Systematic literature review on university website quality

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Article Info	ABSTRACT
	Website is a necessity for organizations to enable users worldwide to access their information and gain a competitive edge over others. The diversity of websites makes assessing website quality a difficult task. The aim of this paper is to identify the issues faced in the quality evaluation of university websites, the models and the factors used for evaluating university website quality. Systematic literature review was used to identify and synthesize related scholarly research papers. Findings show that there is a lack of study on university website quality compared to business websites; website designers did not have the appropriate knowledge on the interface design; and the website quality evaluation is complex since there is no specific evaluation model. Webqual 4.0 model was used to evaluate the quality of universities' websites. From 24 studies, initially 79 quality factors were extracted. After performing comparison, filtration and memoing, six quality factors were identified: information quality, specific content, usability, web appearance, service interaction quality, and functionality. This study makes a useful contribution in developing university website quality model by extending the Webqual 4.0 model.

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1. INTRODUCTION

Website is the essential interaction tool between the organization and its users in today's digital era. Having a website allows organizations to attract users worldwide to access their information and gain a competitive edge over others [1]-[3]. Institutions that have a better level of website quality will pick up higher levels of client fulfillment leading to feasible competitive advantage [4]. Websites have become more pervasive now than in the past regardless of the sector (commerce, government administrations, educations, entertainment, health care, culture, industry, financial services, and many others) [5]-[7].

Universities put enormous effort into creating a valuable website to facilitate stakeholders to access information swiftly without coming to the institutions [8]-[13]. The quality of the university's website reflects the quality of universities activities [14]. Among the information available on universities' websites include academic programs, facilities, infrastructure, activities, achievements, fields of experts, and so forth. Students have higher expectations with regards to website quality, starting from efficiency until the content [15]. Hence, quality websites can attract more users and increase their satisfaction.

Generally, the term quality encompasses the capability of a service or product in terms of meeting the needs and expectations of the consumer [16]. Quality is described by International Organization for Standardization 9000 (ISO) as "the degree to which a set of inherent characteristics of an object fulfills requirements" (ISO, 2015). Quality also implies liberation from defects which means a release from errors that call for redoing the work related to field failures, customer claims, customer dissatisfaction and others [15], [17].

Website quality is dependent on: to what extent it could meet the user's needs [18]. Additionally, it describes users assessment of website performing within delivering information based on its usage capability [19].

The term website quality differs from the traditional concept of quality because website quality should be perceived as a multidimensional factor that considers the users' and designers' aspects [20]. Despite experiencing a lot of weaknesses and problems in some universities websites, most universities are working hard to satisfy the international standard of website quality [21]. Evaluating the quality of a website is very important since the presence of university websites reflects the existence of a university [22]. So, it is imperative to study further on university website quality. Section 1 provides an introduction of the project. Section 2 outlines the research method. Section 3 discusses the results and finally, section 4 reports the conclusion and future works.

2.   RESEARCH METHOD

Systematic literature reviews (SLR) is a common tool to synthesize the prevailing body of literature in a specific field [23], [24]. For this study, the SLR method was utilized to identify and synthesize related scholarly research papers [25]. SLR is defined as a method for identifying, evaluating, and synthesising the existing body of completed and recorded work created by researchers, scholars, and practitioners that is systematic, explicit, and reproducible. Contrary to the use of unstructured methods such as simple literature reviews that have a potential to be biased, SLR results are more reliable and tend to be unbiased [26], [27]. SLR comprises of three phases: review planning, review conduction, and result reporting [25] as shown in Figure 1.
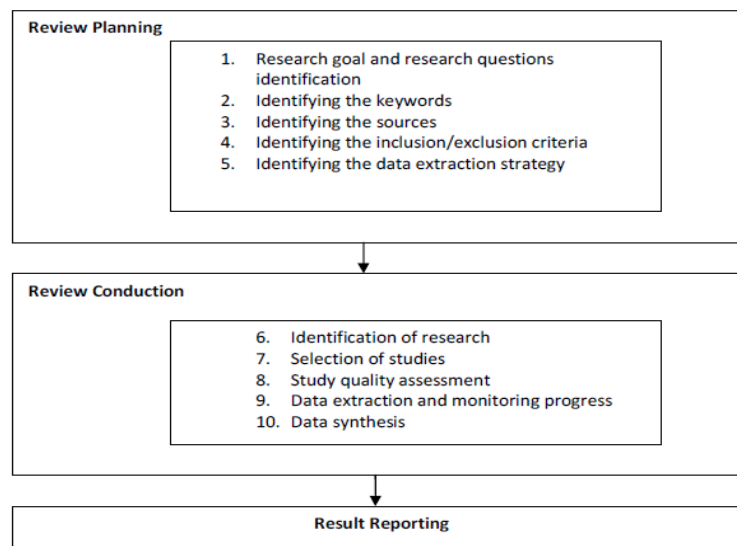

