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Research Article

Critical success factors in the implementation of cloud ERP in SMEs: A case study in Brazilian organizations

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Abstract

Objective: This study aims to identify and discuss the Critical Success Factors (CSFs) that impact the implementation of Cloud ERP in Small and Medium-sized Enterprises (SMEs). **Method:** A multiple case study was conducted in Brazilian SMEs to identify how Critical Success Factors (CSFs) impacted the Cloud ERP implementation process. Qualitative data were obtained through semi-structured interviews. The NVivo software was used for interview coding, and content analysis was performed based on the coded data. **Originality/Relevance:** This study identifies and compiles CSFs that impact the implementation of Cloud ERP in SMEs. Additionally, it analyzes the impact of each CSF through real cases of SMEs. **Results:** Sixteen CSFs impacting Cloud ERP implementation in SMEs were identified. The CSFs were classified according to the TOE framework (organizational, environmental, and technological factors). Among the highlighted CSFs are competitiveness, knowledge in information systems, accessibility flexibility, relative advantage, and security. Additionally, two new CSFs were identified: best practices and process definition. **Theoretical/Methodological Contributions:** This study contributes to the literature by identifying two new CSFs impacting Cloud ERP implementation in SMEs. **Social/Management Contributions**: The results aim to assist SMEs in identifying CSFs in Cloud ERP implementation. They also provide assistance to Cloud ERP providers facing various challenges in delivering a system efficiently and effectively to their clients.

Keywords: Small and medium enterprises. SMEs. Critical Success Factors. Cloud ERP.

Fatores críticos de sucesso na implementação de ERP cloud em PMEs: Um estudo de caso em organizações brasileiras

Resumo

Objetivo: Este estudo visa identificar e discutir os Fatores Críticos de Sucesso (FCS) que impactam a implementação de ERP Cloud em Pequenas e Médias Empresas (PMEs). **Método:** Realizou-se um estudo de casos múltiplos em PMEs brasileiras para identificar como os FCS impactaram o processo de implementação do ERP Cloud. Os dados qualitativos foram obtidos através de entrevistas semiestruturadas. O software NVivo foi utilizado para a codificação das entrevistas, a partir da qual foi realizada análise de conteúdo. **Originalidade/Relevância:** Este estudo identifica e compila os FCS que impactam a implementação de ERP Cloud em PMEs. Além disso, analisa o impacto de cada FCS por meio de casos reais de PMEs. **Resultados:** Foram identificados 16 FCS que impactam a implementação de Cloud ERP em PMEs. Os FCS foram classificados de acordo com o framework TOE (fatores organizacionais, ambientais e tecnológicos). Dentre os FCS que mais se destacam estão: competitividade, conhecimento em sistemas de informação, flexibilidade de acessibilidade, vantagem relativa e segurança. Além disso, dois novos FCS foram identificados: boas práticas e definição de processos. **Contribuições teóricas/metodológicas**: Este estudo contribui com a literatura ao identificar dois novos FCS que impactam a implementação de ERP Cloud em PMEs. **Contribuições sociais/para a gestão**: Os resultados visam auxiliar PMEs na identificação de FCS na implementação de ERP Cloud. Também auxiliam empresas provedoras de ERP Cloud, que enfrentam diversos desafios para entregarem um sistema de forma eficiente e eficaz para seus clientes.

Palavras-chave: Pequenas e médias empresas; PME; Fatores críticos de sucesso; ERP Cloud.

INTRODUCTION

ERP (Enterprise Resource Planning) Cloud systems represent a new paradigm in the field of information and communication technology (ICT) (Ram et al., 2013). An ERP Cloud is a business management system hosted in the cloud and accessed via the Internet. It allows companies to manage all aspects of their operations, from finance and sales to human resources and inventory, in a centralized and integrated way (Barbieri et al., 2023). Operating on a Software as a Service (SaaS) model hosted in the cloud, ERP Cloud has grown exponentially in recent decades. It has given organizations several advantages (Awan et al., 2021). Among the benefits is the potential to create more flexible and easy-to-operate business models. Previous studies have highlighted the relevance and effect of implementing ERP Cloud in various companies (Alsharari et al., 2020; Gupta et al., 2018; Gupta & Misra, 2016b; Razzaq et al., 2021).

As a result, this solution is gaining popularity, particularly among small and medium-sized enterprises (SMEs), which often have limited budgets and need help accessing technology (Gupta & Misra, 2016b). Specific characteristics, including employee count and financial capacity, define SMEs. They play a crucial role in the economy of all countries by creating numerous jobs and contributing significantly to the Gross Domestic Product (GDP) (D'anjour et al., 2024; Frogeri et al., 2021). SMEs are classified based on the number of employees or annual turnover. In this study, we adopt the definition provided by the Brazilian Micro and Small Business Support Service (SEBRAE, 2021) categorizing companies as follows: - Small companies: 20 to 99 employees for manufacturing and 10 to 49 employees for commerce. - Medium companies: 100 to 499 employees for manufacturing and 50 to 99 employees for commerce.

