

An Integration of Webqual 4.0, Importance Performance Analysis and Customer Satisfaction Index on E-Campus

Muhammad Luthfi Hamzah¹, Rahmi Fitria Rahmadhani¹, Astri Ayu Purwati²

¹Departement of Information System, Universitas Islam Negeri Sultan Syarif Kasim Riau, Indonesia

²Department of Management, Institut Bisnis dan Teknologi Pelita Indonesia, Indonesia

muhammad.luthfi@uin-suska.ac.id

Abstract. The research aims to analyze the E-Campus system to determine the system's quality based on the level of user satisfaction and to find out which indicators need improvement in the system using the WebQual 4.0, Importance Performance Analysis, and Customer Satisfaction Index methods. The respondents of this study were students and lecturers of IAIN Bukittinggi. The results of the conformity analysis and gap analysis show that the overall performance of the current system is still not in line with the expectations of its users. The results of the student science analysis showed that general indicators that needed improvement were indicators US1,US3,US5,IQ3, and SIQ6 with a CSI value of 76.41% included in the "Satisfied" category. In contrast, the Lecturer's IPA analysis results showed that overall indicators that needed improvement were US1, US5, and SIQ6 with a CSI value of 82.13% included in the "Very Satisfied" category. Although the results of the analysis of the two respondents are categorized as "Satisfied" with the E-Campus service, it still needs to be developed better to achieve maximum satisfaction. The implication of this research is to be able to find out the extent of user satisfaction with the quality of the E-Campus Academic Information System at IAIN Bukittinggi and the results of the research that are expected to be a benchmark for the management of the E-Campus Academic Information System in making improvements and developing the E-Campus System in the future.

Keywords: importance performance analysis, website quality, user satisfaction, e-campus academic system, customer satisfaction index.

1. Introduction

In today's digital era, it is very important to pay attention to the quality of the available information (Fadilurrahman et al., 2021; Ramadhani et al., 2021). Information can be of good quality and useful if it meets several criteria, such as the information should not be late, should not be biased, and should not have errors. Management of quality information is one of the main needs that need to be carried out for every institution, not least in educational institutions, this is because if the business unit that affects the emergence of information in the agency has low quality or even issues wrong information, this will make it difficult for those who need the information so that it can affect the success of the agency itself (Nurbojatmiko, 2020; Zolotukhina, 2020). In education, especially in universities, management and dissemination of information are usually done by utilizing technology through an information system, one of which is an academic information system (Umaroh, 2021). The academic information system itself is one of the most important elements in universities supporting all academic activities at the college. This information system can increase the efficiency and effectiveness of all scholarly activities to improve the quality of the universities that implement it. An Academic Information System is designed to meet the needs of educational institutions that want computerized educational services to improve performance, quality of service, quality of human resources, and increase competitiveness against other institutions (Rahmat, 2021; Soegoto, 2020). This system can make it easy for its users always to be able to monitor the developments in every activity in the college. The information generated in this academic information system can be utilized in higher education management, decision-making, and reporting in the university environment (Hossain, 2021; Tyas, 2021).

Currently, IAIN Bukittinggi already has four faculties with 23 study programs that have been accredited and are supported by complete learning facilities with a competent workforce. Currently, IAIN Bukittinggi has 224 Lecturers, 133 Education Personnel and 11,277 Students. To improve the efficiency and effectiveness of all academic activities of its students, IAIN Bukittinggi already has an academic information system called the E-Campus information system. Previously, this Academic Information System was named SIMPATI, which has been used since 2007 and was later updated to become the E-Campus Academic Information System implemented in 2015. This system was built to provide flexibility to lecturers and students in searching for information to make it more accessible. Effective and efficient, especially assisting in student academic services such as online KRS, assessments, lecture calendars, PA guidance, street vendors, KKN, scholarship arrangements, leave, thesis guidance for managing comprehensive sessions, and other academic needs (Kurniawan, 2020). The E-Campus Academic Information System is a complex and busy system at certain times, such as filling out the KRS, publishing grades, registering sessions and others (Purwinarko, 2020; Syafariani, 2019). To

support various student academic activities to build the system, it is necessary to make efforts to improve further the quality of services provided so far. One way to measure the success of an information system can be seen from the satisfaction of end-users of the information system. A quality information system will have a positive influence on user satisfaction, if the quality obtained in an information system is higher, the number of users who will use the information system will also increase. Therefore, to maintain the sustainability of the E-Campus information system, universities should know to what extent the quality of their information system is based on the tastes of the end-users, not on the preferences of service providers. However, until now, the university has never measured the perceived quality of the users of the e-campus information system, this is evidenced by the results of interviews with researchers with the system manager and the absence of written documents from the results of the evaluation of the system (Chen, 2021; Deli, 2019). This makes universities unable to know which aspects of the information system must be improved. Therefore, in this final project, an analysis of the E-Campus information system will be carried out to be able to find out the deficiencies in the system, especially to determine the level of system quality on user satisfaction in using the E-Campus information system, as well as to find out which aspects of the E-Campus information system. The information system considered critical by users must be improved so that it can be used as a reference in the future improvement and development of the E-Campus Information system (Fadilurrahman et al., 2021; Hayani et al., 2021).

To identify problems, researchers have surveyed 30 students who use the information system. From the pre-survey results, several issues were found when using the system, which can be shown in Table 1 below.

Table 1: Pre-survey problem

No	Problem	Total	Percentage
1	Unattractive appearance	17	57%
2	Users take a long time to understand the operation of the E-Campus system	16	53%
3	Information is not updated	12	40%
4	Inaccurate information	10	33%
5	The announcement information provided is less detailed	11	37%
6	Server down at login	27	90%
7	Difficult to communicate with the system manager	4	13%

Some of the examples above tend to make system users, both students and lecturers, feel that the quality of the E-Campus system is not what they expect, thus causing users dissatisfaction with the services provided. On the other hand, one of the factors that greatly affect the success of a system lies in user satisfaction, where the higher the quality of the product or service provided, the higher the level of user satisfaction. One of the benchmarks against the system to see the extent to which an

information system can contribute to the success of the agency that implements it is by measuring the level of user satisfaction (Abbas, 2021b, 2021a; Ocloo, 2021). User satisfaction can be used to determine a quality system, where a system can be said to be of quality if it is by the user's wishes, is useful, and is produced or produced in a good and correct way. Measuring user satisfaction can be achieved by comparing the user's perception with the user's real expectations of the information system. One approach that can be used to measure the quality of an information system or website is to use the Webqual 4.0 method. The WebQual 4.0 method is one of the most widely used methods in measuring the quality of a system or website based on end-users' perceptions. This method has three measurement variables described in the form of 22 statement items. The three variables are Usability, Information Quality, and Service Interaction Quality (Rahmat, 2021) (Utami, 2021).

