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BARRIERS IN THE IMPLEMENTATION AND ADOPTION OF CLOUD ERP SYSTEMS

Abstract: For the digitization and integration of internal business processes and data, organizations have been relying on the use of ERP systems for decades. They have evolved from their predecessors MRP, MRP II, on-premise ERP 1.0 from the 1990s to ERP 1.0+ from the 2000s and now into ERP 2.0 systems based on cloud computing technology. Today, cloud ERP systems represent the dominant type of information systems on which organizations base their business, making it essential to comprehensively consider all the benefits they offer. On the other hand, it is realistic to expect certain complications that arise during the crucial phases in the lifecycle of cloud ERP systems, namely, the implementation and adoption phases. The aim of this paper is to review relevant scientific works and highlight the obstacles that burden the implementation and adoption of cloud ERP systems. The outcome of this study, in the form of identified and described barriers of cloud ERP systems, can be beneficial to various levels of management during the implementation and adoption of cloud ERP systems.

Keywords: Cloud ERP, barriers, implementation, adoption

1. INTRODUCTION

In the fast-evolving landscape of digitalization and streamlined business operations, Enterprise Resource Planning (ERP) systems have played a pivotal role for decades. From their early manifestation as Material Requirements Planning (MRP) and MRP II systems to the emergence of on-premise ERP 1.0 in the 1990s and the subsequent ERP 1.0+ systems in the 2000s, ERP solutions have continuously adapted to meet organizational needs. However, the latest evolution brings us to ERP 2.0, a breed of systems powered by cloud computing technology. It is noticeable that transition to cloud oriented ERP solutions catches up speed as there are more solutions in the market by each new day we witness. "In the age of digital transformation, Cloud ERP systems have emerged as the linchpin of modern organizational architecture, seamlessly integrating processes and data across diverse sectors." (Drucker, 2016, p. 115) Cloud ERP systems have emerged as the primary foundation of organizational information infrastructure. Among others - their flexibility, scalability, and accessibility make them indispensable for businesses across various industries and sectors. As organizations increasingly rely on these cloud-based solutions, it becomes imperative to explore their multifaceted benefits comprehensively. Yet, alongside the promise of efficiency and agility, realistic barriers emerge during critical phases in the lifecycle of cloud ERP systems: implementation and adoption. These phases are pivotal, shaping the system's effectiveness and long-term impact. Organizations must navigate these complexities with care, considering both the advantages and potential obstacles. "Organizations must embark on a journey of careful navigation

through the complexities of implementation and adoption, recognizing these phases as instrumental in determining the success and sustainability of cloud ERP utilization." (Smith & Johnson, 2020, p. 201).

Marsintauli and Sari (2023) show us the importance of focusing on behavioral factor alongside technical premises by highlighting that expected performance has a positive impact on behavioral intentions. In contrast, variable expected effort, social influence, and facilitating conditions do not significantly influence behavioral intentions. Furthermore, behavioral intentions have a positive effect on usage behavior, reflecting an individual's belief that utilizing an information system will enhance their work performance. People's behavior can be observed through their intention to use an information system. If someone believes that the system aids in completing their tasks, they are more likely to use it. However, the study results reveal a discrepancy between users' belief in the system's helpfulness for task completion and their assessment of the expected lifespan of effort.

Venkatraman and Fahd (2016) emphasize that in the small and medium-sized enterprise (SME) sector, the myth persists that ERP (Enterprise Resource Planning) systems are intelligent solutions that can address all organizational business problems, such as customer satisfaction, product productivity, and manufacturing efficiency. However, the reality is that an ERP system must be tailored to meet specific business requirements and be managed by the organization's personnel, who make critical business decisions. Consequently, successful ERP adoption not only requires active involvement from ERP vendors but also full support and engagement from top SME management.

Most commonly, SMEs expect ERP solutions to be cost-effective, providing substantial benefits without significant investment. While ERP vendors strive to optimize Total Cost of Ownership (TCO), the quality of implementation and delivery remains proportional to the level of investment. In the case of Application Service Provider (ASP) solutions, both small and large enterprises often fail to realize the TCO benefits promised by ERP vendors due to limited investments. Additionally, many SMEs exhibit reluctance to upgrade their existing IT infrastructure.