Despite numerous benefits, the implementation of cloud ERPs seems to be one of the least addressed topics in the information systems domains (Usman et al., 2019), especially in SMEs in developing countries, causing research on the subject in these countries to remain limited while thriving in developed countries (Alsharari et al., 2020). In addition, the literature shows significant differences in technological implementation between developing and developed countries due to their particularities and different technological, organizational, and environmental contexts (Usman et al., 2019). A significant gap in the field of study concerns the Critical Success Factors (CSFs) for ERP Cloud implementation. According to Alsharari et al. (2020), the relevance of the CSFs and their effects on the implementation of ERP Cloud systems need to be clarified in the post-implementation results.

Previous studies in the field (Jayeola et al., 2022) need more precision in addressing and evaluating the CSF related to ERP Cloud implementation. They also reinforce the need for a comprehensive model for SMEs, simultaneously considering the different perspectives on implementing the management system (Tarani et al., 2021). About this gap in the literature, Usman et al. (2019) argue that there is a need for studies that not only analyze the factors that influence the implementation of ERP Cloud in SMEs but also integrate innovation factors and the perspectives of technology, organization, and environment (TOE framework).

In the field of study, the CSF represents a restricted number of areas, such as security, privacy, cost reduction, competitiveness, and data reliability, that impact the implementation of Cloud ERP in SMEs (Ngai et al., 2008). In addition, implementing a cloud ERP is subject to the effects of organizational, environmental, or technological factors specific to each country or region (Ariati, 2020). In Brazil, socioeconomic particularities, the level of education, and technology incentive policies can directly influence the firm's and its employees' experience, as well as the costs and bureaucracy involved in contracting and implementing ERP Cloud (Ariati, 2020).

Despite the importance of the topic, a case study has yet to explore the impact of CSFs on the implementation of ERP Cloud in Brazilian SMEs. This study examines this gap through the following research question: how do Critical Success Factors impact the implementation of ERP Cloud in Brazilian SMEs? To answer this question, the study was divided into two objectives. The first consists of checking which CSFs have already been identified in the literature. In contrast, the second objective seeks to discuss the impact of these CSFs on Brazilian SMEs that have implemented ERP Cloud. In addition, testable propositions were created from the results, which are presented in the discussion section of this study.

THEORETICAL-CONCEPTUAL BACKGROUND

ERP Cloud systems enable SMEs to efficiently plan and manage their resources by integrating information and processes based on data from functional areas and across organizational boundaries (Johansson et al., 2015; Barbieri et al., 2023). Usman et al. (2019) also cite the benefit of better planning and decision-making. In other words, the cloud system enables SMEs to achieve alignment and reliability of information, integrating processes and procedures and providing greater agility in making information available for decision-making, thus providing a competitive advantage for the business (Awan et al., 2021).

Although its implementation benefits, many small and medium-sized organizations must be more cautious about implementing Cloud ERP. This caution is because some SMEs are unaware of the advantages of cloud ERP or do not know how to deal with its implementation challenges (Alsharari et al., 2020). The study by Wrycza (2011) showed that implementing a Cloud ERP system by SMEs enables them to compete with larger organizations by having a high-tech system to meet their demands, costing less than a traditional system. The study by Alsharari et al. (2020)analyzed the benefits and challenges of using ERP Cloud by SMEs.

In addition, the literature points to several opportunities associated with implementing ERP Cloud in SMEs, among them the positive impact on competitiveness, mainly through the improvement and operational efficiency obtained with ERP Cloud (Barbieri et al., 2023). In addition, using cloud systems considerably increases the flexibility and scalability of SMEs (Tongsuksai et al., 2021). Despite the benefits, there are many challenges associated with technological adoption (Sott et al., 2021; Schwambach et al., 2022).

For companies to be able to compete in digital and globalized markets, it is necessary to understand the barriers that limit them and the opportunities that can boost them (Kolling et al., 2021), especially concerning informed decision-making geared toward the specific needs of the organization. In this context, research exploring the implementation process and the CSF that impact the adoption of ERP Cloud in SMEs is essential to support identifying points that require greater attention (Barbieri et al., 2023). In addition, such studies can help understand SMEs' specific business management needs, allowing ERP Cloud solutions developers to create products tailored to their needs (Awan et al., 2021).

The theoretical contribution of this study is the identification of the CSF and their categorization according to the TOE framework (Razzaq et al., 2021; Salum & Abd Rozan, 2017). In addition, this study seeks to minimize a gap in the literature in the Brazilian context since, until the development of this research, only some studies addressed the CSF that impacts the implementation of ERP Cloud in Brazilian SMEs (Oliveira, 2012). This study also contributes to the literature by identifying two new CSF that affect the implementation of ERP Cloud in SMEs.

This study's practical and managerial contribution is to investigate the impact of the CSF on implementing ERP Cloud in Brazilian SMEs. The results of this research are intended to help SMEs identify the CSF that facilitates the implementation of Cloud ERPs, by analyzing the impact of each CSF on the implementation process. By recognizing this impact, this work will help various actors related to the system implementation process (Gupta & Misra, 2016b). If, on the one hand, the analysis of the CSF will assist SMEs in implementing and managing their processes with ERP

Cloud, on the other hand, the results will also help ERP provider partner companies, which face various challenges in delivering ERP Cloud efficiently and effectively to their customers (Alsharari et al., 2020).