In addition to using the webqual method, this study also uses the Importance Performance Analysis (IPA) method as a tool used in analyzing and comparing the extent to which the performance or service of the system perceived by the user is compared to the level of expectations of the user of the system. This research will also measure the level of user satisfaction of the entire system on the quality of the performance of a given system using the Customer Satisfaction Index measurement method, CSI is a quantitative analysis method that produces a value in the form of a percentage of the level of user satisfaction in using a system or website (Singh, 2021). Measuring the level of user satisfaction is very important so that service providers can find out how much user expectations have been met by a website or system.

2. Literature Review

An information system is a system used in an organization to combine the needs of daily transaction processing, operations, management, and strategic activities to produce reports that must be submitted to certain outside parties (Jufri et al., 2021; Widyasmoro et al., 2022). The academic information system is a web-based information system that is intentionally designed to process academic data and other related data so that the entire process of academic activities can be managed into information that can be used, especially in higher education management, decision making, and reporting at universities that implement it. This Academic Information System was created to answer the needs of educational institutions seeking computerized educational services to improve performance, quality of human resources, quality of services, and increase competitiveness against other institutions (Virianto & Sfenrianto, 2021). The academic information system makes it easy for its users always to be able to monitor developments in every activity that exists in the agency. So, the academic information system is a system that is used in processing data and presenting information related to academic activities, so that users can obtain the information they need easily and quickly, especially information

related to academics at the agency that implements it (Agboola, 2019; Saa, 2020; Utama, 2019).

Customer satisfaction can be seen from the level where users' needs, wants, and expectations are met, resulting in continued use or user loyalty. User satisfaction can be achieved if the product or service presented reaches or even exceeds the wishes of its users. In creating user satisfaction, the most important factor is the quality of the product or service's performance (Jin & Lim, 2021). Quality service or product has a very important influence on the satisfaction of its customers. The higher the quality of a product or service provided, the higher the satisfaction felt by its customers (Isiwanto et al., 2021; Mutmainah & Mahfida, 2021). Because satisfied customers will continue to make purchases or use the business entity, higher levels of user happiness can benefit the agency. If the user is not satisfied with the product or service, causing the user to switch to another product. The level of user satisfaction can be determined by looking at the comparison between perceived performance and user expectations for the service (Rasheed & Liu, 2022). Therefore, the interests or expectations of consumers can be the reason why customers have different interests towards two companies operating in the same industry (Purwanto, 2020).

Feedback can be used to determine the satisfaction of consumers in an organization so that the input can be used as a reference in the development and implementation and improve the quality of the products offered so that the level of customer satisfaction in the future will be better. This feedback can also be used to determine the level of performance in the organization. An organization can improve and further improve its services based on customer complaints to achieve satisfaction from its customers. Consumers usually have a strong attachment to companies that respond to their problems (Abbas, 2021a, 2021b; Marzal, 2020; Purwanto, 2020; Qadri, 2021)

The quality of a system can be seen from the characteristics of the information contained in the system itself. Information related to the system determines the quality of the system. System quality refers to the technology-related features of a system, such as the software and hardware it uses and the ease of operation and how pleasant it is for users to interact with the system. A good website is a site whose main focus is on its content, this is because the content is the main component that drives users to return to the site. The quality of a website has a significant influence on the level of user satisfaction, if the quality of the website increases, users tend to use the website more often. The influence between web quality on customer satisfaction and purchase intention is that the higher the quality of the products and services offered, the greater the customer satisfaction. Increased customer satisfaction can increase revenue for business entities, such as customers who will continue to buy services or products from the company. On the other hand, poor quality leads to low customer satisfaction, which can cause customers to switch to alternative outcomes (Al Firdaus et al., 2021).

WebQual is one of the tools used to evaluate the user's perception of the quality of the website. This method was developed in 1998 by Stuart Barnes and Richard Vidgen and is based on the concept of Quality Function Deployment (QFD), which is a process in developing and implementing a product or service based on the concept of "voice of customer". The WebQual method is one of the most widely used methods or strategies in assessing the quality of a website based on end-user perceptions. This method is the development of the ServQual method from Paramuran, which was previously widely used in assessing the quality of services or service products. Some components in SERVQUAL can already be found in the Webqual dimension (Utami, 2021; Wijaya, 2021).

Webqual and SERVQUAL methods have different point of view. Webqual focuses on website quality, while SERVQUAL focuses on information system services. SERVQUAL started with the concept of customer service in the marketing area, where the SERVQUAL method was originally established to measure the quality of services provided offline, so the use of SERVQUAL is somewhat problematic if used for the information system domain. While the Webqual method from the beginning was developed based on resources to analyze an information system. This shows that Webqual has a strong basis for assessing the quality of information systems, especially the quality of websites (Hartomo, 2021; Hasmin, 2021; Rismayani, 2021).

The Importance Performance Analysis (IPA) method is a simple technique for identifying product or service attributes to generate important information about which indicators the company should pay more attention to and identify areas where the company may be spending too much money on a possible development without any errors. Significant contribution to the overall quality of the product. Quadrant analysis was developed by John A. Martilla and John C. James for the first time in 1997 which was used as a tool to measure the level of user satisfaction with a product or service by comparing user perceptions and expectations to improve the quality of products or services presented in quadrant form analysis (Addas, 2021; Joung, 2021; Mujahidin, 2021). This method is well-documented and has proven its ability to provide useful information in an appropriate format when measuring user satisfaction. Using this analysis quadrant to present results can make it easier for management to interpret the data, making it more useful for strategic marketing decisions. The Importance Performance Analysis (IPA) method is used to evaluate how users' perceptions of performance or services are compared to the level of satisfaction they want. This method can identify the service attributes or benefits that are most needed for development from the point of view of its users. The principle underlying this IPA technique is "the level of customer satisfaction with the product or service provided," which is by their expectations or assessment of the product or service's performance (Pane, 2020; Purwati et al., 2021). The IPA analysis determines the value of the gap between the level of interest (expectations) of users and the level of performance

(perception) of each website quality indicator that is used to determine the level of user satisfaction with the service (Agyekum, 2021; Bismala, 2021; Fan, 2022; Ha, 2021; Lee, 2021; Sukardi, 2022).

