Quality Analysis of E-Learning Website (Elena) Using WebQual 4.0 Method and Importance Performance Analysis (IPA)

Dimas Hardi Pamungkas [1,*], Subhan [1]

[a] Department of Computer Science, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, Semarang, Indonesia
*Corresponding author: pamungkasdimashardi@students.unnes.ac.id

ARTICLE INFO

Article history
Received 15 August 2023
Revised 13 September 2023
Accepted 27 October 2023

Keywords
Service Quality
Website E-Learning
Elena
Webqual 4.0
Importance Performance Analysis (IPA)

ABSTRACT

E-learning website is one of the important elements in education which has a role as an online learning medium. It is important to measure the quality of e-learning website services to maintain the ongoing use of the e-learning website. This research was conducted for evaluation in order to measure and improve the quality of e-learning website services at Semarang State University (Elena) using the Webqual 4.0 method and Importance Performance analysis (IPA) which has a focus on four variables, which that is; usability, information quality, service interaction quality, and overall, as well as to determine the value of user perceptions and expectations of the services that have been provided. Based on the results of the calculations that have been carried out, the Customer Sutisfaction Index (CSI) value is 76.4%, meaning that the respondents stated that they were satisfied with the performance of Elena's e-learning website. The results of calculating the average value of the gap (Gap) on Elena's e-learning website still show a significant negative value of -0.64, these results indicate that the performance level of Elena's e-learning website still does not meet user expectations. The results of the analysis of the IPA quadrants obtained 2 attributes which were included in quadrant I, 10 attributes entered in quadrant II, 7 attributes entered in quadrant III, and 4 quadrants entered in quadrant IV. This research is expected to provide positive input for website managers to be able to improve the quality of services provided to users in the future.

1 Introduction

The information technology is increasingly use widespread in various fields of life. This is because information technology plays an important role in all sectors of life, including in the field of education or academia. Information technology is the application of technology used to process data, in the processing itself including obtaining, compiling, storing, manipulating, processing data in various ways in order to obtain relevant, accurate and timely information (Naibaho & Rahmat, 2017). The impact of the global Covid-19 pandemic has disrupted the direct or face-to-face learning process for students, therefore it has been replaced by online learning methods with the help of electronic learning (e-learning) websites. This is also experienced by universities at Semarang State University. In facing the constraints of the direct learning process due to the Covid-19 pandemic situation, Semarang State University often utilizes e-learning website facilities as learning media or also known as (ELENA).

With the development of web technology-based information system services, it is necessary to have a standard that is used to conduct evaluation and analysis to measure and make recommendations so that its implementation can be assessed. Measuring website quality is very

important to increase the value of using a website. Then an analysis was carried out on the e-learning websites of Semarang State University to find out the quality of the services provided and find out the deficiencies or what needs to be done to improve their e-learning website. To measure the quality of the e-learning website, WebQual 4.0 method is used using 4 construction variables, namely usability, information quality, service interaction quality, and overall.

The Importance Performance Analysis method is used to measure the level of gaps and quadrants of improvement priorities on ELENA. The purpose of this study is to analyze the quality of the website according to users based on usability, information quality, service interaction quality, and overall. In addition, it also analyzes the value of the gap that occurs between the perceived quality rating and the expectations of the quality value expected by users and identifies improvement priorities of e-learning in terms of quadrant analysis. There have been several related studies that have applied the WebQual 4.0 and IPA methods to measure the quality of website services, covers (Napitupulu, 2016), (Prastiti et al., 2021), (Handika et al., 2022), (Al Baiti & Suprapto, 2017), (Prayoga, 2018), dan (Rahmaini, 2018). However, there are unique aspects that were carried out in this study, addition of *Customer Satisfaction Index* (CSI) analysis and the addition of 1 variable, namely overall, which was mostly not found in previous studies using the WebQual 4.0 and IPA methods.