METHOD

This study aims to identify how the CSF impact the implementation of ERP Cloud in Brazilian SMEs. Due to the relevance of the context, a qualitative approach was used to ascertain the events, as well as the elements and meaning of such phenomena (Van Maanen, 1979). The multiple case study approach was used to better understand the subject studied, due to its suitability to the objectives and complexity of the problem studied (Yin, 2015). The case study provides an in-depth understanding of complex social events that cannot be separated from the context in which they are spontaneously inserted (Yin, 2015).

The aim was to test the theory rather than develop a new one. However, we continued making theoretical interventions by deepening the theoretical research and understanding what had emerged through new points of view that weren't perceptible initially.

This stage began with creating a semi-structured interview script, which included open-ended questions that served as the basis for the interviews. Both the topics and the questions were drawn up and outlined in advance. Semi-structured interviews made it possible to include other questions during the interview, allowing new information to emerge during the dialog (Hair et al., 2014).

The interviewer adjusted the order of the questions during the interviews. This format allowed the data to be collected systematically, which helped the subsequent coding and categorization of the data (Patton, 1990). The respondents were selected according to their time in the company and knowledge of the ERP used. In this way, other comments were obtained from the interviewees, which contributed to the research.

The semi-structured interview scripts were designed using a literature review to achieve specific objectives:

i) to analyze how the technological factors available in the organization influence the implementation of ERP Cloud;

ii) to examine how organizational factors influence the implementation of cloud systems;

iii) to investigate how the environmental context interferes with the implementation of ERP Cloud.

A non-random sample was used to apply the research instrument, with SMEs as the unit of analysis. The interviews lasted between 27 minutes and 01h07m. Regarding the sector of activity, firms from industry and commerce were selected. Companies of different sizes made up the sample of SMEs, based on the SEBRAE classification, to analyze companies of various sizes within the universe of Brazilian SMEs.

A sample of 5 SMEs was chosen due to the difficulty of accessibility in finding companies willing to participate in the study. In addition, the number of interviews conducted was defined by reaching theoretical saturation in the results obtained from the interviews (Glaser & Strauss, 2017). The interviews were categorized into: SME1_I1, SME1_I2; SME2_I1, SME2_I2; SME3_I1, SME3_I2; SME4_I1, SME4_I2 and SME5_I1, SME5_I2, to represent the company and the interviewee respectively. All the interviews were recorded, totaling 9 hours and 15 minutes of audio, which were transcribed and analyzed.

NVivo software, version 12, was used to code the interviews and analyze the data. NVivo was chosen because it is widely used in Brazilian academia and has valuable tools for analyzing qualitative data. According to Lage (2011), using computer tools tends to be helpful when qualitative research involves a large volume of data or when it is necessary to cross-reference information based on the attributes of the research subjects.

After collecting the data, the analysis stage began. Initially, data reduction was done to choose, eliminate and organize the data according to the research objective and the categories determined. This was followed by data presentation, where representations were generated to help understand the analysis carried out and, finally, information was sought about the phenomena observed, stipulating propositions (Yin, 2015). In this study, the analysis began by importing the transcribed interviews into NVivo. Once inserted into the software, the study's fundamental concepts were identified based on the reading of each excerpt. At the same time, these concepts were grouped and categorized into first-order codes (Richards, 2015).

Content analysis techniques were used for analysis purposes. Content analysis makes it possible to understand knowledge by constructing quantitative or non-quantitative indicators (Bardin, 2011), or using categories based on theoretical models (Flick, 2004). As with other techniques, rigor must prevail, especially when defining categories, so the results are balanced, conclusive and simplified (Collis & Hussey, 2005).

After conducting the interviews, a categorical analysis was carried out, which consisted of creating categories for analyzing the interviews. Therefore, the following steps were followed:

i) coding the interviews;

ii) defining the units of analysis; and

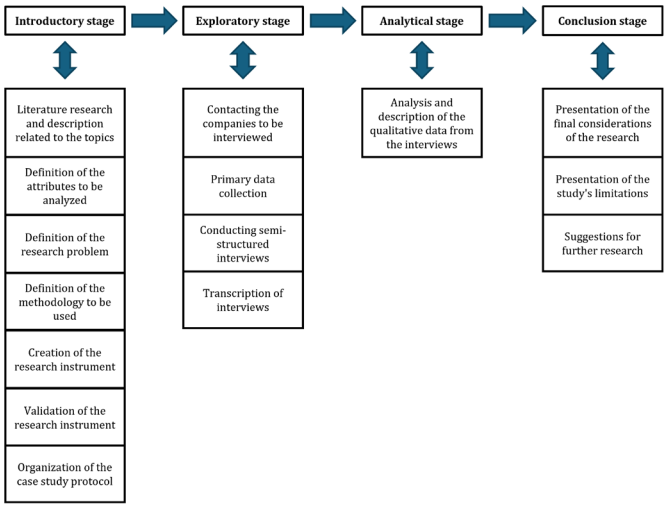
iii) categorizing by observing specific parameters (Richardson et al., 1985).

Considering the semi-structured nature of the interviews, there were already established subdivisions to be addressed with the interviewees. Thus, we consolidated the categorization based on the classification of elements by differentiation through preliminarily chosen criteria (Bardin, 2011).

In this stage, characteristics such as: completeness, homogeneity, concreteness, objectivity and fidelity, as proposed by Richardson et al. (1985), were verified, helping to classify the topics within a category using the same classification principle. Figure 1 shows the methodological stages of the study.