3. Methodology

3.1. Data collection methods and instruments

The data collection method used in this study was a questionnaire. The questionnaire in this study was taken based on the Webqual 4.0 method which consists of 3 variables and is described in 22 statement indicator items. The instrument in data collection is a tool used by researchers to make the research easier and more systematic. To determine the value of importance and user satisfaction on system performance, the type of instrument used in this study is the Likert scale.

3.2. Population and sample

The population in this study are the end-users of the IAIN Bukittinggi Academic Information System consisting of students and lecturers of IAIN Bukittinggi for the 2020/2021 academic year, as many as 11,277 students and 224 teaching lecturers. The sampling technique used in this study is the Accidental Sampling technique, a simple technique where the sampling is done by chance. Researchers carry out this technique by finding anyone who meets the researcher by chance and that person has conditions that match the required data. One of the sampling techniques often used in sampling the number of respondents is the Slovin method. This method calculates the number of samples of users of the E-Campus IAIN Bukittinggi academic system with an error tolerance limit of 10%. Based on the calculations using the Slovin technique above, it was found that the number of samples to be used in this study was 99 student respondents and 69 lecturer respondents.

The stages in describing the respondents are needed to know the identity of the research respondents obtained from each of the questionnaires. Identity of student respondents in the form of Name, NIM, Gender, Department, Faculty, and Semester. Meanwhile, the respondent's identity to the lecturers includes name, NIP, Gender, Position, and Faculty.

3.3. Data process

Data processing from the questionnaire results is carried out after all the research questionnaires have been collected, then a description will be carried out according to the characteristics of the respondents who have filled out the questionnaire. After all the questionnaire data has been collected, the next step is to test the validity and reliability using the IBM SPSS Statistics 25 tools. This test aims to see whether the research questionnaire used is suitable for use or not. The results of this validity test can measure the validity or validity of a research questionnaire. The statement indicator in a questionnaire can be declared valid if it has a correlation value greater

than the r-table value. If the validation test results contain a statement indicating that is declared invalid, the statement must be corrected or deleted.

A reliability test is used to determine the extent to which a measuring instrument can be trusted or relied on. A measuring instrument can be trusted if several measurements have been made, then the findings produced will be relatively the same, as long as the measurement aspects are not different. This test is measured based on the Cronbach Alpha value, the statement indicator can be said to be reliable if the indicator has a Cronbach Alpha greater than 0.60.

3.4. Analysis and discussion process

1. Conformity Analysis
2. Conformity analysis is used to determine the comparison between the performance value of an object with the expectations or the level of interest of the users of the research object. From this conformity analysis, it will show whether the performance of an object is in accordance with the expectations or interests of its users
3. Gap Analysis
4. Gap analysis is a method to determine the gap between performance and user expectations of these variables. This analysis can measure the difference between user satisfaction and the actual performance of a website/system. This Gap Analysis compares the current average performance (perception) with the expected performance. A perception is a form of service provided today. While expectations are user predictions about what they want next
5. IPA Quadrant Analysis
6. The IPA quadrant analysis aims to determine the user's response to the attributes of the questionnaire statement, which will later be presented in 4 areas of the diagram based on the level of importance and performance of the system. Diagram I contains indicators with low performance while user expectations are high, so the indicators in this diagram will be prioritized in system improvement to achieve better user satisfaction, then diagram II where this diagram contains indicators with high performance or already in accordance with user expectations, so that performance must be maintained, the indicators in this diagram can be an advantage that exists in the system compared to others. Quadrant III contains indicators with low performance, as well as low user expectations for these indicators, so there is no need to pay too much attention to them. The last is quadrant IV where the indicator has a performance value that exceeds user expectations, so it is considered excessive which can be transferred to indicators in quadrant I such as costs or services on indicators that are excessive, can be shifted to indicators that need improvement.

7. Customer Satisfaction Index

8. CSI calculation aims to determine how much the overall level of user satisfaction with the system. It is very important to assess user satisfaction in determining how well a website or system has met the expectations of its users.

4. Result and Discussion

4.1. Usability of e-campus

Based on the usability aspect, the e-campus information system still has problems such as users feeling unsatisfied with the appearance of the system which is considered to be still unattractive, this can be seen from an untidy display such as placing information on the home menu where the main information displayed is sometimes attached to the information provided. located next to it, the information also cannot be reduced or shifted so that the information displayed is not entirely readable by the user, the menu button is located at the bottom left and is not colored so that it is less visible, the announcement information does not use left and right alignment so it looks less neat, as well as the font size which is considered too small, thus making users bored and reducing the interest of students/lecturers in using the system. And also the space page that is too long to the bottom even though it doesn't contain any information, thus making the website less user-friendly. A system that has good quality is judged by its appearance and must be user-friendly, uncomplicated, and attractive. The second problem is that many submenus make users confused when using the system. Hence, it takes a long time for them to understand how to operate the system, especially for new students and new lecturers. Some students do not understand some of the menu/submenu functions on the system due to a lack of related socialization. The use of the e-campus academic system is because the socialization of the use of the E-Campus system is carried out only once when PBAK new students. The next problem is that the server is often down when logging in to the system, this is because the access capacity for one login to the system is limited to a maximum of 300 people, so every college needs such as filling out KRS, publishing grades, and registering graduations, the server often goes down because the number of students who log in exceeds the limit. The maximum quota that has been set, this makes it difficult for students to access and operate the system and get the information they want, this is very disturbing so almost all respondents complain about this.

4.2. Information quality of e-campus

Based on the information quality aspect, the problems found in this e-campus system are that there is information that is still lacking in updates, such as there are still some menus that are still empty or rarely filled, such as attendance, extracurricular and organizational submenus. And there is also double information where some

menus/submenus have similar information, such as the contents of announcements located on the home menu and also on the dashboard menu, as well as printing KRS, KHS, and transcripts of values found on 2 different menus, even though the content and output are the same. Next is the menu which is considered less accurate, such as the help menu which should be able to answer/solve student problems, but if the help button is clicked, the system only directs to download documents using the e-campus system as many as 95 pages, this is considered less effective in helping students overcome the difficulties/problems encountered in the system. Another problem is that the information provided is less detailed, such as the absence of an explanation when the info or announcement is displayed on the system, which makes the user not know whether the information provided is new or not.

4.3. Service interaction quality of e-campus

Based on the interaction quality aspect, there are still problems with the e-campus system, such as students having difficulty communicating with the system manager due to the unavailability of the live chat feature or comment column on the e-campus system. Based on interviews with several students, if there is a problem or error with the system, students can only report to the campus through other communication media such as email or messages to the campus Instagram admin or report directly to the department, which is then processed according to procedures so it takes a long time for users in getting a response regarding the problem encountered.