2 Theoretical Basis

2.1 Website

According to terminology, website is a collection of web pages which are generally summarized into domains or subdomains and can be accessed via the World Wide Web (WWW) on the internet. While the website is a type of information presentation service that uses the concept of a hyperlink that is used to assist users in finding information using the internet. According to Destiningrum and Adrian (2017) Website is a web that can be described as a collection of pages that display textual data, animation data, image data, video, sound, and a combination of these associations, both pages that have static and dynamic properties, creating a collection of interconnected buildings, where from each page that is connected to page networks (hyperlinks). Based on their purpose, websites are divided into:

- Web forum, a web that aims as a medium of discussion.
- Personal web, a website that contains a person's personal information.
- Corporate web, a website owned by a company.
- Besides that, there are also e-Government websites, e-Banking, e-Payment, Procurement, and so on.
- Web portal, a website that has many services, ranging from news services, email, and other services.

2.2 Electronic Learning (E-Learning)

E-learning is a learning process in which material sharing, discussions, exams or matters relating to lectures/teaching activities occur through electronic media (Ambarita, 2017). In general, e-learning systems are divided based on the type of interaction and can be divided into two groups, namely static e-learning and dynamic e-learning. An e-learning system is said to be static when system users do not interact with each other, meaning that learning can only process the download of the required material and download the required material or assignments. This system is usually only used to support teaching and learning activities that take place face to face in the classroom. Meanwhile, the online learning system is classified as dynamic if students can learn in an environment that is not much different from the classroom atmosphere, and where in this system it is possible to communicate between teachers and students via chat, email, or other means of communication (Riskiono & Pasha, 2020).

2.3 Website Quality

A good website is a website that has a main focus on the content of the website, where it is the main factor that causes these users to return to visit the website. User perceptions about the quality of a website are based on the characteristics contained in the website, where these characteristics can fill user needs and can focus on the advantages of a website (Hasanov & Khalid, 2015). According to Isthafana (2019) A website can be said to have good quality if it has criteria, namely, it must be

representative, the design is attractive, interactive, safe and secure, as well as concise and simple. From this it can be concluded that website quality is the standard expected by website users when using the website, so that it can be said that the website is of high quality if the user considers that the quality achieved meets or exceeds user expectations.

2.4 WebQual 4.0

According to Barnes and Vidgen (2001) WebQual method is a method that is able to measure the quality of a website service based on the actual perception of its users (Amelia et al., 2019). The WebQual method is a development of the previous method, that is ServQual, which functions to measure service quality.

The WebQual model version 4.0 is a development of WebQual versions one to four, also adapting to the previous ServQual model. According to Barnes and Vidgen (2002) WebQual 4.0 is enabled to measure the quality of a website service based on its 3 variables/dimensions, namely usability, information quality, service interaction quality (Fauziah et al., 2018). In this study, 1 variable was added, namely overall which is used to determine the overall assessment of the quality of a system. The WebQual 4.0 construction contains 22 statement instruments and added 1 with the overall instrument so there are 23 instruments which can be seen in table 1.

Table 1. The WebQual 4.0 construction

Category	WebQual 4.0 Questions
Usability	I find the site easy to learn to operate
	My interaction with the site is clear and understandable
	I find the site easy to navigate
	I find the site easy to use
	The site has an attractive appearance
	The design is appropriate to the type of site
	The site conveys a sense of competency
	The site creates a positive experience for me
Information Quality	Provides accurate information
	Provides believable information
	Provides timely information
	Provides relevant information
	Provides easy to understand information
	Provides information at the right level of detail
	Presents the information in an appropriate format
Service Interaction Quality	Has a good reputation
	It feels save to complete transaction
	My personal information feels secure
	Creates a sense of personalization
	Convey a sense of community
	Makes it easy to communicate with the organization
	I feel confident that goods/services will be delivered as promised
Overall	Overall view of the website

2.5 Importance Performance Analysis (IPA)

According to Martilla and James (1977) Importance Performance Analysis (IPA) method is a simple technique that is used to identify service or product attributes to generate important information about

which indicators the company should pay more attention to and to identify what might cost a lot of money to make possible development without any significant loss to the overall product quality (Siyamto & Yudi, 2017). *Importance Performance Analysis* (IPA) created in 1977 with the aim of measuring the relationship between consumer perceptions and priorities for improving the quality of a product or service, known as quadrant analysis. The measurement results of the IPA method will be divided into four parts in quadrants, where there is an X line to represent performance and a Y line to represent importance. The following describes the four quadrants:

- Quadrant I shows Priorities For Improvements, namely the level of importance is high, but the performance of a service is low
- Quadrant II shows Keep Up The Good Work, which means the level of importance and performance is equally high.
- Quadrant III shows the Lowest Priority, that the level of importance and performance is low
- Quadrant IV shows Possible Overkill, meaning at a high level of performance but a low level of importance.

