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Measurement Items Validation for Investigating the Success of Cloud Enterprise Resource Planning Implementation

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Abstract

The successful implementation of Cloud Enterprise Resource Planning (ERP) systems is crucial for organizations seeking operational optimization and technological advancement. Researchers from various organizations and industries have investigated critical success factors for Cloud ERP implementation using different theories. However, further research is needed to explore the implementation of Cloud ERPs, particularly for organizations of various sizes and contexts. Therefore, this study introduces five dimensions that include thirteen factors. Additionally, it identifies the measurement items that facilitate assessing Cloud ERP implementation success using the Delone and McLean Information Success (D&M IS) model and previous literature. This study aims to validate and confirm the measurement items for successful implementation factors of Cloud ERP. To validate the measurement items, five experts with related expertise reviewed the items based on their relevance and simplicity. All items and the entire scale passed the acceptable standard for validity. The study's contribution lies in its delivery of an instrument for assessing the success factors of Cloud ERP implementation and its applicability in various contexts.

Keywords: Measurement Items, Content Validity, Success Factor, Cloud ERP Implementation

Introduction

Enterprise Resource Planning (ERP) is an application for all-size businesses. ERP automates processes, centralizes data, integrates systems, and helps businesses save resources, adapt to changes, enhance customer service, secure data, and manage budgets (Ongowarsito et al., 2021). Therefore, in contrast to traditional ERP systems, a cloud-based ERP system integrates and automates essential financial, operational, and business processes. Moreover, it provides real-time access to business information anywhere and on any device (Haddara et al., 2022). One aspect of the success of Cloud ERP implementations is determined by the importance of using valid and reliable tools to measure the factors for several reasons. Initially, studying the

success of Cloud ERP implementation aids organizations in recognizing the critical success factors (CSFs). Through understanding these factors, organizations can focus their efforts and resources on areas most likely to lead to successful outcomes. Furthermore, measuring success allows organizations to evaluate the impact of Cloud ERP systems on their business model and processes (Nguyen & Luc, 2018). This evaluation helps organizations determine whether the implementation has achieved the desired improvements in functional efficiencies and overall business performance.

In addition, identifying the success factors gives organizations perceptions of the benefits and risks associated with Cloud ERP implementations (Tongsuksai et al., 2019). Consequently, this information can guide decision-making and help organizations make informed choices about implementing Cloud ERP systems.

Despite several theoretical foundations used to explore the success factors of Cloud ERP, the theories focused only on internal organizational and technological factors. However, the De Lone and McLean (D&M) IS model was employed in this study due to its suitability for examining current phenomena and its popularity in IS successful implementation research. This research includes five dimensions: information quality, Services Quality, System Quality, Support quality, and Process Quality. Hence, practical measurement items are needed to investigate the success of Cloud ERP implementations based on the proposed dimensions. The motivation for this research stems from addressing unique issues and improving the effectiveness of the implementation of cloud ERPs, and the quality dimension holds additional significance due to the necessity for systems that are reliable, and efficient, which is crucial for the successful implementation of cloud ERPs and enhance ERP implementation and management. This study answers the question: “What potential measurement items can be derived to evaluate the cloud Enterprise Resource planning systems implementation success?” and “How can the measurement items be validated?”. The following sections include the literature review, methodology, proposed conceptual model, results and discussion, and conclusions.

Literature Review

Various studies have explored different models and frameworks for assessing the success of ERP implementation. Prior research has particularly emphasized cloud ERP implementation success factors and measurement, highlighting critical success factors (CSFs) like security, project management, and communication (J. A. Gollner & Baumane-Vitolina, 2016). These studies have also identified organizational, environmental, technological, and individual characteristics as key factors influencing the successful implementation of cloud ERP systems. However, there is a need for further research to clarify the criticality of these CSFs, as current findings are inconclusive (Huang et al., 2021). The literature underscores the importance of a more logical and systematic approach to exploring CSFs in cloud ERP implementations, emphasizing the necessity for continued research and the development of measurement frameworks to enhance understanding and evaluation of cloud ERP system implementation success (Huang et al., 2021).