4.4. Respondent description

At this stage of respondent description, data analysis was carried out based on respondents' answers in the respondent profile section contained in the research questionnaire, to find out demographic information related to the characteristics of end-user respondents from the E-Campus academic information system. The first respondents who were taken in this study were 99 students who would be described in 4 groups, namely: by Gender, Faculty, Department, and Semester. For the second respondent in this study, 69 lecturers, will be described in 2 groups, namely based on faculty and gender. The following are the results of the demographic analysis of the respondents. This group categorization aims to clearly know the respondent's description of the object of research carried out. The characteristics of student respondents based on gender can be shown in table 2 below.

Table 2: Student respondents based on gender

Gender	Frequency	Percentage
Male	22	22%
Female	77	78%
Total	99	100%

Based on the results of the recapitulation of respondent data in Table 2, it can be seen that the number of male student respondents was 22 people (22%), while as many as 77 people (78%) of respondents in this study were female. So it can be concluded that the number of student respondents who filled out the female questionnaire was more than the number of male student respondents. The total of all respondents is 99 people.

Table 3. Student Respondents by Semester

Semester	Frequency	Percentage
Semester 2	10	10%
Semester 4	11	11%
Semester 6	26	26%
Semester 8	43	44%
Semester 10	6	6%
Semester 12	2	2%
Semester 14	1	1%
Total	99	100%

Based on the results of the recapitulation of respondent data in Table 4.3, it can be seen that the number of student respondents in this study who came from semester 2 were 10 people (10%), semester 4 students were 11 people (11%), semester 6 students there were 26 people (26%), semester 8 as many as 43 people (44%), semester 10 as many as 6 people (2%), and semester 14 there was 1 person (1%). The total of all respondents is 99 people.

Table 4. Student Respondents by Faculty

Faculty	Frequency	Percentage
Faculty of Islamic Economics and Business	42	43%
Faculty of Sharia	7	7%
Faculty of Tarbiyah and Teacher Training	37	37%
Faculty of Ushuluddin, Adab, and Da'wah	13	13%
Total	99	100%

Based on the results of the recapitulation of respondent data in Table 5, it can be seen that the number of student respondents in this study who came from the Faculty of Economics and Islamic Business were 42 people (43%), the Faculty of Sharia were 7 people (7%), the Faculty of Tarbiyah and Teacher Science as many as 37 people (37%), and from the Faculty of Ushuluddin, Adab, and Da'wah as many as 13 people (13%). The total of all respondents is 99 people.

Table 5: Lecturer respondents by gender

Gender	Frequency	Percentage
Male	37	54%
Female	32	46%
Total	69	100%

Based on the results of the recapitulation of respondent data in Table 5, it can be seen that there were 37 male respondents in this study (54%) and 32 female respondents (46%). So it can be concluded that the number of male respondents who filled out the questionnaire was more than the number of female respondents. The total of all respondents is 69 people.s

Table 6: Lecturer respondents by faculty

Faculty	Frequency	Percentage
Faculty of Islamic Economics and Business	26	38%
Faculty of Sharia	10	14%
Faculty of Tarbiyah and Teacher Training	35	24%
Faculty of Ushuluddin, Adab, and Da'wah	9	13%
Total	69	100%

Based on the results of the recapitulation of respondent data in Table 6, it can be seen that the number of student respondents in this study who came from the Faculty of Economics and Islamic Business were 26 people (38%), the Faculty of Sharia as many as 10 people (14%), the Faculty of Tarbiyah and Teacher Training as many as 24 people (35%), and from the Faculty of Ushuluddin, Adab, and Da'wah as many as 9 people (13%). The total of all respondents is 69 people.

4.5. Analysis data

4.5.1. Validity and reliability test

This validity and reliability test was conducted to see whether the questionnaire was appropriate to be used or not in this study. This test was carried out on data from questionnaires that had been distributed to 99 student respondents and 69 lecturer respondents at IAIN Bukittinggi. This study used a sample of 99 student respondents and 69 lecturers with a significant level of 5% with the results of the validity and reliability tests being valid.

The data analysis carried out in this study consisted of 4 stages of analysis, namely the level of conformity analysis, GAP Analysis, Importance Performance Analysis (IPA), and Customer Satisfaction Index (SCI) analysis.

4.5.2. Conformity analysis

This suitability analysis is used to find out the comparison between the system performance score and the user's expectation or interest score on the object of

research. From the results of this conformity analysis, it can be seen whether the performance of an object is in accordance with the expectations or interests of its users, where in this study, students and lecturers of IAIN Bukittinggi.

The level of conformity between the performance of the E-Campus academic information system and student expectations can be shown in the following Table 7.

Table 7: Conformity analysis of student

Dimension	Statement	Performance Score	Expectation Score	Conformity Value (%)
Usability	US1	370	414	89,37%
	US2	381	409	93,15%
	US3	359	413	86,92%
	US4	383	417	91,85%
	US5	345	415	83,13%
	US6	380	409	92,91%
	US7	367	404	90,84%
	US8	380	403	94,29%
Information Quality	IQ1	391	420	93,10%
	IQ2	405	423	95,74%
	IQ3	376	420	89,52%
	IQ4	381	415	91,81%
	IQ5	380	416	91,35%
	IQ6	376	409	91,93%
	IQ7	373	406	91,87%
Service Interaction Quality	SIQ1	372	406	91,63%
	SIQ2	386	408	94,61%
	SIQ3	404	417	96,88%
	SIQ4	384	407	94,35%
	SIQ5	409	423	96,69%
	SIQ6	352	416	84,62%
	SIQ7	365	408	89,46%

Based on the results of the processing that has been carried out, it can be seen that the level of conformity of each indicator in this study shows that overall it is still below 100% or the level of conformity is <100%. This shows that the quality of the E-Campus information system provided is still not appropriate or does not meet what is expected by student respondents.

Table 8: Conformity Analysis of Lecturer

Dimensi on	State ment	Perfor mance Score	Expecta tion	Conformity Value (%)
Usability	US1	282	318	88,68%
	US2	287	317	90,54%
	US3	278	313	88,82%
	US4	291	319	91,22%
	US5	261	319	81,82%
	US6	285	315	90,48%
	US7	275	311	88,42%
	US8	294	317	92,74%
Informati on Quality	IQ1	278	317	90,54%
	IQ2	296	320	92,50%
	IQ3	284	317	89,59%
	IQ4	287	314	91,40%
	IQ5	292	318	91,82%
	IQ6	282	315	89,52%
	IQ7	281	316	88,92%
Servi ce Inter action Quality	SIQ1	282	314	89,81%
	SIQ2	294	315	93,33%
	SIQ3	292	316	92,41%
	SIQ4	281	312	90,06%
	SIQ5	307	320	95,94%
	SIQ6	248	317	78,23%
	SIQ7	267	315	84,76%

Based on the results of the processing that has been carried out, it can be seen that the level of conformity of each indicator in this study shows that overall it is still below 100% or the level of conformity is <100%. This shows that the quality of the E-Campus information system provided is still not appropriate or does not meet what is expected by lecturer respondents.

