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MCCALL'S SOFTWARE QUALITY METHOD FOR ENSURING THE QUALITY OF NEW STUDENT ADMISSION INFORMATION SYSTEM

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ABSTRACT
New Student Admission (PMB) is a selection process for prospective students that is carried out regularly at a university. It generally involves a number of complex steps, such as collecting and verifying applicant data, assessing files, and announcing selection results. In today's digital era, many universities have adopted website-based admissions information systems to simplify the process of admitting new students. Bhinneka PGRI University is one of the universities that has implemented a website-based admissions information system using the pmb.ubhi.ac.id site. The purpose of this study was to test the feasibility of the admissions information system at Bhinneka PGRI University using the McCall Software Quality method. This research method involves collecting data through questionnaires that include five quality factors from the McCall method, namely accuracy, usability, integrity, reliability, and efficiency. The data was analyzed using a Likert scale to assess users' opinions on the quality of the application system. The results showed that this information system was able to increase staff efficiency in managing the selection process and the University's PMB file. Feasibility testing using the McCall method produces a percentage of 72.08%, which is in the range of 61% - 80% and is included in the good category.

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I. INTRODUCTION

New Student Admission (PMB) is a selection process for prospective students that is carried out regularly at a university [1]. Universities annually open the opportunity for prospective new students to enroll at the destination campus through PMB each campus. Generally, this process involves a number of complex steps, such as collecting and verifying applicant data, evaluating files, and announcing selection results [2]. With the increasing interest of prospective new students who register can support the quality of education from the university itself. In today's digital era, many universities have adopted a website-based admissions information system to simplify and speed up the process of admitting new students. Bhinneka PGRI University is one of the universities that has implemented a website-based admissions information system using the pmb.ubhi.ac.id site. Admissions information system is an information system that plays a role in facilitating universities in managing the process of admitting new students so as to increase the efficiency of the committee in processing data, reduce the use of paper (paperless), reduce bureaucracy and minimize errors in the selection process [3].

The quality of the admissions information system has a crucial role in ensuring the success of new student admissions. Therefore, quality assurance of the admissions information system is very important in this context. The success of the new student admission information system is needed to support all new student data processing processes [4]. Although a website-based admissions information system has been implemented at pmb.ubhi.ac.id, however, there has been no quality assurance carried out systematically.

In the development of a system, each stage such as analysis, design, implementation, testing, and system maintenance has an important role [5]. However, system testing is a key element in evaluating the quality development of the system [6]. In the case of pmb.ubhi.ac.id, several problems can be identified, including data verification errors, limited system functionality, slow website performance, and lack of flexibility in accommodating changes in new student admission policies. Therefore, software quality testing is an important process in software development that aims to evaluate and ensure that the software meets the established quality standards [7].

One method that can be used to test software systems is the McCall method. McCall Software Quality is a model

that describes software quality factors [8]. In essence, McCall identifies three key aspects that emphasize these factors, namely operational properties (Product Operation), the ability of software to undergo changes (Product Revision), adaptability or system adjustment to new environments (Product Transition) [9]. McCall's criteria have the most complete and in-depth aspects (Product Operation) with 5 quality factors such as correctness, usability, reliability, integrity and efficiency [6]. This test will focus on measuring quality factors in Product Operation.

The purpose of this research is to test how feasible the pmb.ubhi.ac.id site is as a new student admission information system. This research will produce a percentage that reflects the user's perception of the quality of the application system [10]. From the results of these percentages, it is hoped that it can provide benefits in the form of information, so that a reference can be made to improve the quality of the existing system.

II. LITERATURE REVIEW

1) McCall's Theory of Quality

McCall's quality theory is the oldest testing model, developed in 1976. The model was first used for a large project implementation within the US Air Force. This model aims to bridge the gap between users and developers. The background of this model is because the lack of clarity of the requirements set to cover important aspects of the functional of a software is the cause of poor performance of a software. In order to create software that has good performance, it is necessary to explore the needs of the user appropriately at the time of initiation. McCall and friends in 1977 have proposed a classification of factors or criteria that affect software quality [11].

a. Quality factors according to McCall

McCall emphasizes McCall's quality factors into three important aspects, namely those related to [12]:

1) The operational properties of the software (Product Operations).
2) The ability of software to undergo changes (Product Revision).
3) Adaptability or adjustment of software to a new environment (Product Transition)