Figure 1. The systematic literature review (SLR) method [15]

2.1. Review planning

The most important activities during the review planning phase are definition of the research questions for this SLR and creation of the review protocol. However, all other activities should not be neglected and should be taken seriously. The results of this phase should include a clearly defined review protocol containing the purpose and the procedures of the review.

2.1.1. Research questions

The first step in the SLR is to determine its focus by clearly frame the questions the review seeks to answer. The questions were made by following PICO table. PICO stands for population, intervention, comparison, and outcomes [17] The formula of each item in PICO are illustrated I n Table 1.

Table 1. PICO summary

PICO	Formula
Population	University websites
Intervention	University website quality, evaluation factors, base model
Comparison	N/A
Result	The factors and indicators to measure the quality of university website, based model, evaluation problems

This SLR seeks to identify answers to the following research questions:

RQ1: What are the problems for evaluating the quality of universities' websites?

RQ2: What are the models used to evaluate the quality of universities' websites?

RQ3: What are the factors and indicators being used to evaluate the quality of academic websites?

2.1.2. Identifying the keyterms

Based on the research questions mentioned above, the key phrase was "universities website quality evaluation." Then, the synonyms of the keyword 'evaluation' were identified which are 'assessment' and 'measurement'. The search string was formulated based on the main terms and their synonyms, and Boolean as shown: evaluation or assessment or measurement) and website and quality and (University or academic or education). The search keywords are used to find relevant studies in the paper's title, keywords and abstract.

2.1.3. Identifying the sources

Five databases were selected for this SLR which include Institute of Electrical and Electronics Engineers (IEEE), Springer Link, Science Direct, Emerald, and Scopus. These databases were selected as they dispense the most important and the highest impact full-text journals and conference proceedings, related to university website quality. This SLR focuses on searching for scientific databases instead of specific books or technical reports, as it assumes that the major research results in books and reports are also usually described or referenced in scientific papers.

2.1.4. Identifying the inclusion/ exclusion criteria

To make certain that only relevant literature is accepted into the SLR, the inclusion and exclusion criteria is used. For the exclusion criteria: papers not in the English language; only the abstract but the full text is not available; does not have factors or characteristics. While for the inclusion criteria: full-text papers; review papers, and white papers published from 2010 to the year 2020 [28].

2.1.5. Identifying the data extraction strategy

Data extraction is the process of capturing key characteristics of studies in structured and standardized form based on information in journal articles. The objective of this step is to design data extraction forms to accurately record the research's information that are obtained from the selected papers. After implementing the inclusion/ exclusion criteria as illustrated in the previous step, information such as citation, the context of the study, base model, and the quality factors are extracted from the selected papers in order to answer the research questions.

2.2. Review Conducting
2.2.1. Identification of research

The search process was separated into two stages which include primary and secondary search. In primary search, the papers were identified in the selected databases using the search string. In the secondary search, the selected primary studies' references were reviewed to determine any additional related studies. This process aims to ensure that the primary search phase has not missed any relevant literature. Table 2 illustrates the results of the primary studies search. After passing the primary study search through five databases, 519 papers were selected. In the secondary stage, a backward search was conducted for the selected papers of the primary studies.