4.5.3. GAP analysis

Gap analysis is a method to determine the gap between performance and user expectations of these variables. Gap Analysis is a comparison of the current average performance (perception) with the expected performance.

Table 9. GAP analysis of student

Dimension	Statement	Performance Average	Importance Average	Gap Score
Usability	US1	3,74	4,18	-0,44
	US2	3,85	4,13	-0,28
	US3	3,63	4,17	-0,55
	US4	3,87	4,21	-0,34
	US5	3,48	4,19	-1,71
	US6	3,84	4,13	-0,29
	US7	3,71	4,08	-0,37
	US8	3,84	4,07	-0,23
Information Quality	IQ1	3,95	4,24	-0,29
	IQ2	4,09	4,27	-0,18
	IQ3	3,80	4,24	-0,44
	IQ4	3,85	4,19	-0,34
	IQ5	3,84	4,20	-0,36
	IQ6	3,80	4,13	-1,33
	IQ7	3,77	4,10	-0,33
Service Interaction Quality	SIQ1	3,76	4,10	-0,34
	SIQ2	3,90	4,12	-0,22
	SIQ3	4,08	4,21	-0,13
	SIQ4	3,88	4,11	-0,23
	SIQ5	4,13	4,27	-0,14
	SIQ6	3,59	4,20	-0,65
	SIQ7	3,63	4,17	-0,55

Based on the processing results obtained, it is concluded that the level of the overall gap between system performance and user expectations is still negative, which means that there is still a gap between student perceptions and expectations of the E-Campus academic information system, where the system still does not meet what students expect. thus making students feel unsatisfied with the current system performance.

Table 10: GAP analysis of lecturer

Dimension	Statement	Performance Average	Importance Average	Gap Score
Usability	US1	4,09	4,61	-0,52
	US2	4,16	4,59	-0,43
	US3	4,03	4,54	-0,51

	US4	4,22	4,62	-0,41
	US5	3,78	4,62	-0,84
	US6	4,13	4,57	-0,43
	US7	3,99	4,51	-0,52
	US8	4,26	4,59	-0,33
Information Quality	IQ1	4,16	4,59	-0,43
	IQ2	4,29	4,64	-0,35
	IQ3	4,12	4,59	-0,48
	IQ4	4,16	4,55	-0,39
	IQ5	4,23	4,61	-0,38
	IQ6	4,09	4,57	-0,48
	IQ7	4,07	4,58	-0,51
Service Interaction Quality	SIQ1	4,09	4,55	-0,46
	SIQ2	4,26	4,57	-0,30
	SIQ3	4,23	4,58	-0,35
	SIQ4	4,07	4,52	-0,45
	SIQ5	4,45	4,64	-0,19
	SIQ6	3,59	4,59	-1,00
	SIQ7	3,87	4,57	-0,70

Based on the processing results obtained, it is concluded that the level of the overall gap between system performance and user expectations is still negative, which means that there is still a gap between student perceptions and expectations of the E-Campus academic information system, where the system still does not meet the expectations of lecturers. so that it makes students feel unsatisfied with the current system performance

4.5.4. Importance performance analysis (IPA)

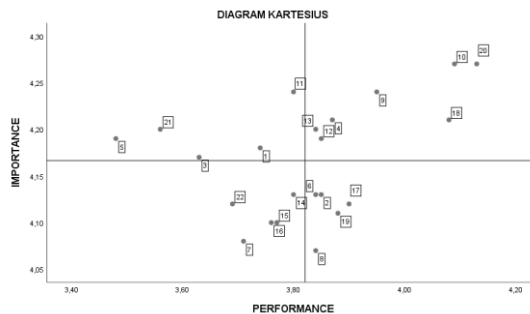


Fig. 1.: Student importance performance analysis diagram

The following is an explanation of the results of the IPA Quadrant that has been obtained above.

1. Quadrant I (High Importance and Low Performance): Concentrate These.

This quadrant illustrates that students' expectations of these attributes are high/important, but in reality the performance given by the system is still low or not as expected, resulting in a low level of satisfaction from its users. Therefore, the campus must pay special attention and make the attributes in this diagram a top priority in improving system performance in the future, in order to improve the quality of the system and achieve maximum user satisfaction. Attributes included in this quadrant include:

- 1: The E-Campus Academic System is easy to learn how to operate (US1).
- 3: The E-Campus Academic System has clear navigation OR instructions (US3).
- 5: The E-Campus Academic System has an attractive appearance (US5).
- 11 : E-Campus Academic System Provides timely and up-to-date information (IQ3).
- 21 : The E-Campus Academic System makes it easy to communicate with universities (system managers academic E-Campus) (SIQ6).

2. Quadrant II (High Importance/High Performance): Keep Up The Good Work.

The level of importance of the attributes contained in this quadrant is considered very important by students, and the performance of the given system is very good for its users. The performance of the attributes in this diagram is in accordance with what is expected by the user, so that each attribute in this diagram must be able to maintain the quality values given by the system(Addas, 2021). The attributes contained in this diagram can be an advantage that exists in the system compared to other systems so it must be maintained. The attributes contained in this diagram are as follows:

- 4: The E-Campus Academic System is easy to use (US4).
- 9 : E-Campus Academic System Provides accurate information (IQ1).
- 10 : E-Campus Academic System Provides reliable information (IQ2).
- 12 : E-Campus Academic System Provides timely and up-to-date information (IQ3).
- 13 : The E-Campus Academic System provides easy-to-understand information (IQ5).
- 18 : I feel that my personal information is stored securely in the E-Campus Academic System (SIQ3).
- 20 : After using the E-Campus Academic System, it made me feel part of the IAIN Bukittinggi community (SIQ5).