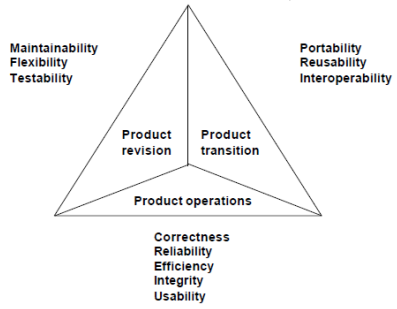

IMAGE 1.
MCCALL'S SOFTWARE QUALITY FACTORS

Based on Figure 1, the explanation of the quality factor according to McCall is as follows [13]:

1) Correctness
How the program will provide results in accordance with the specifications that have been set before and meet customer goals.
2) Reliability
How a program is expected to perform certain functions in accordance with the desired level of accuracy.
3) Efficiency
The amount of computing resources and code required for the program to be able to carry out its functions properly and correctly.
4) Integrity
How access to software or to data by unauthorized persons can be controlled.
5) Usability
The amount of effort required to learn, operate, provide input, and interpret (inputs, and interpreting outputs for a program.
program.
6) Maintainability
The amount of effort required to localize and correct errors that can be found in the program. that can be found in the program.
7) Flexibility
The amount of effort required to modify a program that is operational.

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8) The ability to face testing (testability)
The amount of effort required to test a program with the aim of ensuring that it performs the expected function.
9) Portability
The amount of effort required to transfer a program from one hardware and/or system software environment to another hardware and/or system software environment.
10) Reusability
How a program [or part of a program] can be reused in other applications/programs relates to the packaging and scope of functions performed by the application/program.
11) Interoperability
The amount of effort required to replace a part of a system with another part of the system.

2) Relationship between Quality Factors and Metrics

There are several metrics used in measuring the quantity of software quality developed based on the division proposed by McCall regarding the formula for measuring software quality factors. The following metrics used in these measurements are [14]:

1. Audibility: the degree to which alignment to the standards can be checked.
2. Accuracy: The precision of computation and control.
3. Communicability: The degree to which standardized interfaces, protocols, and bandwidth are used. , protocols, and bandwidth are used.
4. Completeness: The degree to which the full implementation of expected functionality has been achieved.
5. Conciseness: The density of the program in terms of lines of of code.
6. Consistency: The use of uniform design and documentation techniques design and documentation techniques that are uniform throughout the software development project. development project.
7. Data familiarity: Use of standardized data structures and types structures and data types throughout the program.
8. Fault tolerance: The damage done when program encounters an error.
9. Execution efficiency: The run-time performance of a program.
10. Expandability: The degree to which the architecture, data, or procedural design can be extended.
11. Generality: The breadth of potential applications of the components of a program components.
12. Hardware independence: The degree to which the software is separated from the hardware on which it operates.
13. Instrumentation: The degree to which the program monitors its own operation and determines any errors that occur.
14. Modularity: The functional independence of the program components.
15. Operability: the suitability of the program's operation.
16. Security: The availability of mechanisms that control or protect the program and data.
17. Self-documentation: the degree to which the source code provides useful documentation.
18. Simplicity: The degree to which a program can be understood without difficulty.
19. Software system independence: the degree to which the program is independent of non-standard programming language forms, operating system characteristics, and other environmental constraints.
20. Traceability: the ability to trace back a design representation or actual program components to requirements.
21. Training: The degree to which the software enables new users to apply the system.

III. METHODS

To collect sample data, the method used is to distribute questionnaires to respondents. This questionnaire includes five quality factors adopted from the McCall method, namely accuracy, usability, integrity, reliability, and efficiency [11]. From the quality factors can provide answers about the user's opinion of the application, and the quality assessment or the level of application suitability can be determined using a Likert scale [10], [6]. Measurement options using a Likert scale will contain answers Strongly Agree (SS), Agree (S), Neutral (N), Disagree (TS), and Strongly Disagree (STS) [12]. Respondents who will fill out this questionnaire are Bhinneka PGRI University and prospective new students as users of the software being measured.

The results of the assessment of a number of respondents will be calculated from each factor that has been categorized. The division of the quality category range can be seen in Table 1.