Within this paper, authors explore relevant scientific literature, aiming to uncover the barriers that disrupt successful implementation and adoption of cloud ERP systems. By identifying and describing these barriers, authors provide valuable insights for management at various levels. Authors findings serve as a compass, guiding organizations toward informed decisions and sustainable ERP utilization. The authors emphasize that this research is part of a broader effort to explore the barriers in the cloud ERP life cycle, which will occur in the future.

2. RESEARCH METHOD

This paper used a literature review as a research method. It was performed by searching the Google Scholar database of publications to collect qualitative data that represent barriers of cloud ERP implementation and adoption. The terms "barriers" AND "cloud ERP implementation and adoption" were used as search keywords. The meta data (title, keywords and abstract) of the scientific papers that appeared in the search results were first analysed. The analysis was conducted based on the inclusion and exclusion criteria that had been previously defined. To be considered for inclusion in the detailed analysis, papers were required to be written in English, published in scientific journals and conference proceedings, and to be thematically related to the research goal. The detailed analysis excluded papers representing master's theses and doctoral dissertations, papers that did not pass the review process, and papers that were not available. The papers that met the inclusion criteria were then subjected to further analysis to arrive at the results of this theoretical research.

3. FINDINGS

This section presents the results of the conducted literature review, focusing on the overview and description of the characteristics and specificities of barriers in the implementation and adoption of cloud ERP systems.

Cloud ERP systems are complex standard packages of applications that cover multiple areas and can be customized to meet the needs of different users, with high requirements for integrating with existing systems. The profound impact of ERP systems on organizations makes their implementation challenging. Globally, ERP systems represent a significant part of the software industry, and providers are now offering cloud-based ERP systems. With an increasing number of vendors entering the market, the ERP system market is worth billions of dollars. Cloud ERP has a profound impact on an organization because it changes what is purchased, how and from whom purchase is performed. In addition to reducing initial investment and implementation costs, it can also limit the ability to customize and integrate software according to the needs of individual users. A cloud ERP system applies a service-oriented concept, where users consume services delivered via the Internet by service providers. This differs from the traditional product-oriented ERP business model (Gupta et. al., 2017).

Mahmood, Khan and Bokhari (2020) identified a lower-than-expected level of adoption and insufficient understanding of key success factors and barriers to successful adoption as challenges to the adoption of cloud-based solutions. In addition to the previous two, they identified some other barriers, but the line between implementation and adoption barriers is not as clear as it could be, so implementation barriers are frequently used as materials for adoption barriers in the literature. One of those barriers is a mismatch between business processes and the logic of the cloud ERP system that can make its implementation difficult. The importance of managerial support and an effective change management plan can be key barriers. Lack of user training and lack of assigned resources as well as excessive application

customization can prevent successful implementation. ERP systems in the cloud can be rigid, while excessive customization can result in failed implementations, especially if organizations are not ready for change.

Haddara, Gøthesen and Langseth (2021) categorize the barriers into implementation and adoption barriers. The uncertainty of configurations and customizations is connected to the implementation phase, since it concerns technical aspects like system setup before the system is active in the operational environment. Adaptability of services to specific operations and industries (adaptability of the ERP landscape) describes how an organization adopts and adapts ERP services into its existing business processes and presents the challenge of adopting cloud ERP. Demand volatility is a challenge that applies to both phases. The volatility of demands may however negatively affect the adoption phase, when continuously changing requirements can make it difficult for the organization to adapt to new services. A challenge that is related to the implementation phase is the need for expert assessments to ensure the ERP service meets the needs of the organization. However, it can also arise during adoption, when expertise is needed.

Huang, Anwar, Oliver and Rahim (2022) and Gupta et al. (2017) identified barriers specific to the implementation of cloud ERP systems in companies: cloud transparency and data privacy, data security, vendor lock-in, integration with other information system applications and typical organizational barriers.