Figure 1

Methodological steps



Note: Elaborated by the authors.

RESULTS

The content of the interviews shows patterns concerning professionals' perceptions of ERP Cloud implementation. O Table 1 presents the data of the SMEs that participated in the analysis, including the sector, year of foundation, number of employees and length of time using ERP Cloud. O Table 2 shows the primary information on the employees interviewed, including job title and level of education.

Table 1

General information on SMEs

SME	Sector	Year of foundation	Nº of employees	Using ERP Cloud for
SME1	Manufacture	1995	420	12 years
SME1	Manufacture	1995	420	12 years
SME2	Manufacture	1994	39	1 year and 3 months
SME2	Manufacture	1994	39	1 year and 3 months
SME3	Manufacture	1987	250	7 years
SME3	Manufacture	1987	250	7 years
SME4	Commerce	1999	60	6 years
SME4	Commerce	1999	60	6 years
SME5	Commerce	1966	37	2 years
SME5	Commerce	1966	37	2 years

Note: Elaborated by the authors.

Table 2

General information about the interviewees

SME	Job position	Education level	Interview duration
SME1	Digital transformation analyst	Complete university degree	01h07min
SME1	Product engineer	Postgraduate	56min
SME2	Administrative manager	High school complete	51min
SME2	Personnel manager	Incomplete university degree	27min
SME3	Controller manager	MBA	01h07min
SME3	PPC Coordinator	MBA	01h
SME4	ICT manager	Postgraduate	01h04min
SME4	Operations manager	Complete university degree	51min
SME5	Administrative manager	Postgraduate	57min
SME5	Marketing analyst	Complete university degree	49min

Nota: Elaborada pelos autores.

To categorize the data using NVivo, analysis categories and factors were identified according to the theoretical framework. The categories were classified according to the TOE framework, one of the most robust and validated frameworks for analyzing organizational technological adoption (Usman et al., 2019). The CSF identified in the literature were grouped into their respective categories. The categories and factors identified are shown in Table 3.

Once the CSF had been identified and classified, they were discussed according to the responses of the professionals interviewed.

Table 3

Categories and CSF identified in the literature

CSF categories	Factors	References
Technological Factors	Compatibility; security; relative advantage; cost reduction; privacy; complexity; experimentation.	Tarani et al. (2021); Razzaq et al. (2021); Alsharari et al. (2020); Albar & Hoque (2019); Usman et al. (2019); Gupta et al. (2018); Gupta & Misra (2016a); Hasheela (2016); Ziyad & Rehman (2014); Abu-Khadra & Ziadat (2012); Gonzalez et al. (2012); Rogers (2003).
Organizational Factors	Top management; company innovation; information technology expertise; access flexibility; financial availability.	Jayeola et al. (2022); Tarani et al. (2021); Razzaq et al. (2021); Alsharari et al. (2020); Albar & Hoque (2019); Gupta & Misra (2016b); Usman et al. (2016).
Environmental Factors	Legal incentive; competitiveness.	Tarani et al. (2021); Alsharari et al. (2020); Lutfi (2020); Albar & Hoque (2019); Usman et al. (2019); Low et al. (2011); Gupta & Misra (2016b); Huang & Palvia (2001).

Note: Elaborated by the authors.

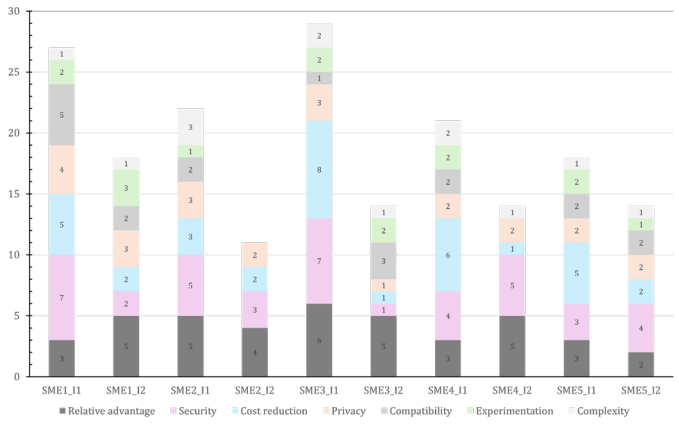
Impact of technological factors on ERP Cloud implementation in SMEs

The technological factors are related to the structural characteristics of the company, as well as employees' knowledge about ERP Cloud. In this category, 7 CSF were addressed: relative advantage, security, cost reduction, privacy, compatibility, experimentation and complexity.

Relative advantage and security were the most frequently addressed FCS among the technological factors, appearing 41 times in the 10 interviews. A Figure 2 shows how often the FCS mentioned above were discussed at the interviews.

Figure 2

Technological Factors



Note: Elaborated by the authors.

The predominant factor (relative advantage) aims to verify whether the new system brings benefits compared to the previous system. The responses to this factor were diverse. Some companies said that, at first, ERP Cloud didn't get any relative advantages because the previous system had been customized to meet all the company's specific requirements. In contrast, the new system only met some of the organizational needs. This change in the system was a culture change that forced employees to leave their comfort zones and learn how to use the new system.