3. Quadrant III (Low Importance/Low Performance): Low Priority.

The attributes contained in this Quadrant have a relatively low level of importance, as well as the fact that their performance is not considered very important, resulting in a low level of user satisfaction. The attributes included in this quadrant only have a very small effect on the benefits felt by the user. So overall, the attributes in this diagram will not greatly affect the performance results on the level of user satisfaction. The attributes contained in this quadrant are as follows:

- 7 : The E-Campus Academic System can improve competence and increase knowledge (US7).
- 14 : E-Campus Academic System Provides detailed information (IQ6).
- 15 : E-Campus Academic System Provides information in the right format (IQ7).
- 16 : E-Campus Academic System Has a good reputation (SIQ1).
- 22 : The E-Campus Academic System provides services as promised (SIQ7).

4. Quadrant IV (Low Importance/High Performance): Possible Overkill.

In this quadrant there are attributes that represent things that are considered less important but are of high quality. The attributes in this quadrant describe items that are not so important but still of good quality. This quadrant indication does not require further action from management. However, the costs associated with the supporting features in this quadrant can be reduced to save money or allocate resources on these attributes to other attributes that require more improvement, such as the attributes in diagram I. The following attributes are in this diagram, namely:

- 2: The use of the E-Campus Academic System is clear and easy to understand (US2).
- 6: Design of the E-Campus Academic System according to the type (ie. academic website) (US6).
- 8 : This E-Campus Academic System provides a positive experience for me (US8).
- 17 : E-Campus Academic System Provides a sense of security when conducting academic activities (SIQ2).
- 19 : E-Campus Academic System Creating space for personalization (SIQ4).

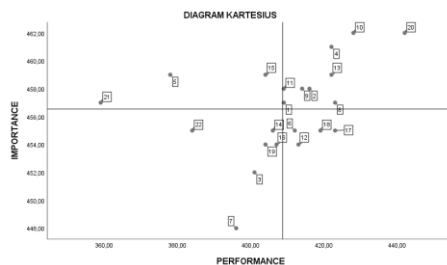


Fig. 2: Lecturer importance performance analysis diagram

The following explains the results of the IPA Quadrant that has been obtained above.

1. Quadrant I (High Importance and Low Performance): Concentrate These.

This quadrant illustrates that lecturers' expectations for these attributes are high/important, but in reality, the performance provided by the E-Campus academic information system is not as expected by students so that it does not provide satisfaction to students. Therefore, the campus must pay special attention and make the attributes in this diagram a top priority in improving system performance in the future, to achieve user satisfaction and can improve the quality of the system. The following attributes are included in this quadrant, namely:

- 1: The E-Campus Academic System is easy to learn how to operate (US1).
- 5: The E-Campus Academic System has an attractive appearance(US5).
- 21 : E-Campus Academic System Provides convenience to communicate with universities (E-Campus academic system managers) (SIQ6).

2. Quadrant II (High Importance/High Performance): Keep Up The Good Work

The level of importance of the attributes contained in this quadrant is considered very important by students, and the performance of the given system is very good for its users. The attributes in this diagram have provided performance that is in accordance with what is expected by the user, so that each attribute in this diagram must be able to maintain the quality values given by the system. The attributes contained in this diagram can be an advantage that exists in the system compared to other systems so it must be maintained. The attributes contained in this diagram are as follows.

- 2: The use of the E-Campus Academic System is clear and easy to understand (US2).
- 4: The E-Campus Academic System is easy to use (US4).
- 8 : This E-Campus Academic System provides a positive experience for me (US8).
- 9 : E-Campus Academic System Provides accurate information (IQ1).
- 10 : E-Campus Academic System Provides reliable information (IQ2).
- 11 : E-Campus Academic System Provides timely and up-to-date information (IQ3).
- 13 : E-Campus Academic System Provides easy-to-understand information (IQ5).
- 20 : After using the E-Campus Academic System, it made me feel part of the IAIN Bukittinggi community (SIQ5).

3. Quadrant III (Low Importance/Low Performance): Low Priority.

The attributes contained in this Quadrant have a relatively low level of importance and the fact that their performance is not considered very important, resulting in a low level of user satisfaction. The attributes included in this quadrant only have a very small effect on the benefits felt by the user. So overall, the attributes in this diagram will not greatly affect the performance results on the level of user satisfaction. The attributes contained in this quadrant are as follows.

- 3: The E-Campus Academic System has clear navigation or directions (US3).
- 7 : The E-Campus Academic System can improve competence and increase knowledge (US7).
- 14 : E-Campus Academic System Provides detailed information (IQ6).
- 15 : E-Campus Academic System Provides information in the right format (IQ7).
- 16 : E-Campus Academic System Has a good reputation (SIQ1).
- 19 : E-Campus Academic System Creating space for personalization (SIQ4).
- 22 : The E-Campus Academic System provides services as promised (SIQ7).

4. Quadrant IV (Low Importance/High Performance): Possible Overkill.

In this quadrant there are attributes that represent things that are considered less important but are of high quality. The attributes in this quadrant describe items that are not so important but still of good quality. This quadrant indication does not require further action from management. However, the costs associated with the supporting features in this quadrant can be reduced to save money or allocate resources on these attributes to other attributes that require more improvement, such as the attributes in diagram I. The attributes in this diagram are as follows.

- 6: Design of the E-Campus Academic System according to the type (ie academic website) (US6).
- 12 : E-Campus Academic System Provides relevant information (IQ4).
- 17 : E-Campus Academic System Provides a sense of security when conducting academic activities (SIQ2).
- 18 : I feel that my personal information is stored securely in the E-Campus Academic System (SIQ3).

4.5.5. Customer satisfaction index (CSI)

The customer satisfaction index is a quantitative evaluation that produces the percentage of user satisfaction with a system or website. It is very important to assess user satisfaction in determining how well a website or system has met the expectations of its users. This CSI is needed to determine the level of overall user satisfaction by taking into account the importance of product indicators (Irma, 2021; Mohseni, 2021).

The Customer Satisfaction Index obtained based on student respondents is 76.41%, this value is on the CSI scale for the second category 66% - 80.99%, namely the "Satisfied" category, which means that students are currently satisfied with the performance of the services provided by the system, but the level of satisfaction felt by users is still not maximized because it has not reached 100% satisfaction. According to Purwati, et al. (2021), one way that can be done to increase the CSI value is by paying attention to the attributes contained in quadrant I based on the results of the science diagram analysis. In this way, it is expected to increase the overall CSI score to achieve maximum satisfaction for its users, namely students

Based on the results of the overall calculation, the indicator obtained a value (CSI) based on lecturer respondents, which is 82.13%, this value is on the CSI scale, the first category is 81% - 100%, namely the "Very Satisfied" category, which means the lecturer is very satisfied. on the performance of services provided by the current system, but the level of satisfaction felt by users is still not maximized because it has not reached 100% satisfaction. According to Purwati et al. (2021), one way that can be done to increase the CSI value is by paying attention to the attributes contained in quadrant I based on the results of the science diagram analysis. In this way, it is expected to increase the overall CSI score to achieve maximum satisfaction for its users, namely lecturers.

