Integrating System Quality, Information Quality, and Service Quality for Evaluating IS Quality

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Abstract. Ensuring quality is crucial for attaining efficiency, user happiness, and overall system success in the field of Information Systems (IS). This research explores the integration of System Quality, Information Quality, and Service Quality by fusing the characteristics to develop an integrated framework to evaluate IS quality. Information systems play a vital role in attaining a range of diverse objectives across many contexts, and their evaluation extends beyond technical aspects to incorporate factors such as user satisfaction, data accuracy, and service quality. Interrelationships are found, dimensions are matched, and a comprehensive conceptual framework is created through this study. We then integrate the framework with quality standards that are used to evaluate IS, such as Quality in Use (ISO 25010), Data Quality (DMBOK), and Service Quality. In conclusion, this study emphasizes the need for a comprehensive framework for evaluating IS Quality. In future research, this framework will be used to evaluate real scenarios of information systems.

Keywords: Delone and McLean, Data Quality, Information Systems Quality.

1 Introduction

Information system refers to a comprehensive collection of software applications that are managed by information technology with the purpose of facilitating the achievement of individual, group, corporate, or community objectives [1]. Information systems is used to acquire, manipulate, retain, evaluate, and distribute data [2]. The primary objective of information systems is to enhance productivity and efficiency within organizational contexts [3]. In light of advancement of information systems, every organizations are engaged in a competitive quest to develop comprehensive and efficient information systems to support their business processes [4].

The evaluation of Information Systems (IS) quality is a complex task that involves various dimensions and elements that are essential for the system's efficacy, user contentment, and overall influence on the company. The evaluation encompasses not solely the technical efficacy of the system, but also its congruence with user requirements, the precision of the data it handles, and the caliber of the services it offers. The assessment process seeks to assess the degree to which the information system (IS) effectively achieves its intended objectives, promotes user efficiency, and contributes to the

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attainment of organizational objectives. This entails the evaluation of various aspects like usability, information quality, and the effectiveness of service quality. To ensure a comprehensive evaluation of information systems (IS), it is essential to adopt a holistic perspective that encompasses various interconnected factors, namely System Quality, Information Quality, and Service Quality. Recognizing the interdependence of these dimensions is crucial, as they collectively contribute to the overall success of the system. By utilizing a range of models, standards, and procedures, businesses have the ability to methodically evaluate the quality of information systems. This process allows them to identify specific areas that require enhancement, enabling them to make well-informed decisions that result in improved user experiences and optimal data management.

2 Literature Review

2.1 System Quality

System quality measures information system effectiveness, affecting software and data components, and ensuring successful implementation of information systems [5]. System quality is a metric used to assess the overall quality of an information system, taking into account both its hardware and software components. It refers to how effectively the information system's hardware, software, policies, and other operational components fulfill the users' information demands [6]. It represents the website's technical ability to provide users with simple and rapid access to information while assuring its reliability and security [7]. Users are highly motivated to implement and utilize systems that can deliver the optimum technical efficiency and expected precision [8]. The following Fig 1 is the quality dimensions.

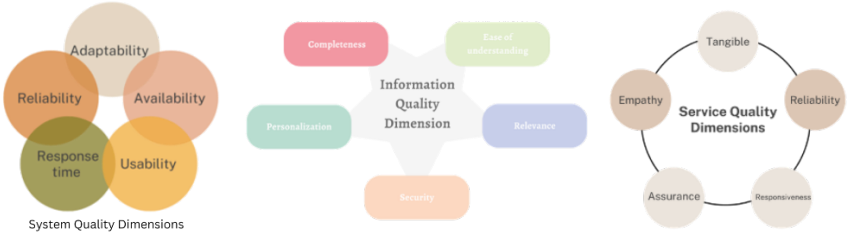

Fig. 1. Quality Dimensions

2.2 Information Quality

Information quality involves managing reports and web pages, providing documentation and give supports to customers [9]. Information is data that has gone through management and processing in order to derive significance and enhance the decision-making process, surpassing the necessary criteria and boosting the quality of the information [10]. Data is related to the display of information in many forms such as textual content, numerical values, visual elements like graphics, photographs, auditory

components like sounds, or audiovisual recordings [11]. High quality data needs to be maintained, because: data is a very valued asset that has significant inherent value, there is a beneficial connection between improving data quality and increasing customer happiness, enhancing the quality of data has the capacity to enhance both revenue and profitability, and the improvement of data quality might be strategically interpreted as a competitive strategy or advantage [12]. Information Quality Dimensions [13] are, Security which means the extent to which a customer believes its secure [14]. Personalization, Completeness, Ease of understanding and Relevance.