On the other hand, most of the interviewees considered that the implementation of the system had brought benefits over the previous one, especially about better control of access and information traffic and greater security, as can be seen in excerpts from the interviews:

> *"I felt that the improvement in terms of compatibility was the speed with which information enters the system and generates other information that is needed. So this has greatly increased the speed with which information enters and is processed and facilitates other processes." (Interviewee 3).*

> *"It has brought advantages, from what I said, as it is the same system, scalability, flexibility, availability of the system itself. As well as the security of our data. Today I can tell you that with the time I've had the company, today I feel much safer having my data there in the ERP Cloud than here in my datacenter." (Interviewee 5).*

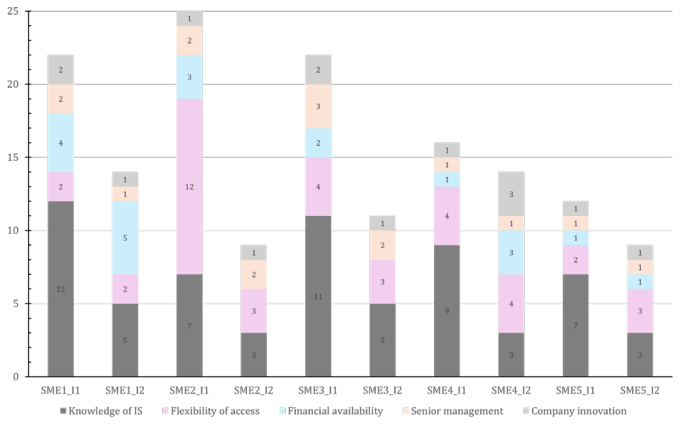
While Interviewee 3, the administrative manager at SME2, reported better system compatibility and speed in integrating and updating information, Interviewee 5, the Controller Manager at SME3, highlighted the more significant data security obtained through ERP Cloud. It shows that the interviewees' perceptions are intrinsically related to their position and strategic vision.

Impact of organizational factors on ERP Cloud implementation in SMEs

Organizational factors refer to how the organizational context influences the implementation of a new technology in the company, either positively or negatively. In this study, the following factors were analyzed: top management support, company innovation, information technology knowledge, accessibility flexibility and budget planning and control. A Figure 3 shows how often the CSF mentioned above was addressed in the interviews.

Figure 3

Organizational Factors



Note: Elaborated by the authors.

Knowledge of information systems and flexibility of accessibility were the most frequently mentioned among the organizational factors, appearing 65 and 39 times, respectively, in the 10 interviews.

Another point mentioned by the interviewees is that the company does not need to have an internal ICT team that knows ERP Cloud for it to be implemented. What is more important is that the employees know the company's processes and are committed to its implementation.

In this way, the ERP Cloud supplier will bring in the technical knowledge of the system and the company's employees the knowledge of the business processes. However, although SMEs have ICT sectors with few employees, turnover must be low to reduce the risk of losing knowledge when an employee leaves. The longer an employee stays with the company, the more likely they are to know both the technology used and the organization's business processes. The following account highlights these issues.

> *"The company has its own IT department, and the IT department doesn't have a high turnover rate [...] they're practically business analysts. We understand the company's business, and we know the processes of all the sectors. It makes it much easier [...] the users are already more mature, we have a low turnover, so whoever is there has been there for a long time and if someone comes in, they already have someone on their side who is more mature" (Interviewee 7).*

As Interviewee 7, the IT Manager at SME4, points out, there is a great deal of concern about employee turnover in the sector, since they have a mastery of the SME's business processes. The IT sector of the company analyzed is not responsible for the ERP Cloud itself, but for integrating the SME's processes and needs with the provider's service. It requires a great deal of knowledge of the internal routines and methods, so the aim is to maintain a low turnover of professionals.

Similarly, access flexibility is a crucial factor for SMEs. The dynamism and competitiveness of the market make it possible - and often require - employees to move around to carry out activities. Thus, the flexibility of ERP Cloud, by enabling access from different locations, has enabled SMEs to keep their operations running during the COVID-19 pandemic between 2020 and 2022. During this period, many companies had to reinvent how they carried out their activities to stay active in the market. The interviewees reinforce these advantages:

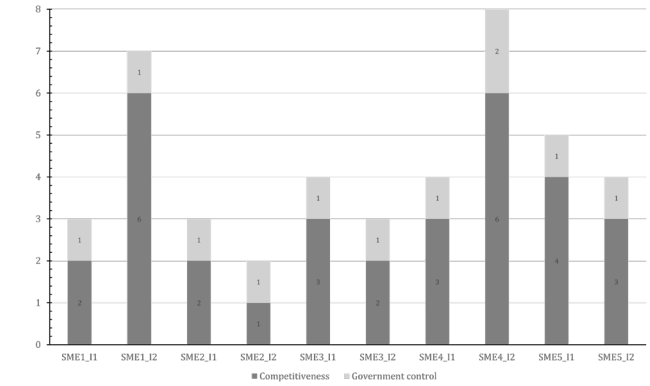
> *"That was a crucial point. We were only going to change our ERP system if it was in the cloud. Because before it was in the cloud, you either had to give the employee access via TeamViewer, Video or AnyDesk so they could access it from their computer at home, or access it from their machine at the company. But with this facility, everything in the cloud works on the cell phone, it works through the browser, you don't need to have anything installed, it was one of the decisive factors in choosing to put this system in the cloud. It was a determining factor. Also the sales part. There are salesmen on the street, the salesman: "I'm going to sell with the paper with the price list". On his cell phone, he opens it up and can see it. It's made it much easier for us. With the Internet, you can access it anywhere in the world." (Interviewee 3).*

Impact of environmental factors on ERP Cloud implementation in SMEs

The environmental factors represent the context in which the company operates. This research checked the following factors: government control and competitiveness. Figure 4 shows the number of times the environmental factors were addressed in the interviews.