Cloud computing has the characteristic of separating enterprise data from user company hardware and servers, which means IT operations run by third-party cloud providers are not transparent to user companies, who also have limited control over the cloud services they subscribe to. Cloud environments have a lack of transparency and control that can raise concerns about data privacy. Some businesses worry about where their business data will be physically stored by cloud service providers and whether their sensitive data will be protected. In the cloud ERP model, data access and security policies are becoming increasingly important, as is the cost of protecting data privacy, which can be high for small and medium-sized enterprises. In addition, client companies have little control over how cloud service providers store and process their data. The data privacy issue is one of the reasons why many organizations hesitate to implement cloud ERP systems.

Cloud service providers are believed to provide more secure IT infrastructure for protecting data. The most common cause of data leak and data loss, however, is often human error rather than technical failures. By definition, cloud ERP systems integrate different business processes of the organization, as well as different departments. The aforementioned integration provides managers with access to data from other business units. In case managers make copies of data on their own devices that are subject to theft or loss, the data on those devices would also fall into unauthorized hands. Data security, confidentiality and ownership represent some of the biggest barriers for cloud ERP (Hustad, Sørheller, Jørgensen, & Vassilakopoulou, 2020). Many organizations believe that their data can only be protected if it is kept within the organization itself. As a result, they are concerned data could be stolen or leaked during the implementation if data are in the cloud. Considering that data security is in the hands of the cloud ERP provider, there is no guarantee of absolute security.

Vendor lock-in occurs when a customer is not able to switch cloud providers due to dissatisfaction with the provider without significant costs, legal constraints or technical incompatibility. A company can maximize the strategic advantages of cloud technology in two ways. The first way is by changing cloud service providers according to their ever-changing business strategies. The other option is to merge various cloud services/solutions to create own system of the highest quality. Client companies need to provide data in a format that can be used by other cloud ERP providers (Haddara, Gøthesen, & Langseth, 2021).

Integrating cloud ERP systems with other information system applications is also a challenge, as managing this process will be even more challenging in a cloud environment. Specifically, client companies with limited control over the cloud will not have the freedom and rights to customize cloud ERP and integrate it with other applications as they would with on-premise ERP systems. Cloud ERP system providers may not be able to integrate company's information system software applications because they are developed using different technologies and platforms (Muslmani, Kazakzeh, Ayoubi, & Aljawarneh, 2018).

The previous research suggests that typical organizational problems like poor top management support, poor cross-functional communication, ineffective reengineering of business processes, and ineffective change management processes will always occur rather than technical problems (Øverdal, Haddara, & Langseth, 2023).

According to Øverdal, Haddara, and Langseth (2023), cloud ERP systems face barriers such as change management and increasing efficiency of use. Specifically, user education, learning how to use, discovering, understanding, and implementing all existing features and functions of the product have been identified as key barriers post-implementation. Client companies will face these barriers if they are not able to trust the cloud ERP provider and if the provider is not approachable and helpful. Cloud ERP providers should provide such a guarantee and be involved with the entire process, from planning to production. It is important that cloud ERP vendor representatives (consultants) and senior managers in client companies be trained on change management techniques.

Usman et al. (2017) note that finding suitable software solutions is the main challenge facing small and medium-sized enterprises (SMEs). In contrast to large enterprises, cloud ERP adoption by SMEs has been hampered by the high costs involved with upgrading/updating, maintenance, and integration.

Usman, Ahmad, and Zakaria (2014) identified various barriers in the process of implementing and maintaining ERP systems in SMEs. The most significant are the customization of ERP and the reengineering of business processes. The mentioned barriers must be dealt with by SMEs throughout the entire ERP implementation lifecycle. Although cloud ERP systems offer numerous technological advantages, their customization is limited. Additionally, it imposes a heavy

financial burden on the client organization once it is completed. The following barriers were also identified in addition to the most significant ones: insufficient flexibility in adapting to business processes, and long or incomplete integration.

Moreover, they examined the key influencing factors that prevent ERP systems from being successfully adopted. They include: top management's lack of leadership/commitment, availability of technical and business specialists (skilled resources) in the organization, internal change management during business process reengineering, ERP system selection preceded by an inadequate definition of functional requirements, ineffective communication between management at different levels and ERP vendors, unrealistic expectations from the ERP system (the so-called cost benefit utopia), which is reflected in the belief that ERP is an intelligent solution to all organizational business problems such as customer satisfaction, product quality, and finding product defects. Inadequate end user training due to inadequate assessment of the budget, time and resources required, centralized decision-making and resistance to change in SMEs, and redundant ERP vendor processes that are not required by SMEs, are some of the other key factors influencing cloud ERP adoption (Venkatraman/Fahd 2016).