2.3 Service Quality

Service Quality is one of the IS Success Model by Delone & McLean. Service quality Ensuring the satisfaction, expectations, and fulfilment of users. [15]. Service quality encompasses the manner and attributes of a service that effectively fulfil the needs and desires of clients, hence achieving or meeting their anticipated standards. The process entails the continual adaptation of expectations, allocation of services based on customer expectations, and the provision of consistent service quality [16]. Service quality is defined as an accurate and trustworthy performance, with reliability being crucial for organizational trust [5].

The Service Quality indicators [13] are, first, Tangible it means that it has up-to-date hardware and software. Second, Reliability it means that its dependable. Third, Responsiveness it means that it give swift service to users. Fourth, Assurance it means that employees have the knowledge to do their job well. Lastly, Empathy it means that it has users' best interests at heart.

It is said that "IS success is a multidimensional and interdependent construct—and that it is therefore necessary to study the interrelationships among, or to control for, those dimensions. Researchers should systematically combine individual measures from the IS success categories to create a comprehensive measurement instrument" [13]. The statement implies that while particular metrics are helpful in and of themselves, they might not completely and accurately reflect an IS's success or performance as a whole, we can conclude that a comprehensive and integrated methodology is necessary for evaluating Information Systems (IS).

3 Methodology

This research uses qualitative data collection techniques in the form of literature studies for the integrated frameworks. The concept of research validity refers to the line between what is intended to be studied and what is actually being studied. If the questions used in a study do not align with the desired objectives, the resulting conclusions may be deemed invalid [17]. The validity of a qualitative study can be measured by [18], Confirmability, it provides a comprehensive understanding of data collection, processing, transformation, and presentation, demonstrating self-awareness and self-awareness regarding personal assumptions, values, biases, and emotional emotions. It considers various hypotheses and alternative conclusions, preserving data for future reevaluation, and connecting conclusions to the obtained data. Dependability, The

research questions are clear and the methodology is consistent. The researcher's position is clearly defined, and the findings show consistent patterns across data sources. The study uses fundamental paradigms and analytical conceptions, systematically gathering data from diverse locations, periods, and participants. Intercoder agreement tests are conducted when necessary, and data quality checks are systematic. Various forms of peer or colleague review have been implemented. Credibility, provides contextually rich and relevant descriptions of existing and new theoretical categories, with measures effectively capturing underlying variables. The findings are clear, coherent, and systematically connected, with well-defined methods to validate claims, propositions, hypotheses, and conclusions. The study identifies areas of uncertainty and seeks negative evidence. Participants deemed the results accurate, and if predictions were made, their accuracy is recorded. And Transferability, the ability of a study's findings to be applied to other settings or populations. It involves providing a comprehensive explanation of the original sample's features and any limitations in the selection process. This study's sampling methodology has high theoretical diversity, enhancing its generalizability. The theory's potential for transferability is outlined, along with recommendations for future empirical investigation. If feasible, the findings are replicated in subsequent research to evaluate their robustness.

4 Results

4.1 Exploring Quality Dimensions Overlap and Relationships

Exploring the overlap and interrelationships between various quality dimensions is essential to comprehend the complexity of information systems evaluation. Examining how quality in use, data quality, and service quality interact and influence one another within the context of evaluating information systems yields valuable insights. By investigating these connections, researchers can identify synergies that improve the overall efficacy of an integrated evaluation framework. This investigation helps not only in identifying potential conflicts or trade-offs, but also in identifying areas where advancements in one dimension may have positive effects in other dimensions. Understanding how advances in data quality contribute to increased user satisfaction or how optimized service quality can positively affect the perception of quality in use can facilitate more strategic decision-making in system development and management, for instance. As the dimensions are frequently interdependent, elucidating their interrelationships promotes a deeper comprehension of the holistic impact of information systems, thereby enabling more informed and well-rounded evaluations.

Table 1, shows the dimensions of System Quality, Information Quality, and Service Quality based on the paper we found. From it, we integrate with standards of that is commonly use to evaluate information Systems Quality. ISO 25010 [19] has been used to evaluating the quality of a website [20], agricultural electronic services [21], measuring the public value of UX on a website [22], and applications [23–28]. DMBOK from The Data Management Body Knowledge (DMBoK) [29], has been used to evaluating the data quality of applications [12] and to measure data management quality maturity [30]. ISO 25012 has been used to evaluate data quality [31–33]. Service

Quality are used so we could have an in-depth focus to meets its users expectations. It shows that there are dimensions that overlap between System Quality, Information Quality, and Service Quality with Quality in Use, Data Quality, and Service Quality.