Figure 4

Fatores ambientais



Note: Elaborated by the authors.

In Brazil, the legal issue is complex compared to other European countries. Legal incentives could help more companies implement this type of system. Competitiveness and government control appeared 32 and 11 times in the 10 interviews.

Competitiveness in a globalized world is increasing rapidly. Business increasingly generates interrelationships between different parts of the world, making the physical distance between companies and people even smaller. For one of the companies interviewed, competitiveness was not a factor that accelerated the implementation of ERP Cloud, but rather the flexibility of accessibility, making it possible for the company to have information about its products and place orders online, doing away with traditional catalogs.

For the other companies, competitiveness was a factor that accelerated the implementation of ERP Cloud. According to her, having the same system used by the supplier facilitates processes between business partners, as can be seen:

> *"Having a supplier who uses the same system makes it easier. Today, when [...] our partners come, they ask 'how did you manage to check, because you can tell me how far the product is and on what note you sent it. How did it get there, can I come and see it?" So we bring it. It would be our dream for our customers to use this same tool, it would make our day-to-day life much easier" (Interviewee 8).*

Interviewee 8, Operations Manager at SME4, said that while government incentives are non-existent for adopting ERP Cloud, the strengthening of external networks with other SMEs is expanding. The company analyzed acts in competition with others in the sector, competing and cooperating simultaneously to find solutions to common challenges. In addition, implementing ERP Cloud adds considerable value to relations with suppliers and customers, mainly through integrating systems and easier access to data and information.

Concerning government control, the government's participation through legal incentives was not verified in any of the interviews carried out, i.e. the government has no policy to encourage SMEs to update their technology. It was identified that, depending on the company's segment, it must follow the laws specific to its field of activity.

In addition to the organizational, environmental and technological factors mentioned above, the interviews revealed two other factors: good ERP Cloud implementation practices, and help to define organizational processes. Table 4 shows how many times each CSF was mentioned in each interview.

DISCUSSION

According to the interviews, the more standard (unchanged) the ERP Cloud is implemented, the more agile the implementation process will be. Companies should not turn the new system into the old system, with all the customizations it had before. At first, the implementation should include as few customizations as possible to get the system up and running and after getting to know the new system, the necessary developments and modifications should be made.

One practice SMEs adopted has been using other ICT tools to make data available to the requesting areas. Thus, the information is extracted from the ERP Cloud system and used in different tools to be tabulated as required. Some companies have a team responsible for data intelligence to generate reports, support decision-making, and develop new tools that add value to the business. As a result, the company does not need to have a programmer in-house to carry out customizations but instead has an intelligence area. In this area, reports are created according to the company's needs.

The results of this research are in line with the study by Heredia-Calzado and Duréndez (2019), where it was found that ERP Cloud is made up of several modules that work in an integrated way to bring results in a single system and that most companies choose to implement the standard system to take advantage of the already consolidated good practices that the system makes available and reduce possible errors due to customizations to meet the company's particularities. Based on these findings, the first proposition was formed.

Proposition 1:

Using best practices provided by ERP Cloud systems can facilitate implementation in SMEs.

Thus, the use of good practices represents the implementation of the standard ERP Cloud - without customizations. In addition, the ERP Cloud standard helps SMEs build their process flow and increases credibility because other companies already use the system.

In this context of technological modernization for SMEs, ERP Cloud stands out because, compared to traditional ERPs, it doesn't require significant initial investments in infrastructure, and it doesn't require a specialized ICT team. With ERP Cloud, SMEs don't have to worry about possible maintenance and technological

Table 4

Critical success factors identified in the study

			Interviews										
			SME1_I1	SME1_I2	SME2_I1	SME2_I2	SME3_I1	SME3_I2	SME4_I1	SME4_I2	SME5_I1	SME5_I2	Total
Critical Success Factors	Technological Factors	Relative advantage	3	5	5	4	6	5	3	5	3	2	**41**
		Security	7	2	5	3	7	1	4	5	3	4	**41**
		Cost reduction	5	2	3	2	8	1	6	1	5	2	**35**
		Privacy	4	3	3	2	3	1	2	2	2	2	**24**
		Compatibility	5	2	2	-	1	3	2	-	2	2	**19**
		Experimentation	2	3	1	-	2	2	2	-	2	1	**15**
		Complexity	1	1	3	-	2	1	2	1	1	1	**13**
	Organizational Factors	Knowledge of IS	12	5	7	3	11	5	9	3	7	3	**65**
		Flexibility of access	2	2	12	3	4	3	4	4	2	3	**39**
		Financial availability	4	5	3	-	2	-	1	3	1	1	**20**
		Senior management	2	1	2	2	3	2	1	1	1	1	**16**
		Company innovation	2	1	1	1	2	1	1	3	1	1	**14**
	Environmental Factors	Competitiveness	2	6	2	1	3	2	3	6	4	3	**32**
		Government control	1	1	1	1	1	1	1	2	1	1	**11**
	New Factors	ERP Cloud best practices	-	1	1	-	3	1	1	1	2	1	**11**
		Process definition	-	1	2	1	1	3	1	2	1	1	**13**

Note: Elaborated by the authors.

updates, corroborating the study by Tarani et al. (2021), which shows that companies with subscription-based ICT services reduce the complexity of technologies within the organization.