According to Gupta et al. (2017), cloud ERP barriers can be classified into those that relate to the adoption and implementation phase. The former include: size of the organization, implementation costs, dependence on the Internet, and sensitivity to user needs. The latter include: minimal required IT infrastructure, fast and easy implementation, ensuring ERP regulation by vendors, adapting to the specific needs of SMEs and maintaining a stable system for large companies.

When switching to cloud ERP systems, organizations have experienced the automation of system updates by the ERP vendor, i.e. lack of control over cloud ERP system updates. In addition to the obvious advantages of free updates and an up-to-date cloud ERP system, there are also some disadvantages. These disadvantages are reflected in the fact that organizations do not have any control over the update of the cloud ERP system, as the cloud ERP provider is entirely responsible for this process. As a result, organizations may interpret these updates as forced, since they were made without their consent.

Haddara, Gøthesen and Langseth (2021) identified the following barriers during the adoption of cloud ERP systems in companies. The first aspect is adaptability to changes, which includes barriers such as change management control list, new features and flexibility in customization. The second aspect includes system migration to the cloud, which entails barriers such as application migration and platform migration. The third aspect represents system performance, which includes characteristics such as response time and system availability. Cloud ERP's performance is directly related to the Internet's speed, so high-speed Internet is essential for cloud ERP's high performance. There may be a delay in response time when dealing with a large number of business processes and a large amount of data in the cloud ERP system. Cloud ERP is even more dependent on Internet availability and speed in such situations (Hustad et al., 2020). The fourth aspect of the challenge involves choosing a cloud ERP provider, which includes market research, the ability of the implementation team, and cost-effectiveness analysis. The final fifth aspect represents user satisfaction, which includes business process mapping, the look and feel of using the software, and the simplicity of the process.

According to Hasheela and Smolander (2014), the implementation of ERP systems is time-consuming and involves a high risk of failure or disruption of business operations, which is part of the obstacle to their adoption.

According to Gupta and Misra (2015), a lack of adequate and comprehensive information about the features of cloud ERP systems often leads to suspicion and confusion among decision makers in organizations. This can lead to misperceptions and misconceptions, such as fears about data security and privacy (for instance, "some managers might think that using online-based ERP system like Cloud ERP would endanger the security and privacy of their data"). Research has also shown that there are mixed results and inconclusive evidence regarding the impact of cloud ERP system implementation on the decision-making process in organizations. Despite some studies indicating that cloud ERP systems are successful, some report contrasting results. There are also barriers such as organizational support, competitive pressure, adaptability and integration limitations.

Øverdal, Haddara, and Langseth (2023) focused their research on the barriers of cloud ERP systems specific to public enterprises. The rigid nature of supplier selection is the main challenge, which is further complicated by the size of the public enterprise, significantly impacting the choice of cloud ERP supplier. Since these are public enterprises, they must procure cloud ERP systems through a public procurement process. A major problem is the lengthy public procurement process, often resulting in the acquisition of cheaper, and consequently lower-quality, cloud ERP systems in terms of their characteristics.

In their study, Tongsuksai, Mathrani and Weerasinghe (2021) identified the barriers of implementing cloud ERP systems for SMEs from the perspective of cloud ERP system providers. The results of the study showed that cloud ERP system providers face the following barriers: cost overruns, lack of information compatibility between departments, project team changing during the implementation process, lack of governance inside the organization, lack of training, CSPs or consultants becoming unavailable and over-estimating cloud ERP efficiency.