Table 2. Primary search results

Databases	Number of papers	Databases	Number of papers
Emerald	12	Springer	258
IEEE	24	Scopus	151
Science Direct	74	Total	519

2.2.2. Selection of the studies

This step narrows down the number of documents found in the previous searching phase. To begin with, eligibility criteria was applied to determine which of the studies identified in searches are pertinent based on the paper title while all irrelevant papers were discarded. The discardment was conducted by applying filters related to the university's website quality. Furthermore, the abstract of the filtered paper was assessed followed by the introduction and the conclusion/discussion of the filtered papers. This step consisted of a more thorough selection of the documents.

After administering the first level of eligibility criteria, 13 primary studies associated with university website quality were retrieved. Using these 13 studies, a secondary search was carried out, which involved

reviewing the references in the selected primary studies to identify relevant supplemental studies. From this secondary search phase, 17 studies were collected from the references of primary search. The final number of selected studies was 30 studies. 30 studies went through the second level of inclusion/exclusion criteria where 28 studies were included and two studies were excluded due to duplication.

2.2.3. Study quality assessment
This step involves assessing the quality of the selected studies in order to support the extraction of the information for synthesis and result from analysis. A quality assessment checklist was adapted from [25]. Table 3 presents the checklist that was employed for assessing the paper quality. For the quality assessment, the following scale was used: Yes=1, Partially 0.5, and No=0 [29], it was concluded that the higher the study score, the greater the quality of the study which is concurrent with its ability to address the research question in a better way.

Table 3. Study quality assessment checklist [13]

No.	Question	Answer
QA1	Are the aims clearly stated?	Yes/No/Partially
QA2	Are the methods used in each paper clearly described?	Yes/No/Partially
QA3	Do the objectives lead to conclusions?	Yes/No/Partially
QA4	Is the knowledge or understanding been extended by the research?	Yes/No/Partially
QA5	Is the diversity of perspective and context been explored?	Yes/No/Partially
QA6	Are the links between data, interpretation, and conclusions are clear?	Yes/No/Partially
QA7	Does the detail/ depth/ complexity of the data is conveyed?	Yes/No/Partially

In the next step, the total scores for each article were calculated and the percentage was determined by dividing the total score by seven. A paper with the total score greater than five or 70% will be selected for the final study. From the previous 28 papers, four papers were rejected where three papers scored 4.0 or 57% and one scored 3.5 or 50%. So, there are 24 final studies selected from this SLR process. The result of quality assessment for the final selected studies is illustrated in Table 4. Figure 2 shows the overall process of this SLR process and the results for each steps.

Table 4. Result of quality assessment for final studies

Citations	QA1	QA2	QA3	QA4	Q5	QA6	QA7	Total	%
[8]	1	1	1	1	1	0.5	1	6.5	93
[11]	1	1	1	1	1	1	1	7	100
[30]	1	1	1	1	1	0.5	0.5	6	86
[31]	1	1	1	1	1	1	1	7	100
[32]	1	1	1	1	1	1	1	7	100
[33]	1	1	1	1	1	1	0.5	6.5	93
[34]	1	1	1	1	1	1	1	7	100
[35]	0.5	1	0.5	1	1	0.5	0.5	5	71
[36]	1	1	1	1	1	1	1	7	100
[37]	1	1	1	1	0	0.5	0.5	5	71
[38]	1	0.5	1	1	1	0.5	0.5	5.5	79
[39]	1	0.5	1	0.5	1	0.5	1	5.5	79
[40]	1	1	1	0.5	1	0.5	1	6	86
[41]	1	1	1	1	1	1	1	7	100
[42]	1	0.5	1	1	1	0.5	0.5	5.5	79
[43]	1	1	1	1	1	1	1	7	100
[44]	1	1	1	0.5	1	0.5	1	6	86
[45]	1	1	1	0.5	1	0.5	1	6	86
[46]	1	1	1	1	1	1	1	7	100
[47]	1	1	1	1	1	1	1	7	100
[48]	1	1	1	1	1	1	1	7	100
[49]	1	0.5	1	1	1	0.5	0.5	5.5	79
[50]	1	1	1	1	0.5	1	0.5	6	86
[51]	1	1	1	1	1	1	0.5	6.5	93