YS: Yes
NS: No

Table 1. Quality Dimensions and Standards

Quality	Dimensions	Reference	Quality in Use	Data Quality	Service Quality
System Quality	Reliability	[34–51]	NS	NS	**YS**
	Flexibility	[34, 38, 42–46, 50, 52–64]	**YS**	NS	NS
	Accessibility	[7, 34, 38–40, 47–49, 51, 56, 60, 65–67]	NS	NS	NS
	Timeliness	[34]	NS	NS	NS
	Speed	[36, 40, 41, 43, 46, 52, 68]	NS	NS	NS
	Ease of use	[7, 35, 38–46, 48, 50, 52–55, 57–59, 61, 62, 64, 66–76]	NS	NS	NS
	System features	[42, 46, 52, 77]	NS	NS	NS
	Accuracy	[46, 52, 78, 79]	NS	**YS**	NS
	Usefulness	[7, 38, 65, 71]	**YS**	NS	NS
	Understandable	[40, 53–55, 57–59, 69, 74, 76]	NS	NS	NS
	Functionality	[37, 42, 48, 49, 56, 64, 66]	**YS**	NS	NS
	Efficiency	[37, 52, 79]	NS	NS	NS
	Response Time	[38, 39, 44, 45, 48, 50, 63, 67, 73, 80]	NS	NS	NS
	Comfortable	[57]	**YS**	NS	NS
	Availability	[43, 68]	NS	NS	NS
	Currency	[78]	NS	NS	NS
	Completeness	[78]	NS	**YS**	NS
Information Quality	Completeness	[7, 34, 37, 40, 42, 45, 46, 50, 51, 63, 70–72, 75, 79, 80]	NS	**YS**	NS
	Accuracy	[7, 34, 36–38, 41, 44, 45, 47–51, 53, 55–62, 64–66, 73, 75, 76, 79–82]	NS	**YS**	NS
	Format	[7, 34, 45–48, 63]	NS	**YS**	NS
	Currency	[34, 54, 63]	NS	NS	NS
	Availability	[37, 44, 46, 52, 66, 67, 69]	NS	NS	NS
	Relevance	[7, 37, 39, 40, 42, 43, 45, 46, 49–56, 58–61, 64, 67, 68, 70, 73, 75, 82]	NS	NS	NS
	Timeliness	[38, 46, 49, 56, 61, 62, 64]	NS	**YS**	NS
	Security	[39, 40, 46, 52, 66, 78, 82, 83]	NS	NS	NS
	Reliability	[36, 41, 44, 52, 57, 63, 65, 66, 72, 76, 80, 81]	NS	NS	**YS**
	Organized	[41, 53–55, 57, 58, 69, 77]	NS	NS	NS
	Accessibility	[35, 40, 79, 82]	NS	NS	NS
	Understandability	[35, 37, 39–42, 46, 50, 51, 67, 68, 70–72, 75, 79, 82]	NS	NS	NS
	Usability	[35, 41, 46, 57, 62, 64, 66, 72, 73, 82]	NS	NS	NS
	Trust	[56, 61, 83]	**YS**	**YS**	NS
	Functionality	[42]	NS	NS	NS
	Flexibility	[47]	**YS**	NS	NS
	Ease of Use	[83]	NS	NS	**YS**
Service Quality	Tangibles	[7, 34, 37, 40, 42, 45, 46, 50, 51, 63, 70–72, 75, 79, 80]	NS	NS	**YS**
	Reliability	[7, 34, 36–38, 41, 44, 45, 47–51, 53, 55–62, 64–66, 73, 75, 76, 79–82]	NS	NS	**YS**
	Responsiveness	[7, 34, 45–48, 63]	NS	NS	**YS**
	Empathy	[34, 54, 63]	NS	NS	**YS**
	Service Reliability	[37, 44, 46, 52, 66, 67, 69]	NS	NS	NS
	Assurance	[7, 37, 39, 40, 42, 43, 45, 46, 49–56, 58–61, 64, 67, 68, 70, 73, 75, 82]	NS	NS	**YS**
	Support	[38, 46, 49, 56, 61, 62, 64]	NS	NS	NS
	Functionality	[39, 40, 46, 52, 66, 78, 82, 83]	NS	NS	**YS**