3 Method

The research method used in this study is WebQual 4.0 to measure the quality of e-learning website services based on usability, information quality, service interaction quality, and overall while to measure gaps and quadrant analysis using the Importance Performance Analysis (IPA) method. The stages of the research are as follows:

3.1 Determination of Population and Sample

Population is a very well-known word in research and is often used to mention a family or a group of objects that are the target of research (Umami, 2018). While the sample is part of the total characteristics possessed by the population or a small part of the population members obtained according to certain stages so that they can represent a population (Rahmaini, 2018). in this study using purposive sampling, purposive sampling is a sampling technique that is carried out with a specific purpose (Retnawati, 2017).

In this study the population used was users of the e-learning website at Semarang State University (Elena) which consisted of Semarang State University students for the 2018-2022 academic year, 43582 total students as of December 2022 (Semarang, 2022). The results of the calculations with equation (1) are as follows:

- $n = \frac{43582}{1+43582 \text{ X } (0.1)^{2}!} = 99{,}9 = 100$

In this study, the error rate used was 10%. From the results that can be seen in the calculation above, it is found that the minimum sample is 100 respondents.

3.2 Questionnaire Design

Questionnaire is a series of questions used to obtain information about personality and other matters related to research materials (Sugiyono, 2013). Questionnaire design used refers to webqual 4.0 construction with 4 dimensions/variables namely usability, information quality, service interaction quality, and overall that use 23 indicators where there are additional variables that have one indicator, namely the Overall variable. The assessment of the four dimensions is based on the level of performance and expectations of e-learning website users.

3.3 Questionnaire Distribution

This research was conducted by distributing questionnaires using the Google form with distribution using social media such as WhatsApp and Instagram. This research began on January 1 and ended on January 15, 2023.

3.4 Validity and Reliability Test

According to Arikunto (2013) validity is a measure that shows the level of validity and validity of an instrument. The questionnaire is said to be valid if the questions and statements in the questionnaire reveal what is being measured. While the reliability test is a test that functions to determine the extent to which a measuring instrument can be credible and trusted. A measuring instrument can be trusted

if several measurements have been made and the findings are relatively the same when the measurement aspects are not different (Rahmaini, 2018).

3.5 Data Analysis

At this stage an analysis was carried out in the form of frequency description analysis on WebQual, *Customer Satisfaction Index* (CSI), Gap analysis, and quadrant analysis with *Importance Performance Analysis* (IPA) method using SPSS.

4 Results and Discussion

4.1 Validity and Reliability Test Results

The validity test used is a product moment technique by correlating each statement with the results of the score of each variable. In determining significant or insignificant by comparing the value of r count with the value of r table degree of freedom/Df = n-k. The value of r table is obtained where n = 30 and r table with a significant level of 5% is 0.361. The validity test was carried out using the product moment person correlation, if the product moment correlation value r count > r table or significance <0.05, then the instrument is declared valid. If r count <r table then the instrument item is invalid. details can be seen in Table 2 and Table 3 below.

Table 2. Validity test on the performance dimensions

Variable	Code	r Count	r Table	Description
Usability	US1	0,871	0,361	Valid
	US2	0,858	0,361	Valid
	US3	0,709	0,361	Valid
	US4	0,791	0,361	Valid
	US5	0,708	0,361	Valid
	US6	0,677	0,361	Valid
	US7	0,681	0,361	Valid
	US8	0,797	0,361	Valid
Information Quality	IQ1	0,818	0,361	Valid
	IQ2	0,735	0,361	Valid
	IQ3	0,696	0,361	Valid
	IQ4	0,582	0,361	Valid
	IQ5	0,660	0,361	Valid
	IQ6	0,805	0,361	Valid
	IQ7	0,757	0,361	Valid
Service Information	SIQ1	0,775	0,361	Valid
Quality	SIQ2	0,681	0,361	Valid
	SIQ3	0,691	0,361	Valid
	SIQ4	0,840	0,361	Valid
	SIQ5	0,484	0,361	Valid
	SIQ6	0,559	0,361	Valid
	SIQ7	0,691	0,361	Valid
Overall	OV1	1	0,361	Valid