TABLE 1.
POSITIVE STATEMENT

Positive Statement	Score
Strongly Agree	5
Agree	4

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Neutral	3
Disagree	2
Strongly disagree	1

Source: Khairullah[6]

After determining the scale to be used, then make an instrument based on McCall's theory [10]. Measurement is done using the formula:

Fa = w1c1 + w2c2 + w3c3 + … + wncn [8]. (1)

Where:

Fa = Software quality factor

w1 = Product-dependent weight and importance

c1 = matrix of influencing software quality factors

The scoring system uses the following steps:

1. Determine the factor.
2. Determine the Weight (W) on each criterion from 0.1 to 0.4 depending on the importance of the Bhinneka PGRI University Admissions System.
3. Determining the scale of criteria values, using a scale with provisions 1-5 as in table 1.
4. Entering the value of each criterion.
5. Calculating the total value with the formula
6. Then the quality factor value is converted into a percentage (%). The percentage is calculated using the following equation [8]:

$Percentage = \frac{results\ obtained}{maximum\ value} \times 100\%$ The percentage results are used to provide answers to the feasibility of the aspects studied. This scale shows the range of percentage numbers. The maximum expected value is 100% and the minimum is 0%. The range of eligibility categories can be seen in the following table [6]:

TABLE 2.
PERCENTAGE CATEGORIES

Positive Statement	Score
Strongly Agree	81% - 100%
Agree	61% - 80%
Neutral	41% - 60%
Disagree	21% - 40%
Strongly disagree	<21%

Source: Hanes [10]

IV. RESULTS AND DISCUSSION

After obtaining sample data from distributing questionnaires to users of the Bhinneka PGRI University PMB admissions information system within a 10-day period, 23 respondents were obtained, including university staff and prospective new students. Then the data is processed and the average value of each indicator is determined. The results of determining the weights and averages produce Fa values as software quality factors which can be seen in the following table:

TABLE 3.
RESEARCH RESULTS

No	Faktor	Sub Factor	Item	Weight	Criteria Value	Factor Value
1	Correctnes (0,3)	*Consistency*	Form and button design features on each page are the same / fixed	0,2	3,9	2,29
			Features and table design on each page are the same	0,3	4	
		Completeness	This website has been able to perform data processing (display, save)	0,4	4,2	
			The features contained on the website are all functional	0,4	4,2	
		Treaceability	Website is able to track usage errors (errors)	0,4	3,8	
2	Reliability (0,3)	*Accuracy*	This website is easy to enter inputs needed by the system	0,4	4	1,75

		Error Tolerancy	This website can be used by parties who have registered	**0,3**	**4**	
		Simplicity	The menus on this website can be easily understood by users without any obstacles	**0,3**	**4,1**	
			The information on this website can be easily understood without any difficulties.	**0,3**	**4,1**	
		Training	There is a help service provided by the system to assist new users in using this website.	**0,4**	**4,1**	
3	**Usability (0,3)**		The availability of a contact menu so that website users can contact the university to get more complete information.	**0,4**	**4,2**	**2,38**
		Communicativeness	The language used is easy to understand	**0,3**	**4,3**	
			The function of each button is clear	**0,3**	**4,1**	
		Operability	Menu options and buttons on the website are easy to use	**0,3**	**4,3**	
4	**Integrity (0,3)**	***Security***	This website can monitor new user access	**0,3**	**3,7**	**2,4**
			The login process can run correctly according to user expectations	**0,3**	**4,3**	
5	**Efficiency (0,35)**	***Execution Efficiency***	The service menu on this website is already functioning properly as needed	**0,3**	**4,2**	**2,9**
			The function of the content or content on this website has accommodated the delivery of information from the University.	**0,4**	**4,1**	

So that the total quality (∑) is obtained, the results are as follows:

$$\sum = \frac{(0{,}3 \times 2{,}29) + (0{,}3 \times 1{,}75) + (0{,}3 \times 2{,}38) + (0{,}3 \times 2{,}4) + (0{,}35 \times 2{,}9)}{5} \times 100\%$$

The percentage results will be compared with the Likert scale previously described, so as to measure the attitudes, opinions, and perceptions of individuals or groups towards the Bhinneka PGRI University admissions information system. To categorize the percentage level, the information can be found in Table 3. From this analysis, it can be concluded that overall, the Bhinneka PGRI University admissions information system is in the percentage range between 61% - 80% with a Functionality Percentage of 73.22%, which is included in the good category.

V. CONCLUSION

Based on the results of the analysis of the research that has been done, it shows that this information system is able to facilitate the management of new student admission data at Bhinneka PGRI University. This can be seen from the results of the feasibility test using the McCall method which shows that the test percentage of 73.22% is in the range of 61% - 80%, which is included in the good category. These results indicate that this information system is able to increase staff efficiency in managing the selection process and the University PMB file.

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