Awan et al. (2021) conducted a study to identify barriers in SMEs' adoption of cloud ERP systems. There are ten barriers identified by the research: reliability of the Internet, lack of awareness, user resistance, limited functionality, vendor trust and lack of knowledge. Since cloud ERP relies on real-time data connections, it is dependent on the network (the Internet). Consequently, the usability of the cloud ERP system is undoubtedly affected by the quality of the Internet, as measured by the connection speed and stability available at specific physical locations. As a result, network dependency is a risk associated with adopting a cloud ERP system model, because cloud ERP systems rely on

high-quality Internet connections to function (Paulsson/Johansson 2023). It has already been mentioned that the reliability of the Internet is crucial for cloud ERP systems, and in some countries it is questionable. Such circumstances inevitably raise the question of whether cloud ERP systems are suitable for such countries (Awan et al. 2021). Lack of awareness in organizations leaves the question of how cloud ERP will be adopted in an organization that has very little or no knowledge of it. The resistance of users to something new like cloud ERP is to be expected. First and foremost, employees want to know if their jobs are secure after cloud ERP adoption. Secondly, the knowledge and skills related to using cloud ERP do not match those of the previous system. The training of employees is therefore necessary. It is believed that traditional ERP systems are old and mature, so cloud ERP takes time to mature. The limited functionalities of cloud ERP force organizations to revise their own business processes according to cloud ERP in order to fully map them.

The perception of vendor trust is expressed by concerns about the capability and capacity of certain local cloud ERP vendors. Support from vendors may be lacking in certain situations, so organizations with sufficient resources prefer to develop their own solutions. Trust is not only established by the reputation of a vendor, but also by the agreement with a vendor. External pressure is defined as an indicator of the adoption of new technology. Cloud ERP is a technology that client organizations and their employees are under constant pressure to adopt because their competitors already use it. When moving to cloud ERP, a company may encounter problems during adoption due to a lack of knowledge and experience of its employees. There is no doubt that knowledge and experience are acquired over time, and that lack of knowledge is an entirely natural phenomenon in the adoption of any new technology, including cloud ERP (Awan et al. 2021).

Paulsson and Johansson (2023) identified architectural barriers and countermeasures that large companies should consider when adopting cloud ERP systems. They determined two architectural barriers that had not been discussed before: system mobility and scalability.

Modern cloud ERP systems are accessible via mobile devices, such as tablets and mobile phones. In other words, the system can be accessed anywhere and at any time. Access to ERP systems is not limited to the physical office or desktop computers where they are installed. A cloud ERP platform enables system mobility, which improves business decision-making and performance. Despite this, mobility presents organizations with new types of risks on many levels. First of all, mobile devices can be lost or stolen, compromising data security and privacy. Second, in line with the bring-your-own-device culture, where companies encourage employees to install work-related apps on their own mobile devices, users tend to install different types of applications. Applications with sensitive data, such as cloud ERP systems, may be at risk as a result of this behaviour (Zhong, & Erik Rohde, 2014).

The literature on Cloud ERP systems frequently emphasizes scalability as a positive attribute. Risks associated with scalability are ignored. First, scalability depends on a well-designed and implemented cloud infrastructure. If these basic aspects of cloud infrastructure are not met, scalability will not be possible. Second, scalability is often taken for granted. Scalability is expected to be available whenever client organizations need it. However, cloud service providers are also subjected to limited processing and storage capacities. Although those capacities are limited, it also depends on how cloud service providers can use additional technologies to efficiently and effectively allocate resources to where they are needed most.

CONCLUSION AND FUTURE RESEARCH

In both SMEs and large organizations, cloud ERP has become a dominant type of information management system. In addition to the obvious benefits it brings, given that it is the last and relatively new generation of ERP systems, the authors of the paper were interested in analysing the barriers during its implementation and adoption, in order to highlight potential risks that could be experienced by organizations that implement cloud ERP systems. For the purpose of discovering and systematizing the barriers associated with cloud ERP implementation and adoption, a literature review method was used to review, up to the time of writing this paper, the published papers on this topic. As a result of the literature review, it was possible to identify scientific papers that addressed this topic. An in-depth analysis of the papers led to research findings relating to barriers in the adoption and implementation of cloud ERP systems. Several characteristics and specifics of certain barriers point to numerous potential problems companies will face during this complex process. It is essential for all relevant organizational units and top management in companies to become familiar with the numerous barriers observed and described if they are to be able to successfully implement and adopt cloud ERP systems.

This paper is an initial step for future research, which will focus on identifying barriers in the life cycle of cloud ERP systems by conducting a systematic literature review (SLR). Once SLR is completed, empirical research will reveal ways to overcome the most critical barriers identified for an organization.

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