2.2.4. Data extraction and monitoring progress
24 studies were selected and systematically reviewed. The extracted information such as citation, the context of the study, the base model, and the quality factors have been used in the final study and synthesized to answer the research questions. The main content from the extracted information represented in the Table 5.
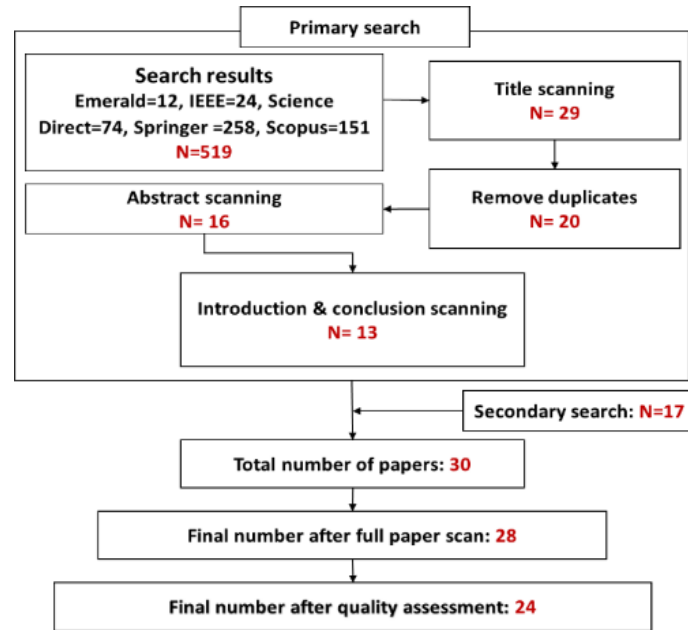
Figure 2. Overall SLR process

Table 5. Fields of studies and institutions for final papers

ID	Citation	Field of Study	Institutions
R1	[8]	University website	Telkom University, Indonesia
R2	[11]	University website	University of Kanjuruhan Malang, Indonesia
R3	[30]	Academic libraries	Nigerian academic libraries
R4	[31]	University website	Nigerian University
R5	[32]	University website	Iranian state university
R6	[33]	Course website	National Taiwan Ocean University
R7	[34]	University website	Tanzanian Public University
R8	[35]	College library website	Institute of Science and Technology, China
R9	[36]	University website	Delft University of Technology, Netherlands
R10	[37]	University website	Institut Teknologi Sepuluh Nopember Surabaya, Indonesia
R11	[38]	University website	X University, USA
R12	[39]	University website	University of Bari's, Italy
R13	[40]	University website	118 Portuga universities
R14	[41]	University website	Malaysian Universiti
R15	[42]	University libraries	Maharaja Sayajirao University
R16	[43]	University website	Kenyan University
R17	[44]	Research institute	X Agency
R18	[45]	University website	Jember University, Indonesia
R19	[46]	Higher education services	LL-Dikti IV
R20	[47]	University website	Eastern Samar State University, Philippine
R21	[48]	University website	Universities in Indonesia
R22	[49]	University website	Universitas Sumatera Utara, Indonesia
R23	[50]	University website	Three Jordanian universities
R24	[51]	Language center websites	Mulawarman University

2.2.5. Data synthesis

The quality factors were identified from the 24 relevant research based on user perspectives. Data coding technique was used to label and organize the factors into themes. From 24 studies, 79 quality factors were extracted. Based on the similarities and differences of data codes, a constant comparison was performed. To identify the similarities, filtration was done based on explicit and implicit duplication. Explicit duplication is the clear duplication using the same code. For example, code for 'Usability' that appeared in many papers will be included once. Implicit duplication is the difference code that has the same meaning. For example, 'information quality' and 'content quality' have the same meaning. After removing duplications and applying memoing technique, six quality factors were generated as in Table 6.