Different theories and models are used to investigate the adoption and implementation of information systems at the individual and organizational levels. These theories provide an explanation and investigation of the phenomena. The most influential theories used in

information system success in general and cloud ERP successful implementation studies (TOE, FVM) are the fit-viability model and the technology organization environmental theory. Other studies used an updated De Lone & Mc Lean information system success (Nguyen & Luc, 2018). Fundamentally, De Lone and McLean's model significantly contributes to the literature on evaluating the success of information systems (IS). It was one of the first theories to provide some structure to selecting success measures by IS researchers (DeLone & McLean, 1992, 2003).

Moreover, Al-Kofahia et al. (2020) conducted a review using the DeLone and McLean IS Success Model, highlighting that developing countries mainly provide primary data on e-government, ERP, and e-learning systems, using surveys and cross-sectional methods. Researchers highlight a lack of longitudinal studies and the use of homogeneous samples. further exploring the updated D&M model is essential. The theory needs to be examined for measuring cloud ERP success in developing nations like Africa. Developing regions face unique challenges where quality dimensions hold significance, requiring attention to ensure successful ERP implementations, driving technological adoption and economic growth.

Research Methodology

Four steps were involved in the research methodology for this paper:

Step 1: A comprehensive literature review was conducted to achieve the objective of the study. By working on a thorough literature review focused on literature analysis, empirical data, and industry case studies, considering related theories, on Cloud ERP implementation success factors and the Delone & Mclean Information Success Model and looking for studies that have used the DM IS Model to assess the success of similar IT implementations, including Cloud ERP systems.

Step 2: Extraction of Measurement Items Derivation in general and related to Delone McLean Information Succusses theory 2003 in specific system quality and services quality dimensions.

Step 3: Adapting measurement items from the literature that align with the study's purpose.

Step 4: Step 4: Validation of the content.

A Proposed Conceptual Model

The development proposed model focused on two focal variables: System use and Successful Implementation of Cloud ERP, see Figure 1. In addition, this study used five dimensions with thirteen factors identified and extracted from previous cloud ERP implementation studies. It was selected precisely by looking into research objectives and problem phenomena. Understanding and evaluating the success of Cloud ERP implementations is crucial, with the DeLone and McLean Information Systems Success Model (DM IS Model) providing a comprehensive assessment framework. This study focused on five dimensions: information quality, system quality, and service quality. Additionally, process and support quality were proposed to address the context of a large African governmental organization.

Process quality represents the overall process of enhancing organizational factors for successful implementation, including internal factors such as process transformation, top management support, and project management quality. Ensuring high process quality is essential for the efficient operation of cloud ERP systems. This includes standardizing business processes, streamlining workflows, and enhancing overall efficiency. Involving internal

stakeholders, such as employees and managers, is critical for maintaining process quality, as it promotes collaboration and successful implementation. Process quality plays a direct role in maximizing the benefits of the cloud ERP system, enabling organizations to enhance decision-making, visibility, and agility.

The support quality dimension in cloud ERP implementation refers to the ability of providers and external parties to offer cooperative services and high-quality support, beyond just core technological factors, which can significantly contribute to the successful implementation of cloud ERP systems. Their expertise can provide specialized knowledge, experience, and support, enabling organizations to overcome challenges and transition smoothly. This is critical for success in Africa, where the availability of good vendors and consultants is still limited.

Each dimension encompasses specific factors. For example, support quality includes Consultant commitment and Vendor reputation. Additionally, the system quality dimension contains Interoperability, customizability, and integration. Furthermore, service quality factors include Flexibility, Reliability, and Rapport. The information quality dimension includes information accuracy and information format, while the process quality incorporates Business Process Transformation, project management, and Top Management Support. These factors collectively form an initial Cloud ERP implementation success model. Integrating these factors and dimensions into measurement items offers a practical approach to assess various aspects of Cloud ERP implementation success, enhancing our understanding of outcomes resulting from Cloud ERP system adoption. Figure 1 illustrates the proposed model for this study.