Another advantage that Gupta and Misra (2016a) bring up in their study, which was verified by the SMEs interviewed, is that companies do not have to have prior technical and operational knowledge to implement this type of system. Attention should be paid to mapping the processes so that it is possible to choose the system that will best meet the needs of the SME. Ngai et al. (2008) discussed and identified this attribute in this study. Based on this, the second proposition was created.

Proposition 2:

The implementation of ERP Cloud helps to define the process flows of SMEs.

In this sense, it can be seen that the implementation of ERP Cloud has helped SMEs, which did not have a clearly defined process flow, to model and manage their processes. While large companies have their processes mapped out and their activities clearly defined - facilitating the implementation of ERP Cloud - SMEs go through the reverse process, and ERP Cloud is the facilitating factor for defining process flows. In the SMEs analyzed, many previously non-standardized activities now follow a sequence of execution, making organizational processes more dynamic and reducing the rate of errors.

In addition to the search for standard implementation and the ability of ERP Cloud to contribute to improving organizational processes, another issue that has already been mentioned stands out. Based on the interviews, SMEs did not consistently implement the ERP that was best suited to their operations. In some cases, compatibility was prioritized over the brand or cost of the ERP.

Much of the academic literature argues that SMEs choose ERP Cloud based on the system's compatibility with their values, needs and past experiences (Alsharari et al., 2020; Hasheela Miss & Mufeti, 2016; Tarani et al., 2021). Some interviewees agreed with the literature, as they considered that the system's complexity could compromise implementation and use. However, some companies followed a different path and chose the system based on brand, cost, security or business partners. The third proposition was created based on these results, which diverge from the literature.

Proposition 3:

ERP Cloud compatibility is often overlooked in relation to other critical success factors when choosing a system.

According to the interviews, it can be seen that compatibility is not the only factor guiding the choice of ERP Cloud in SMEs, contrary to the results of the studies by Tarani et al. (2021) and Alsharari et al. (2020). Factors such as cost, brand, security and privacy impact the decision regarding which ERP Cloud to hire.

It also applies to the companies that defined the ERP to be implemented based on the system used by their business partners. This decision was made in search of possible benefits for partners from future developments. It should be noted that when a company chooses to implement the same system as that used by a commercial partner, negotiations between them can take place more quickly, depending on the level of integration between the systems used. It corroborates the study by Tarani et al. (2021), which shows that the flow of information within and between organizations is fundamental to the organization's success.

In addition, some companies did not prioritize compatibility or brand when assessing which ERP Cloud was best to implement. These companies consider it essential to have all the processes mapped out. Based on this mapping, they can determine which ERP is best for their needs and check the developments necessary to meet the company's specific requirements, which aligns with propositions 2 and 3.

The security and privacy with which data is stored in the ERP Cloud also positively influenced companies to implement the ERP Cloud. Although SMEs were initially wary of transferring their data to a third party - because they thought that if the data remained stored within the company, it would be more secure - they soon came to trust and preferred to hand over this responsibility to the system supplier.

A common way for SMEs to get to know ERP Cloud, before implementing it is to get to know it through business partners who already use the system (Razzaq et al., 2021). In this way, SMEs can evaluate the system and check for possible security problems that have occurred in other companies. In general, SMEs showed caution when choosing a system, avoiding unknown solutions that could cause future problems.

In addition, it should be noted that most SMEs took into account the flexibility of ERP Cloud when choosing the system, being one of the main factors analyzed, corroborating the studies carried out by Alsharari et al. (2020), Usman et al. (2016) and Gupta et al. (2018). Companies are looking for a system that can be accessed from different locations. The flexible accessibility of ERP Cloud has enabled companies to keep their operations running during the COVID-19 pandemic between 2020 and 2022. During this period, many companies had to reinvent how they carried out their activities to remain active in the market. Based on this finding, the fourth proposition was created.

Proposition 4:

Flexibility of access has become one of the main factors in choosing ERP Cloud.

It can be seen that for the SMEs interviewed that implemented ERP more than 5 years ago, flexibility of accessibility was not a criterion analyzed when defining the system. The culture required the employee to be physically at the company to carry out activities, i.e. it was not common for the employee to work from home or elsewhere. At that time, the factors used by companies to select ERP were cost, security and the possibility of the system meeting the company's possible growth without making significant investments. These reasons contrast with the factors found in the studies by Alsharari et al. (2020) and Usman et al. (2016).