Table 3. Validity test on the importance dimensions

Variable	Code	r Count	r Table	Description

Usability	US1	0,601	0,361	Valid
	US2	0,675	0,361	Valid
	US3	0,736	0,361	Valid
	US4	0,774	0,361	Valid
	US5	0,543	0,361	Valid
	US6	0,716	0,361	Valid
	US7	0,627	0,361	Valid
	US8	0,700	0,361	Valid
Information Quality	IQ1	0,840	0,361	Valid
	IQ2	0,715	0,361	Valid
	IQ3	0,793	0,361	Valid
	IQ4	0,811	0,361	Valid
	IQ5	0,627	0,361	Valid
	IQ6	0,676	0,361	Valid
	IQ7	0,417	0,361	Valid
Service Information	SIQ1	0,791	0,361	Valid
Quality	SIQ2	0,745	0,361	Valid
	SIQ3	0,678	0,361	Valid
	SIQ4	0,589	0,361	Valid
	SIQ5	0,673	0,361	Valid
	SIQ6	0,732	0,361	Valid
	SIQ7	0,795	0,361	Valid
Overall	OV1	1	0,361	Valid

After the validity test is carried out, reliability test will then be carried out with the aim of knowing the level of accuracy, stability or consistency, stability or consistency of a tool in expressing certain symptoms from a group or individual.

Reliability test in this study used the Cronbach's alpha model. The value of the variable is said to be reliable or reliably measured by the benchmark reliability index table, which is said to be reliable if the Cronbach's alpha value is > 0.6 (Rahmaini, 2018). The following results of the reliability test with the SPSS 25 application can be seen in Table 4 and Table 5 below.

Table 4. Reliability test on the performance dimensions

Variable	*Cronbach's Alpha*	Description
Usability	0,886	Reliable
Information Quality	0,845	Reliable
Service Interaction Quality	0,802	Reliable
Overall	1	Reliable

Table 5. Reliability test on the importance dimensions

Variable	*Cronbach's Alpha*	Description
Usability	0,817	Reliable
Information Quality	0,822	Reliable
Service Interaction Quality	0,831	Reliable
Overall	1	Reliable

From the results of the calculation of the validity and reliability tests above using the help of the IBM SPSS Statistics 25 application, it shows that all existing instruments on the variables usability, information quality, service interaction quality, and overall are stated to be valid and reliable because the value of cronbach's alpha more than 0,6, so that all statement variables and indicators are fully used in this research.

4.2 Frequency Description Analysis on WebQual

In this research, the number of respondents used was 100 students. From this data will be analyzed descriptively the frequency distribution based on each variable by grouping the number of respondents who answered statements for each item based on a scale of 1-5, where the value 1 = Strongly Disagree (STS), 2 = Disagree (TS), 3 = Enough Agree (CS), 4 = Agree (S), and 5 = Strongly Agree (SS). After the calculation is carried out, it will be divided into 5 groups when the criteria for user satisfaction are as shown in table 6.

Table 6. WebQual criteria scale

Index Value	Description
81% - 100%	Strongly Agree (SS)
66% - 80.99%	Agree (S)
51% - 65.99%	Enough Agree (CS)
35% - 50.99%	Disagree (TS)
0% - 34.99%	Strongly Disagree (STS)

The results of the percentage level for calculating performance and importance on the e-learning website at Semarang State University (Elena) based on webqual 4.0 can be seen in table 7 and table 8 below.

Table 7. WebQual frequency distribution on performance dimensions

Answer	Likert Scale	Frequency	Persentage (%)
Strongly Disagree (STS)	1	7	0,30
Disagree (TS)	2	109	4,74
Enough Agree (CS)	3	627	27,26
Agree (S)	4	1110	48,26
Strongly Agree (SS)	5	447	19,43
Total		2300	100

In Table 7 above it is known that the overall data of the webqual variable in the performance statement is 0.30% of respondents answered strongly disagree, 4.74% of respondents answered disagree, 27.26% of respondents answered quite agree, 48.26% of respondents answered agreed, and 19.43% of respondents answered strongly agreed.