Table 6. The list of universities websites quality factors

No.	Quality factors	Study ID
1	Information quality	R10, R22, R8, R3, R9, R4, R5, R11, R13, R20, R1, R14, R19, R15, R16
2	Specific content	R10, R8, R9
3	Usability	R10, R22, R8, R3, R9, R4, R5, R11, R6, R12, R13, R1, R14, R19, R15, R7, R16
4	Web appearance	R10, R22, R3, R9, R20, R1, R14, R19
5	Service interaction quality	R3, R4, R5, R11, R6, R12, R13, R1, R15, R16
6	Functionality	R8, R4, R6, R12, R20, R1, R14, R7

3.   RESULTS AND DISCUSSION

In this section, we talk about how this work can be helpful for research communities. This work also leads to some possible future work areas. This research was conducted to answer three main research questions:

3.1. To investigate the issues of evaluating the quality of universities' websites

Table 7 presents the issues of evaluating universities' websites quality. The findings indicate that there is still a lack of study on university websites quality compared to business websites [33], [34]. From the developers aspects, some of the designers did not have the appropriate knowledge of usability engineering and user interface design which affect the quality of the websites. The most common issue is related to website evaluation aspects since website quality evaluation is complex and multidimensional and there is no specific evaluation model for university websites. The evaluation of universities' websites differs from other websites, in terms of structure and content. Besides, the factor of priorities and weights depend on the website type [11], [12], [52]-[54]. For example, user interface and atractiveness are essential factors to attract more consumers to an e-commerce website [55]. Conversely, information quality is more important for educational website [10], [56]. Moreover, there is often an overlapping among factors and sub-factors [57] which generally happens for the models inspired by software quality standards [5], [57]. For example, 'efficiency' is the main factor in ISO 9126 model, but it is a subfactor in the WebQual 4.0 model. Additionally, several website quality evaluation models are not scalable in terms of indicators [5], [58]. The possibility to focus only on some quality factors or sub-factor while ignoring the others, is generally not kept into consideration [1], [59]. It is challenging to evaluate the quality of university website as various types of different indicators affect the website's design [60].

Table 7. The issues of evaluating universities websites quality

Main Issues	Issues	Paper ID
Researchers interest	- Most of the research on website quality mainly focused on business websites but lacks on university websites.	R5, R6
	- Most of the research focused on the quality from developer and designer perspective with little work on user perspectives.	R1
Problems from website developers aspects	- Many university website designers did not have the appropriate knowledge of usability engineering and user interface design. They caused unnecessary traffic on the internet and also inconsistent in terms of colors, structure, and fonts.	R2, R15
	- Many university websites have problems in terms of accessibility, functionality, security, web appearance, and the quality of the content.	R2, R3, R18, R21, R22
Problems from website evaluation aspects	- Website quality evaluation is complex and multidimensional.	R1, R2, R3, R4, R14
	- There is no specific evaluation model for university websites that takes into account the needs of different user groups.	R6
	- The standard of evaluation website quality is still limited.	R10, R15
	- General models have often been applied to assess the quality of academic websites, but they do not consider the requirements of specific stakeholders of the website.	R6, R15
	- Limited academic research on the overall website quality and most of them concentrate on a specific topic on quality such as usability.	R1, R3, R10, R15, R21

3.2. To identify the base model or aspect for evaluating the quality of universities' websites

Table 8 and Figure 3 illustrate the distribution of models or aspects of criteria used to evaluate the university website quality. There are 11 evaluation models were extracted from this SLR. The most frequent model used to measure the quality was WebQual 4.0 (46%), followed by ISO/IEC 9126 (13%).

3.3. To investigate factors and indicators to evaluate the quality of universities' websites

79 quality factors from 24 studies have been extracted in this SLR. After removing duplications and applying memoing technique, six quality factors were identified: Information quality, specific content, usability, web appearance, service interaction quality, and functionality. Besides the factors, this study also identified the indicators for each factors as listed in Table 9.