5. Conclusive Remarks

Based on the results of the overall calculation, the user satisfaction value (CSI) based on student respondents is 76.41%, this value is on the second category CSI scale, namely "Satisfied", this shows that students are currently satisfied with the performance of the services provided. system, but the level of satisfaction felt by users is still not optimal. While the results of the overall calculation of the indicator obtained a value (CSI) based on lecturer respondents, which is 82.13%, this value is on the first category CSI scale, namely the "Very Satisfied" category, which means that lecturers are very satisfied with the performance of the services provided by the current system. However, the level of satisfaction felt is still not maximized because it has not yet reached 100% satisfaction. One way that can be done to increase the CSI value is by paying attention to the attributes contained in quadrant I based on the results of the science diagram analysis. In this way, it is expected to increase the overall CSI value to achieve maximum satisfaction for the end users of the E-Campus Academic Information System, namely students and lecturers at IAIN Bukittinggi.

Recommendations given by researchers related to problems that still exist in the system, which are priorities for improvement in order to achieve better system quality, namely in the form of improvements to the layout and appearance of the system, giving color to the menu navigation buttons, increasing the number of access quotas. login, as well as the addition of the Customer Center service feature so that users can

provide input, questions, and complaints that they encounter on the system so that the system manager can use it as an evaluation material for future system improvements.

The limitation of this research is that the object studied is still in one university, it is hoped that furthermore it will be able to study the same system at all universities in Indonesia. And the contribution of this research is in the management of the E-Campus Academic Information System is expected to be able to maintain the quality of the system which is considered good in fulfilling the wishes or satisfaction of its users, which is in quadrant II in the science analysis. To the management of the E-Campus Academic Information System, it is hoped that the results of this research can be used as a reference or material for consideration in the improvement or renewal of the E-Campus system in the future to be able to improve the quality of the system in accordance with the expectations of end users. To those who will develop research with the same theme as this research, it is hoped that they can add other variables outside the Webqual 4.0 method to get more perfect results and can be used as comparisons, because measuring the quality of a website or system is not only influenced by the variables contained in webqual 4.0, there are still many variables or other measurement methods that can be investigated in order to improve the quality of a system or website.

References

Abbas, B. (2021a). Effectiveness of academic information system quality on improving student satisfaction in higher education institutions. In *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 350–357.

Abbas, B. (2021b). Performance on academic information system service units and student satisfaction in private higher education. In *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 706–713.

Addas, A. (2021). Public open spaces evaluation using importance-performance analysis (IPA) in Saudi Universities: The case of King Abdulaziz University, Jeddah. *Sustainability (Switzerland)*, 13(2), 1–16.

Agboola, B. (2019). Impact of ICT on information retrieval system in academic libraries: The experience of Federal University Gashua Library, Yobe State, Nigeria. *Library Philosophy and Practice*, 2019.

Agyekum, K. (2021). Importance-performance analysis (IPA) of the indoor environmental quality (IEQ) of an EDGE-certified building in Ghana. *International Journal of Building Pathology and Adaptation*.

Al Firdaus, A. A., Muafiah, E., Heriyudanta, M., & Al_barazanchi, I. (2021). Empowerment of Marketing Strategies of Angkringan Traders Through Social Media During Covid-19 Time in Ponorogo. *Jurnal Pengabdian Dan Pemberdayaan*

Masyarakat Indonesia, 1(3), 84–94.

Bismala, L. (2021). Student satisfaction in e-learning along the covid-19 pandemic with importance performance analysis. *International Journal of Evaluation and Research in Education*, 10(3), 753–759.

Chen, W. (2021). A blockchain-based information management system for academic institutions: a case study of international students' workflow. *Information Discovery and Delivery*. <https://doi.org/10.1108/IDD-01-2021-0010>.

Deli. (2019). Academic Information System Technology Acceptance Study: Case Study Universitas Internasional Batam. *Journal of Information Technology Education: Research*, 3(1), 85–93.

Fadilurrahman, M., Kurniawan, T., Ramadhani, Misnasanti, & Shaddiq, S. (2021). Systematic literature review of disruption era in Indonesia: The resistance of industrial revolution 4.0. *Journal of Robotics and Control (JRC)*, 2(1), 51–59.

Fan, S. C. (2022). An importance–performance analysis (IPA) of teachers' core competencies for implementing maker education in primary and secondary schools. *International Journal of Technology and Design Education*, 32(2), 943–969.

Ha, J. (2021). Educational needs related to elder abuse among undergraduate nursing students in Korea: An importance-performance analysis. *Nurse Education Today*, 104. <https://doi.org/10.1016/j.nedt.2021.104975>.

Hartomo, K. D. (2021). Quality Evaluation in Disaster Mitigation Information System using Webqual 4.0 Method. In *2021 2nd International Conference on Innovative and Creative Information Technology, ICITech 2021* (pp. 174–178).

Hasmin, E. (2021). Evaluation of News's Website with Webqual and Importance Performance Analysis. In *3rd International Conference on Cybernetics and Intelligent Systems, ICORIS 2021*.

Hayani, A., Sari, E. A., & Sukiman. (2021). Artificial intelligence librarian as promotion of iain lhokseumawe library in the revolutionary Era 4.0. *Journal of Robotics and Control (JRC)*, 2(2), 88–93. <https://doi.org/10.18196/jrc.2258>.

Hossain, M. E. (2021). Modelling end users' continuance intention to use information systems in academic settings: Expectation-confirmation and stress perspective. In *Interdisciplinary Journal of Information, Knowledge, and Management*, 16, 371–395).

Irma. (2021). Customers' satisfaction index in Begos Restaurant Tamalanrea, Makassar City. In *IOP Conference Series: Earth and Environmental Science*, 788(1).

Iswanto, Raharja, N. M., Prasojo, I., & Tanane, O. (2021). Empowerment of msme during the COVID-19 pandemic with information technology. *Jurnal Pengabdian*

Dan Pemberdayaan Masyarakat Indonesia, 1(1), 1–8.

Jin, Z., & Lim, C. K. (2021). Structural relationships among service quality, systemic characteristics, customer trust, perceived risk, customer satisfaction and intention of continuous use in mobile payment service. *Journal of System and Management Sciences*, 11(2), 48–64.