Table 8. WebQual frequency distribution on importance dimensions

Answer	Likert Scale	Frequency	Persentage (%)
Very Not Important (STP)	1	1	0,04
Not Important (TP)	2	16	0,70
Enough Important (CP)	3	209	9,09
Important (P)	4	782	34,00
Very Important (SP)	5	1292	56,17
Total		2300	100

In table 8 above it is known that the overall data for the webqual variable in the importance statement is 0.04% of respondents answering very unimportant, 0.70% of respondents answering not

important, 9.09% of respondents answering quite important, 34% of respondents answering important, and 56.17% of respondents said it was very important.

Can also be seen in the following chart figure 1 below.

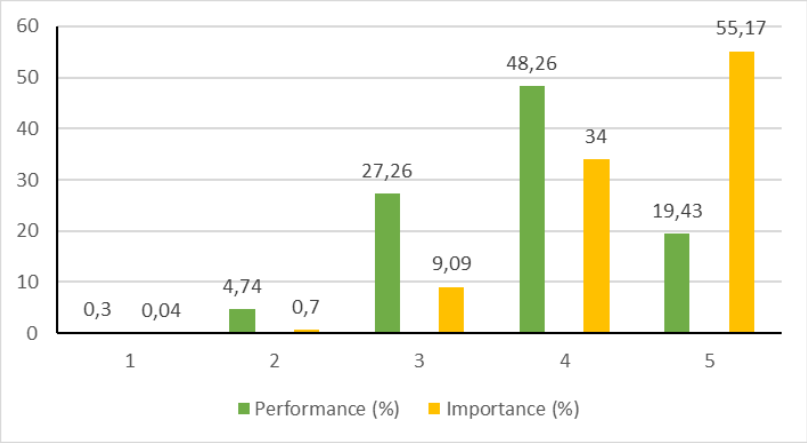

Figure 1. WebQual chart diagram on the performance dimension and the importance dimension

In chart diagram 1 above it is known that the green chart diagram depicts the percentage value of Webqul on the performance dimension and the yellow chart diagram depicts the percentage value of Webqual on the importance dimension.

4.3 Customer Satisfaction Index (CSI)

The customer satisfaction index (CSI) is the percentage value of overall user satisfaction with the services that have been provided. CSI is made based on the cumulative view of satisfaction which defines satisfaction as the experience of its users based on the services or products provided (Turkyilmaz et al., 2013). In this study, namely user satisfaction with the e-learning website at Semarang State University (Elena). The calculation of the customer satisfaction index (CSI) index value can be seen in equation 2 are as follows.

$$\text{CSI} = \frac{\text{Weight Total}}{\text{Height Score}} \text{ x } 100\% = \frac{3.82}{5} \text{ x } 100\% = 76{,}4\%$$

Based on the customer satisfaction index (CSI) criteria scale, the percentage value of 76.4% is included in the satisfaction criterion index value. So, the results of the questionnaire from 100 respondents on performance amounted to 76.4% of respondents said they were satisfied.

4.4 Gap Analysis

Calculation of the gap analysis as a whole webqual 4.0 variable can be seen in the following table 9.

Table 9. Gap analysis calculation results

Variable	Performance	Importance	GAP
Usability	3,80	4,42	4,01
Information Quality	3,79	4,52	4
Service Interaction Quality	3,85	4,41	3,53
Overall	3,97	4,62	4
Mean	3,85	4,49	

Based on the measurement of the average value of the level of performance appraisal and importance, it is known that the average score of the quality of the e-learning website at Semarang State University (Elena) at the performance assessment level is 3.88 and the average score for the

quality of the university's e-learning website Semarang State (Elena) at the importance level is 4.48. In knowing the average value of the gap is done using the equation 3 above as follows.

$$Qi\ (Gap) = 3{,}85 - 4{,}49 = -0{,}64$$

4.5 Quadrant Analysis of Importance Performance Analysis (IPA)

To find out what attributes need improvement, you can use the *Importance Performance Analysis* (IPA) technique. The output of this analysis can describe indicators that are the top priority for improvement to indicators that are in line with user expectations, which will be depicted in a four-quadrant diagram. The results of the quadrant analysis can be seen in the Cartesian diagram at figure 2.