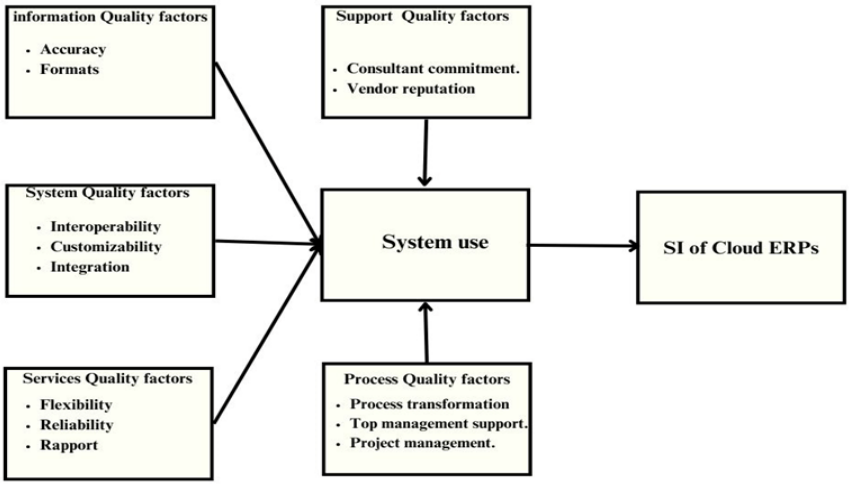

Figure 1. The Proposed Model

Results and Discussions

Measurement Items Derivation

Table (1) presents the measurement items to test the model using a survey. It was derived from integrating Cloud ERP implementation success factors and the dimension of the DM IS Model. These measurement items offer feasible means to assess various aspects of Cloud ERP

implementation success and contribute to a more comprehensive understanding of the outcomes of adopting Cloud ERP systems.

Table 1
Factors and the Measurement Items

Dimension	Factor	Code	Measuring Items	References
Support Quality	Consultant commitment	CC_1	Good relationships and communication between parties	(Bawack & Kala Kamdjoug, 2022; Ifinedo, 2006)
		CC_2	Conflict resolutions.	
		CC_3	Ability to transfer his knowledge to the organization.	
		CC_4	Consultant documentation for the CERP Project should be tailored to the organization's needs.	
	Vendor reputation	VR_1	perceived ability of the software vendor to provide customer service and support.	(Ifinedo, 2006; eethamraju, 2015
		VR_2	Perceived software ability to support processes and workflow.	
		VR_3	Offer opportunities for value co-creation. (Co-creation of value)	
		VR_4	Ensure services compliance with regulatory requirements.	
Information Quality	Information Accuracy	IA_1	Information output Complete	(Gable *et al.*, 2008; Ifinedo, 2006; Iivari, 2005)
		IA_2	Information output Concise	
		IA_3	Information output useful in our daily jobs	
		IA_4	Information output Relevant for decision-making use.	
	Information Format	IF_1	Good appearance and format	(Ifinedo, 2006)
		IF_2	Comparable to other outputs (consistency)	
		IF_3	Easily to understand	
		IF_4	adaptable to different devices.	New
System Quality	Interoperability	IN_1	Communicate between different applications.	(Picek *et al.*, 2017)
		IN_2	Communicate between different cloud vendors.	
		IN_3	Communicate Transparently with other systems.	
		IN_4	Exchange the data internally and externally.	
	Customizability	CU_1	The system can be easily tested, modified, and upgraded.	Gable et al., 2008 Ifinedo, 2006)

Content Validation

Content validity is crucial in research methodology, particularly in the development of questionnaires, surveys, and assessment tools. The questionnaire goes through validation using content assessments. Content validity was drawn from prior literature and validated instruments. Experts who specialize in Information Systems and Cloud ERP systems evaluated the relevance and simplicity. The Content Validity Index (CVI) method was used to ensure the content validity of our measurement instrument. This involved calculating two types of CVI: Item-level Content Validity Index (I-CVI) and Scale-level Content Validity Index (S-CVI). I-CVI assessed individual item validity, while S-CVI evaluated overall questionnaire validity. A 4-point ranking scale was used to measure the relevance and simplicity of each construct (Yusoff, 2019).