Quality	Dimensions	Reference	Quality in Use	Data Quality	Service Quality
	Interactivity	[36, 41, 44, 52, 57, 63, 65, 66, 72, 76, 80, 81]	NS	NS	NS
	Ease to use	[65]	NS	NS	NS
	Providing Guidance & Training	[7, 35, 36, 38, 40, 42, 45, 46, 48, 53–55, 57–59, 69–73, 75–77, 81]	NS	NS	NS
	Fair Understanding	[42, 48, 53, 55, 58, 60]	NS	NS	NS
	Staff Availability	[41, 53–55, 57, 58, 69, 77]	NS	NS	NS
	Timeliness	[35, 40, 79, 82]	NS	NS	NS
	Competences	[35, 37, 39–42, 46, 50, 51, 67, 68, 70–72, 75, 79, 82]	NS	NS	NS
	Security	[35, 41, 46, 57, 62, 64, 66, 72, 73, 82]	NS	NS	NS
	Privacy	[35]	NS	NS	NS
	Technical Ability	[35, 42, 48]	NS	NS	NS
	Present	[37]	NS	NS	NS
	Guarantee	[56, 61, 83]	NS	NS	NS
	Readiness	[43]	NS	NS	NS
	Evaluation	[43]	NS	NS	NS
	Feature availability	[43]	NS	NS	NS
	Technical Support	[42]	NS	NS	NS
	Availability	[42]	NS	NS	NS
	Maintenance	[46, 60]	NS	NS	NS
	individual focused	[47]	NS	NS	NS
	Up-to-date	[47]	NS	NS	NS
	Dependable	[79]	NS	NS	NS
	Simplification	[49]	NS	NS	NS
	time reduction	[49, 63]	NS	NS	NS
	Effectivity	[83]	**YS**	NS	NS

4.2 Constructing the Integrated Framework for Evaluation

The construction of the Integrated Framework for Evaluation involves a meticulous process of combining the System Quality (Quality in Use), Information Quality (Data Quality), and Service Quality models into a unified and exhaustive framework for evaluating the quality of information systems. We chose Quality in Use, Data Quality by DMBOK, and Service Quality because it's relevant and the latest quality model to evaluate information systems. By combining the assets of each individual model, this endeavor seeks to produce a holistic perspective. The procedure entails a series of systematic stages, including a comprehensive analysis of the three models, the identification of common elements among them, the alignment of dimensions and metrics, the synthesis of a conceptual framework, the creation of a hierarchical arrangement, and the visual representation of the integration. Subsequently, this integrated framework is tested against real-world scenarios to ensure its efficacy and modified in response to expert feedback.

Exhaustive documentation clarifies the composition, rationale for integration, and application guidelines of the framework. As the integrated framework is used to evaluate information systems in specific contexts, its outcomes are analyzed and its ability to provide a holistic view of system quality is evaluated. Ultimately, the success of the construction of this integrated framework depends on a thorough understanding of the individual models and a deliberate approach to their combination, which could yield a potent instrument for evaluating the quality of information systems tailored to the specific context of the study.

Table 2. The Integrated Framework

Quality	Dimensions
Quality in Use	Efficiency
	Usefulness
	Trust
	Comfortable
	Flexibility
	Effectivity
Data Quality	Completeness
	Accuracy
	Currency
	Availability
	Timeliness
Service Quality	Tangibles
	Reliability
	Responsiveness
	Empathy
	Functionality

Table 2 shows the proposed integrated framework, which in the future research will be used to evaluate information systems quality. Preferably in e-Government sector, due to the complexity of electronic government services and the number of stakeholders engaged, the application of an integrated framework is particularly essential in the e-government sector. In this context, an integrated framework that combines the Quality in Use, Data Quality, and Service Quality provides a comprehensive evaluation methodology for information systems. E-government initiatives comprise a vast array of services designed to improve public service delivery, citizen participation, and administrative efficacy. Complex interactions between technology, data, and service delivery mechanisms are required for such initiatives. Using an integrated framework, e-government agencies can thoroughly evaluate not only the technological functionality of systems, but also the quality of services provided and the dependability of underlying data.

5 Conclusions

The evaluation of Information Systems (IS) quality has become an challenging task in a dynamic environment shaped by rapid technical progress. This process extends beyond basic technical expertise, embracing dimensions such as Systems Quality, Information Quality, and Service Quality. It is essential to incorporate these elements into an integrated framework in order to conduct a thorough evaluation that aligns with the intricate characteristics of contemporary information systems. The relation between Systems Quality, Information Quality, and Service Quality indicators can give a broader meaning when evaluating information systems. The interaction between these factors promotes a holistic perspective on information systems quality, enabling well-informed decision-making, efficient system development, and improved user experiences. Organizations can achieve enhanced efficiency, user satisfaction, and organizational success by adopting an integrated approach that recognizes the interrelationships

among Systems Quality, Information Quality, and Service Quality within contemporary information systems. In the current context, where information systems play a crucial role in the functioning of enterprises and governance, the presence of a comprehensive and cohesive evaluation framework is essential. This framework serves as a vital instrument in ensuring that technology acts as a catalyst for advancement. There are still a number of directions that may be investigated further, Future studies could delve further into the application of the integrated framework in actual circumstances.

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