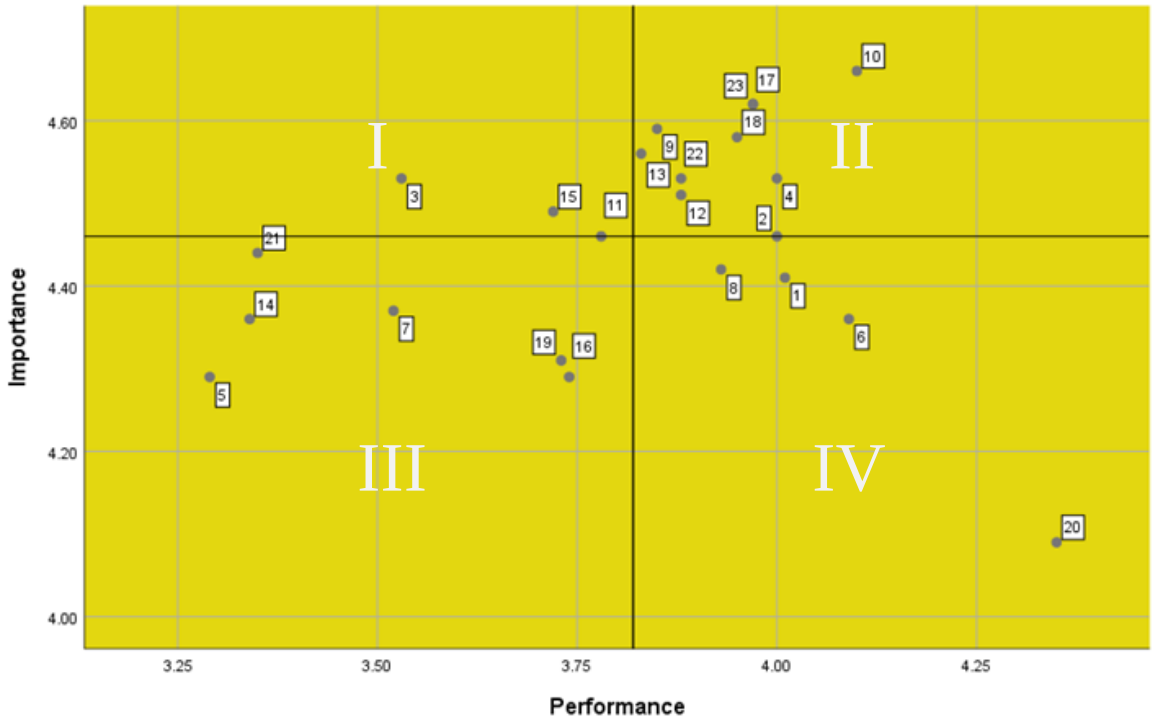

Figure 2. Cartesian Diagram of *Importance Performance Analysis* (IPA)

Based on the Cartesian diagram figure 2 IPA quadrant analysis shows that:

1. Quadrant I (Consentrate These)
   Quadrant I describes the indicator located in this quadrant are considered as important indicators and/or expected by the user but the actual perception conditions that exist at this time are not satisfactory, so the indicators included in this quadrant are indicators that are a priority for improvement. There are 2 indicators in quadrant I where the user's expectations of this indicator are high while the quality is not in accordance with the expectations of its users. These indicators are the US2 and IQ7.
2. Quadrant II (Keep Up the Good Work)
   Quadrant II describes the attributes that are considered important by users while the service provider has provided good service to users on these attributes. There are 10 indicators whose quality must be maintained because they meet the expectations of their users, namely indicators US2, US4, IQ1, IQ2, IQ4, IQ5, SIQ2, SIQ3, SIQ7, and OV1.
3. Quadrant III (Low Priority)
   Quadrant III describes indicators that are not really needed attention because the user's expectation of this attribute is low. In quadrant III there are 7 indicators indicating that these indicators do not really need attention because the user's expectations of these indicators are

low. The indicators included in quadrant III are US5, US7, IQ3, IQ6, SIQ1, SIQ4, and SIQ6 indicators.

4. Quadrant IV (Possible Overkill)
   The indicators included in quadrant IV are indicators that are not too important but have good quality so that attention to this indicator can be diverted to other indicators that are more in need. In quadrant IV there are 4 indicators, namely indicators US1, US6, US8, and SIQ5.