In addition to the flexibility of accessibility, the flexibility to make changes to the system was also checked. Over time, there may be a need to adjust the system to meet the company's needs or external demands. The flexibility to implement developments and customizations in ERP Cloud is related to the system the SME has implemented. It was found that some ERPs are more flexible when it comes to making changes, while others are more rigid. In this second type, for a demand to be made by the ERP provider, it may be necessary for the request to be made by many clients or by a significant client. Otherwise, changes are difficult to obtain unless the SME chooses to bear the development costs in full.

In addition to the above factors, the involvement of senior management is paramount if implementation is to be successful. Senior management manages the resources needed to implement ERP Cloud (Albar & Hoque, 2019). Senior management is also responsible for communicating the relevance and benefits that the new technology will bring (Zamzeer et al., 2020). Based on this statement, the fifth proposition was composed.

Proposition 5:

The role of senior management is more critical than ICT knowledge for the successful implementation of ERP Cloud.

According to Tarani et al. (2021) and Razzaq et al. (2021), ICT knowledge was highlighted as an essential factor for implementing ERP Cloud, while in the companies interviewed, it was not considered a critical factor. The role of senior management was considered more important than ICT knowledge. As a result, there is less and less of a need for SMEs to have internal ICT departments. The same cannot be said for the importance of senior management orchestrating the project.

The participation of senior management was mentioned in the studies by Albar and Hoque (2019), Gupta et al. (2019) and Alsharari et al. (2020) as being extremely important for successful implementations. This study also found that the top management of the SMEs actively participated in all project stages, mainly to provide the necessary resources and keep the team engaged to achieve the defined objectives.

Another factor considered fundamental by SMEs was experimentation. Alsharari et al. (2020) found that experimentation is almost impossible before a company adopts ERP Cloud. If it were possible, it would help the company define which system to implement. The companies interviewed also found no possibility of experimenting with the system before implementation. Therefore, careful testing became an essential tool for ensuring the success of the ERP Cloud implementation.

The participation of the government through legal incentives was not verified in any of the interviews carried out, and no incentive policy was identified. Thus, the results found in this study are incompatible with the studies by Albar and Hoque (2019) e and Salum et al. (2017), whose results show that when the government encourages SMEs, they become more likely to implement new technologies.

CONCLUSION

The interviews showed that the CSFs impacted all ERP Cloud implementations in Brazilian SMEs, and when they were well managed, they enabled the implementations to take place satisfactorily. The results indicate that, in Brazil, the implementation of ERP Cloud in SMEs differs in some respects, such as being a tool that helps model companies' business processes, which is confirmed by the fact that SMEs prioritize implementing the system in standard mode.

If, on the one hand, this finding attests to the originality of the study, there is a need to delve deeper into the subject in emerging countries that are increasingly adopting cloud technology. Although studies have been identified in other countries, each territory's factors and characteristics impact how companies operate and how innovation takes place. Technology is necessary if organizations are not to lose competitiveness, free themselves from geographical barriers and overcome the traditional way they carry out their activities.

From the results of this study, it can be seen that the relevance of the CSFs can change in each country, depending on the characteristics of each region, the local culture and customs, and the economy of the area where the system is being implemented. However, for implementation to be successful, it is of the utmost importance to plan and monitor all stages of the project so that the impact of regional characteristics on the CSFs is mitigated and their effect on the implementation process is reduced.

In this sense, this study has the potential to help companies understand the main CSFs that need to be assessed and monitored during a cloud ERP implementation project. Knowing these factors makes it possible to find alignment between the parties to move toward a successful implementation.

Although a methodology was used to try to reduce researcher bias, this study is not without its limitations. Only ten interviews were conducted in five SMEs to carry out this research. The interviews were conducted with employees with the greatest knowledge of ERP Cloud and did not include all employees who use the system. The SMEs interviewed are only located in the southern region of Brazil. Therefore, the limited sample prevents the results from being generalized to SMEs nationwide. More extensive future studies are needed to cover this gap. In addition, the analysis carried out was subject to the participant's perception of the research instrument and the researchers' perception of the results obtained and is susceptible to errors or implications.

Based on the results and the limitations themselves, it is recommended that further studies be carried out, covering a more significant number of SMEs and interviews with employees who use ERP Cloud in different regions of Brazil. Other studies could be carried out looking at other CSFs not covered in this study. In this way, more information will be generated to help SMEs considering implementing ERP Cloud in their operations make more assertive decisions and reduce errors in the implementation process.

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Conflict of interest statement

The authors declare that there is no conflict of interest.

Authors' statement of individual contributions

Roles	Contributions	
	Barbieri L. M.	Sott M. K.
Conceptualization	■	
Methodology	■	■
Software	■	
Validation	■	■
Formal analysis	■	■
Investigation	■	■
Resources	■	
Data Curation	■	■
Writing - Original Draf	■	
Writing - Review & Editing	■	■
Visualization	■	■
Supervision	■	■
Project administration	■	
Funding acquisition	■	■

Note: Acc. CRediT (Contributor Roles Taxonomy): https://credit.niso.org/

Open Science: Data availability

The entire dataset that supports the results of this study has been made available on SciELO Data from the REGEPE Entrepreneurship and Small Business Journal and can be accessed at the following DOIs:

Badge	Description
	https://doi.org/10.48331/scielodata.TWN7SV
	Not applicable
	https://doi.org/10.48331/scielodata.TWN7SV
	https://doi.org/10.14211/regepe.esbj.e2463pr
	Not applicable

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