Table 8. Base model for website quality evaluation

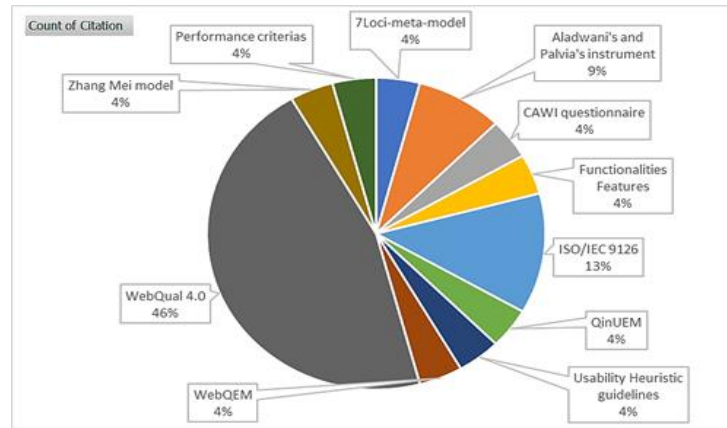| Base Model	Study ID	Base Model	Study ID
Aladwani's and Palvia's instrument	R1, R5	QinUEM	R14
7Loci meta-model	R15	Usability Heuristic guidelines	R2
CAWI questionnaire	R13	WebQEM	R9
Functionalities features	R3	Zhang Mei model	R11
ISO/IEC 9126	R6, R10, R17	WebQual 4.0	R4, R7, R8, R16, R18, R19, R20, R21, R22, R23, R24
Performance criterias	R12		

Figure 3. Base model for website quality evaluation

Table 9. List of factors and their indicators

Factor	Indicators	Factor	Indicators
Information Quality	1. Usefulness	Web Appearance	1. Attractiveness
	2. Completeness		2. Changing look
	3. Clarity		3. Proper use of fonts
	4. Currency		4. Proper use of colors
	5. Information accuracy		5. Appropriate use of images
	6. Information believable		6. Proper use of multimedia
	7. Information relevant		7. Style consistency
	8. Information detail		8. Proper choice of page length
	9. Information uniqueness		9. Good labeling
	10. Information broadness		10. Text-only option
	11. Information originality		11. Proper use of language
	12. Variety information		12. Good labeling
Specific Content	1. Research interest & achievement		13. Text-only option
	2. Student portal		14. Enjoyment
	3. Course description		15. Noticeable logo
	4. Timetable		16. Logical structure
	5. Contact information	Service Interaction Quality	1. Good reputation
	6. General information		2. Secure transaction
	7. Brochure		3. Secure information
	8. Admissions		4. Personalization
	9. Academic policies		5. Sense of community
	10. Research information		6. Responsiveness
	11. Frequently used forms		7. Trust
Usability	1. Easy to learn to operate		8. Recoverability
	2. Miscellaneous features		9. Availability
	3. Easy to navigate		10. Non-deficiency
	4. Easy to use		11. Additional services
	5. Competent	Functionality	1. Searching and retrieving
	6. Creates a positive experience		2. Suitability
	7. Use of special plug-ins		3. Student-oriented domain features
	8. Anonymity		4. Effective
	9. Browser sniffing		5. Accessibility
	10. Interactivity		6. Portable device compatibility
	11. Multi-language		7. Visibility features
	12. Page Speed		8. Bookmark facility
	13. Links visibility		9. Stability
	14. Alternative paths		10. Changeability
	15. User-Friendliness		11. Interoperability
			12. Flexibility

4. CONCLUSION

This paper employed SLR to search for papers related to university website quality by addressing the following research questions: RQ1: What are the problems in evaluating the quality of universities' websites? RQ2: What is the base model used to evaluate the quality of universities' websites? RQ3: What are the factors and indicators being used to evaluate the quality of university websites? Regarding the issues for university website quality evaluation, a variety of evaluation criteria have been used. 24 final papers were considered eligible after the inclusion/exclusion process and quality assessment. Majority issues of university websites quality were related with website evaluation aspects since website quality evaluation is complex and multidimensional. Majority studies used the Webqual 4.0 as the base model to evaluate the universities website where information quality, usability, and service interaction quality are the factors for Webqual 4.0 model. From the final articles, 79 factors were identified to evaluate the university website quality. After removing duplications and applying memoing technique, six quality factors were identified which are information quality, specific content, usability, web appearance, service interaction quality, and functionality. These identified website quality factors extend the factors used for Webqual 4.0 by adding specific content, web appearance, and functionality as the important factors to measure university website quality. With regard to future work, the researcher is interested to validate the factors and indicators identified from this SLR with experts in order to develop the university website quality model.

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