5 Research Result

5.1 Quality Service of Semarang State University E-Learning Website (Elena) Seen from Performance Dimensions and Importance Dimensions

Semarang State University (Elena) e-learning website based on the four variables used to conduct the first research, namely the usability variable of 100 respondents 75.93% said they agreed on the performance dimension and on the importance dimension 88.43% said it was very important to the website Elena's e-learning. On the information quality variable, 75.71% of the 100 respondents agreed on the performance dimension and on the importance dimension, 90.37% said it was very important to Elena's e-learning website. On the service interaction quality variable, 77.06% of the 100 respondents agreed on the performance dimension and on the importance dimension, 88.17% said it was very important to Elena's e-learning website. On the overall variable, out of 100 respondents, 79.4% agreed on performance and on importance, 92.4% said it was very important for Elena's e-learning website.

Based on the results of the analysis using the importance performance analysis (IPA) method, it is obtained that the attributes that must be repaired and the service quality improved, because according to users the perceived quality is still not good. The first attribute that needs to be improved is that which is located in quadrant I which is the Usability 3 (US3) attribute, which that that "E-learning Unnes (Elena) has clear navigation or instructions". The second attribute is Information Quality 7 (IQ7) which that that "E-learning Unnes (Elena) provides information in the right format.

5.2 Dimensions Value of Service Quality of Semarang State University E-Learning Website (Elena) Based on Gap Values

Based on the average value of the Gap on the Semarang State University e-learning website (Elena) it can be seen that it shows a negative value (<0) which is equal to -0.6. These results indicate that the performance level of the Semarang State University e-learning website (Elena) is still lacking and has not met user expectations. For this reason, it is necessary to repair and increase the statement attributes based on the *Importance Performance Analysis* (IPA) which can be seen in table 10 as follows.

Table 10. Gap analysis service quality improvement plans

Gap	Maintenance Plan
Gap 1	In improving the quality of website services for usability, service managers must always improve the website in terms of ease of use, ease of understanding, ease of browsing, and providing an attractive appearance or visual quality of the website so that users gain knowledge and a pleasant experience.
Gap 2	In improving the quality of website services for information quality, Managers must provide information that is reliable, truthful, information that is easy to understand, accurate information, information that is in accordance with the topic of a website, the latest information, detailed information, information presented in the design, and the appropriate format.

Gap 3	In improving the quality of website services for service interaction quality, Managers must always try to improve websites that have a good reputation, provide a sense of security for users, ease of communication, and make users feel full trust when storing personal information on the website.

6 Conclusion

Based on the results of the calculations that have been carried out, it shows a Customer Satisfaction Index (CSI) value of 76.4%, meaning that the respondents stated they were satisfied with the performance of Elena's e-learning website. The results of calculating the average gap value on the Semarang State University e-learning website (Elena), it shows a negative result (<0) which is equal to -0.64, meaning that the performance level of Elena's e-learning website still does not meet user expectations. This explains that there is still a gap between actual perceptions and user expectations of the quality of Elena's e-learning website. From the results obtained after conducting an analysis using quadrant analysis, it was found that 2 attributes were included in quadrant I where this quadrant was the main priority in improving service quality, because quadrant I contained a low level of performance while having a high level of importance, these attributes is on the US3 attribute, namely "E-learning Unnes (Elena) has clear navigation or instructions" and the second attribute is IQ7, namely "E-learning Unnes (Elena) provides information in the right format".

Based on the research conclusions that have been made, there are still some deficiencies and suggestions that the author can convey in this study. This research was only conducted with student research subjects as one of the end users of Elena. For further research, it is hoped that when conducting an analysis it will be carried out with the subject of all end users of a website, in this case all end users of Elena, namely students and lecturers.

7 References

Al Baiti, A., & Suprapto, A. R. (2017). Pengukuran Kualitas Layanan Website Dinas Pendidikan Kota Malang Dengan Menggunakan Metode Webqual 4.0 dan IPA. *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer e-ISSN*, *2548*, 964X.

Ambarita, A. (2017). Implementasi Sistem E-Learning Menggunakan Software Moodle Pada Politeknik Sains Dan Teknologi Wiratama Maluku Utara. *IJIS-Indonesian Journal On Information System*, *1*(2).

Amelia, Lisa, & Pradesan, L. (2019). Pengukuran Kualitas Layanan Website Terhadap Kepuasan Pengguna Pada Universitas XYZ dengan Menggunakan Metode Webqual 4.0. *Jurnal Sistem Dan Informatika*, *14*(1), 57-63.