Joung, J. (2021). Approach for importance-performance analysis of product attributes from online reviews. *Journal of Mechanical Design, Transactions of the ASME*, 143(8).

Jufri, M., Saifullah, A., Dwi, A., Alfin, M., Muharram, M., Dwi, A., & Budi, S. (2021). Project management training for “Indy Soulart Fiberglass” to increase productivity. *Jurnal Pengabdian Dan Pemberdayaan Masyarakat Indonesia*, 1(4), 155–161.

Kurniawan, A. R. (2020). Web Service for academic information systems. In *IOP Conference Series: Materials Science and Engineering*, 879(1).

Lee, S. W. (2021). An integrated importance-performance analysis and modified analytic hierarchy process approach to sustainable city assessment. *Environmental Science and Pollution Research*, 28(44), 63346–63358.

Marzal, J. (2020). The use of ADDIE model to re-create academic information systems to improve user satisfaction. In *Journal of Physics: Conference Series*, 1567(3).

Mohseni, N. (2021). Studying the conformity level of customer needs and organisation perception using a customer satisfaction index. *International Journal of Productivity and Quality Management*, 32(2), 246-264.

Mujahidin, E. (2021). Importance performance analysis model for implementation in national education standards (SNPs). *Academic Journal of Interdisciplinary Studies*, 10(5), 114–128.

Mutmainah, N. F., & Mahfida, S. L. (2021). Utilization of Online Learning Media during the Covid-19 Pandemic in Teaching and Learning Activities by Teachers at MTs Muhammadiyah Karangajen. ... *Masyarakat Indonesia*, 1(3), 103–110.

Nurbojatmiko. (2020). Information Security Awareness of Students on Academic Information System Using Kruger Approach. In *2020 8th International Conference on Cyber and IT Service Management, CITSM 2020*.

Ocloo, P. E. D. (2021). Information Systems Evaluation in Ghanaian Academic Libraries Using DandM IS Success Model. *Library Philosophy and Practice*, 2021, 1–27.

Pane, E. S. (2020). Save And Loan Credit Information System Based On Web. *Journal of Applied Engineering and Technological Science (JAETS)*, 2(1), 14–20.

Purwanto. (2020). Measurement of user satisfaction for web-base academic information system using end-user computing satisfaction method. In *IOP Conference Series: Materials Science and Engineering*, 909(1).

Purwati, A. A., Mustafa, Z., & Deli, M. M. (2021). Management Information System in Evaluation of BCA Mobile Banking Using DeLone and McLean Model. *Journal of Applied Engineering and Technological Science (JAETS)*, 2(2), 70–77.

Purwinarko, A. (2020). Development of information systems for academic final projects documentation. In *Journal of Physics: Conference Series*, 1567(3)..

Qadri, M. N. (2021). Testing the relationship of academic information system, service units performance, and student satisfaction in private higher education institutions. In *Proceedings of the International Conference on Industrial Engineering and Operations Managemen*, 358–366.

Rahmat, T. (2021). ServQual and WebQual 4.0 for usability check academic information system of private university. In *Journal of Physics: Conference Series*, 1869(1).

Ramadhani, Suswanta, & Shaddiq, S. (2021). E-Marketing of village tourism development strategy (Case study in the tourist village puncak sosok). *Journal of Robotics and Control (JRC)*, 2(2), 72–77.

Rasheed, M., & Liu, J. (2022). Relation between Customer Interaction and Service innovation in Brazil firms: Investigating Organization Learning from Customers. *Journal of System and Management Sciences*, 12(1), 323–340.

Rismayani. (2021). E-Learning Vs Google Classroom using WebQual 4.0 Modification: Quality of Learning Services during COVID-19 Pandemic. In 3rd International Conference on Cybernetics and Intelligent Systems, ICORIS 2021.

Saa, A. A. (2020). Mining Student Information System Records to Predict Students' Academic Performance. In *Advances in Intelligent Systems and Computing*, Vol. 921, pp. 229–239

Singh, P. (2021). Evaluating Customer Satisfaction of Weather Index Insurance Service Quality Using Kano Model. In 2021 IEEE Bombay Section Signature Conference, IBSSC 2021. <https://doi.org/10.1109/IBSSC53889.2021.9673370>

Soegoto, E. S. (2020). Web service for academic information systems. *Journal of Engineering Science and Technology*, 15, 36–44.

Sukardi. (2022). Evaluation of Educational Service Quality of Vocational High School (VHS) Based on Importance Performance Analysis (IPA) Quadrant. *Eurasian Journal of Educational Research*, 2022(97), 27–42.

Syafariani, R. F. (2019). Web-Based Academic Information System. In IOP Conference Series: Materials Science and Engineering, Vol. 662, No.2.

Tyas, S. S. (2021). Usability Testing for Student Academic Information System in State Polytechnic of Creative Media. In Journal of Physics: Conference Series (Vol. 1898, Issue 1).

Umaroh, S. (2021). Delone and mclean model of academic information system success. EEA - Electrotehnica, Electronica, Automatica, 69(2), 92–101.

Utama, D. (2019). Fuzzy logic for simply prioritizing information in academic information system. International Journal of Mechanical Engineering and Technology, 10(2), 1594–1602.

Utami, I. S. (2021). Analysis the Effect of Website Quality on User Satisfaction with the WebQual 4.0 Method and Importance-Performance Analysis (IPA) (Case Study: SPMB Sebelas Maret University's Website). In Journal of Physics: Conference Series (Vol. 1842, Issue 1).

Viriando, Y. F., & Sfenrianto. (2021). Using Delone & Mclean information system success model to evaluate the success of online platform. Journal of System and Management Sciences, 11(2), 182–198.

Widyasmoro, W., Suwarno, I., Surahmat, I., Nugraha, T. A., & Al_barazanchi, I. (2022). Dissemination of technology utilization of FM community radio as a means to support teaching learning activities for students during the covid-19 pandemic at Muhammadiyah Elementary School Tlogolelo, Hargomulyo, Kokap District, Kulon Progo, DIY. Jurnal Pengabdian Dan Pemberdayaan Masyarakat Indonesia, 2(1), 34–42.

Wijaya, I. G. N. S. (2021). E-commerce website service quality and customer loyalty using WebQual 4.0 with importance performances analysis, and structural equation model: An empirical study in shopee. Register: Jurnal Ilmiah Teknologi Sistem Informasi, 7(2), 107–124.

Zolotukhina, E. B. (2020). Using information and communication technologies in teaching the academic discipline lifecycle management of information systems. In Journal of Physics: Conference Series (Vol. 1691, Issue 1).