The I-CVI is calculated by dividing the number of experts who rated an item as 3 or 4 by the total number of experts. A rule of thumb is that with a group of five or more experts, the I-CVI for each item should not be below 0.79 to consider an item acceptable. The S-CVI can be measured in two ways. One method, S-CVI/UA, is considered acceptable to have a value of 0.80 or higher for S-CVI/UA. Another method, S-CVI/Ave, averages the I-CVIs for all items, and S-CVI/Ave typically exceeds 0.90 when demonstrating excellent content validity (Madadizadeh & Bahariniya, 2023). Table 2 shows the evaluation by 5 five experts. Recommendations after meeting and discussion were considered to delete two constructs with their items, and two new constructs were added. After that, the modified questionnaire was revalidated by the same expert. Meetings were held to agree on the modifications of the items. This ensured that the questionnaire's content validity was confirmed, and the revised questionnaire was prepared for the next step.

Table 2
Content Validity Index Evaluation by Experts

Construct	Items	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	1-CVI	UA	Agreem
Consultant Commitment	CC_1	1	4	4	4	3	0.8	0	Accepta
	CC_2	2	4	4	4	3	0.8	0	Accepta
	CC_3	2	3	4	4	4	0.8	0	Accepta
	CC_4	2	3	4	4	4	0.8	0	Accepta
Vendor Reputation	VR_1	1	4	4	4	3	0.8	0	Accepta
	VR_2	1	4	4	4	3	0.8	0	Accepta
	VR_3	4	4	4	4	3	1	1	Accepta
	VR_4	4	4	4	4	4	1	1	Accepta
Information Accuracy	IA_1	3	4	4	4	4	1	1	Accepta
	IA_2	3	4	4	4	4	1	1	Accepta
	IA_3	3	4	4	4	4	1	1	Accepta
	IA_4	3	4	4	4	4	1	1	Accepta
Information Format	IF_1	3	4	4	4	4	1	1	Accepta
	IF_2	3	4	4	4	3	1	1	Accepta
	IF_3	3	4	4	4	4	1	1	Accepta
	IF_4	3	4	4	4	4	1	1	Accepta
Interoperability	IN_1	1	4	4	4	4	0.8	1	Accepta
	IN_2	4	3	4	4	4	1	1	Accepta
	IN_3	1	3	4	4	4	0.8	0	Accepta
	IN_4	1	3	4	4	3	0.8	0	Accepta
Customizability	CU_1	3	4	4	4	4	1	1	Accepta
	CU_2	1	4	4	4	4	0.8	0	Accepta
	CU_3	3	3	4	4	3	1	1	Accepta
	CU_4	3	3	4	4	4	1	1	Accepta
Integration	INT_1	1	3	4	4	4	0.8	0	Accepta
	INT_2	1	3	4	4	4	0.8	0	Accepta
	INT_3	4	4	4	4	4	1	1	Accepta
	INT_4	3	3	4	4	4	1	1	Accepta
Flexibility	FL_1	4	4	4	4	4	1	1	Accepta

The Scale-level Content Validity Index (SCVI/Ave) displayed in the table above has an average agreement among five experts of 0.96, which indicates strong content validity. An SCVI/UA value of 0.82 indicates that experts agree on the relevance and appropriateness of the

questionnaire items, as measured by the scale-level Content Validity Index (S-CVI). Once the content validity is confirmed, it ensures that the questionnaire items accurately measure the construct of interest, establishing a solid foundation for the instrument's validity.

Conclusions

Within the scope of this study, valid measurement items were developed to evaluate the success of Cloud ERP implementation using constructs obtained from a comprehensive literature review. These items were adopted and adapted to meet the study's purpose and were validated for relevance and simplicity using the CVI. However, the study's focus on quality dimensions may overlook other factors, limiting its generalizability to specific contexts. In the next phase of this ongoing study, the measurement items will undergo piloting to assess their validity and reliability. This suggests a direction for further investigation. Future research should expand to additional dimensions and validate items empirically.

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