Arikunto, S. (2013). *Prosedur Penelitian Suatu Pendekatan Praktik*. Rineka Cipta.

Destiningrum, M., & Adrian, Q. J. (2017). Sistem Informasi Penjadwalan Dokter Berbassis Web Dengan Menggunakan Framework Codeigniter (Studi Kasus: Rumah Sakit Yukum Medical Centre). *Jurnal Teknoinfo*, *11*(2), 30-37.

Fauziah, Deva, N., Wulandari, & Dewi, A. N. (2018). Pengukuran Kualitas Layanan Bukalapak. com Terhadap Kepuasan Konsumen Dengan Metode Webqual 4.0. *Jurnal Ilmu Pengetahuan Dan Teknologi Komputer*, *3*(2), 173-180.

Handika, R., Hasbi, M., & Susyanto, T. (2022). Analisis Kualitas Website E-Learning Pada Perguruan Tinggi dengan Metode WebQual 4.0 dan Importance Performance Analysis. *Jurnal Ilmiah Sinus*, *20*(2).

Hasanov, J., & Khalid, H. (2015). The Impact of Website Quality on Online Purchase Intention of Organic Food in Malaysia: A WebQual Model Approach. *Procedia Computer Science*, *72*, 382-389.

Isthafana, M. R. (2019). Analisis kualitas Website Kanwil Kementerian Agama Provinsi Jawa Timur Menggunakan Metode Webqual 4.0 Modifikasi. *Journal of Information Systems, Faculty of Science and Technology, Sunan Ampel State Islamic University*.

Naibaho, & Rahmat, S. (2017). Peranan dan Perencanaan Teknologi Informasi Dalam Perusahaan. *Jurnal Warta Dharmawangsa*(52).

Napitupulu, D. B. (2016). Evaluasi Kualitas Website Universitas XYZ Dengan Pendekatan WebQual [Evaluation of XYZ University Website Quality Based On Webqual Approach]. *Buletin Pos dan Telekomunikasi*, *14*(1), 51-64.

Prastiti, N., Koeshardianto, M., & Apriliana, R. (2021). Pengukuran Kualitas Website Akademik Menggunakan Webqual 4.0 Dan Importane-Performane Analysis (IPA) Untuk Peningkatan Layanan Pengguna (Studi Kasus: Universitas Trunojoyo Madura). *Jurnal Simantec*, *10*(1), 9-16.

Prayoga, D. (2018). *Analisis Kepuasan Pelanggan Kantor Pos Dengan Metode Importance Performance Analysis (IPA) Dan Customer Satisfaction Index (CSI)(Studi Kasus Pada Kantor Pos Sragen)* Universitas Islam Indonesia.

Rahmaini, S. N. (2018). *Analisis Kualitas Website Akademik Menggunakan Metode Webqual 4.0 Dan Importance-Performance Analysis (IPA)* Jakarta: Fakultas Sains Dan Teknologi UIN Syarif Hidayatullah].

Retnawati, H. (2017). Teknik Pengambilan Sampel. Workshop Update Penelitian Kuantitatif, Teknik Sampling, Analisis Data, dan Isu Plagiarisme,

Riskiono, S. D., & Pasha, D. (2020). Analisis Metode Load Balancing Dalam Meningkatkan Kinerja Website E-Learning. *Jurnal TeknoInfo*, *14*(1), 22-26.

Semarang, U. N. (2022). *Ekosistem Data Unnes*.

Siyamto, & Yudi. (2017). Kualitas Pelayanan Bank Dengan Menggunakan Metode Importance Performance Analysis (IPA) dan Customer Satisfaction Index (CSI) Terhadap Kepuasan Nasabah. *Jurnal Ilmiah Ekonomi Islam*, *3*(01), 63-76.

Sugiyono, D. (2013). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif dan R&D*. Alfabeta, Bandung.

Turkyilmaz, A., Oztekin, A., Zaim, S., & Fahrettin Demirel, O. (2013). Universal Structure Modeling Approach to Customer Satisfaction Index. *Industrial Management Data Systems*, *113*(7), 932-949.

Umami, W. H. (2018). *Analisis Kualitas Layanan Website E-FILING Menggunakan Metode Webqual dan IPA (Studi Kasus: KPP Pratama Palembang)* UIN Raden Fatah Palembang].