Efficiency reached the satisfied category (4.25), and Service indicators also reached the satisfied category (4.17), and the total level of satisfaction reached the satisfied category (4.18). Overall, the user were satisfied with WIOEM System. It is possible to achieve the highest category level by receiving input suggestions, asking for regular feedback from the developer to actual users. So if there are some minor problem with the system, the developer could fix/solve the problem as soon as possible. The WIOEM System User Satisfaction Level is show in Table 11.

Table 11. WIOEM System User Satisfaction Level

Indicator	Average Score	Category
Performance	4,31	Satisfied
Information	4,23	Satisfied
Economic	4,04	Satisfied
Control	4,11	Satisfied
Efficiency	4,25	Satisfied
Service	4,17	Satisfied
Average Satisfaction Level	**4,18**	**Satisfied**

CONCLUSION

The results of these calculations can be concluded that the WIOEM system has provided satisfaction in accordance with user expectations. The average satisfaction level of the 6 PIECES method variables is 4.18 which is included in the satisfied category. Likewise, the use of the PICES method in this study provides an overview for system developers to continue to evaluate the WIOEM system on a regular basis in order to maintain its advantages, so that WIOEM user

satisfaction can be maintained in the satisfied category or further increased to reach the very satisfied category. Another way to reach the category level is very satisfied, namely, receiving input suggestions or criticism from system users, asking for regular feedback from users to evaluate parts that need to be improved [14] so that users feel that their opinions are valued and find comfort when using the WIOEM system. You can also add a Chatbox which is able to provide a quick response if the user experiences problems when using the WIOEM system [15]. With good service, users will be very satisfied with the system. As for suggestions for further research, namely being able to conduct research with a wider level of users may use the PIECES method or combine the PIECES method with other methods such as Importance Performance Analysis to identify what are the important performance factors that must be demonstrated by an organization in meeting customer satisfaction user.

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