

# Enterprise Systems Implementation Success in the Shakedown Phase

*Completed Research Paper*

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## ABSTRACT

Enterprise systems (ES) are popular in both business and academia: many organizations adopt an ES and much has been published on the topic. However, we argue not much is known about success (and its contributing factors) during the different moments of an ES implementation, although this is highly relevant for practice. This study considers the relevant success factors during the shakedown phase of an ES implementation. We use a framework that incorporates three dimensions of success: user, correspondence, and system success. Each success dimension has its own set of success factors. We empirically study an ES implementation in its shakedown phase at a large university in the Netherlands, through conducting interviews and a survey. Results show that data accuracy, troubleshooting, and user support were rated the most important for ES implementation success, whereas business process reengineering (BPR), customization, and again data accuracy were evaluated the best for this ES implementation.

## Keywords

ERP, enterprise resource planning, success factors, university, Netherlands.

## INTRODUCTION

The enterprise systems (ES) industry is still popular and growing. Already in the 1970s, organizations pursued the idea of having one integrated IS for the entire enterprise (Markus and Tanis, 2000), also known as an Enterprise Resource Planning (ERP) system. ES are the result of decades of development in integrating IS for organizations. ES software packages promise integration of all information that flows through an organization (Marnewick and Labuschagne, 2005). The adoption of an ES provides various potential gains: replacing legacy systems, reducing IT maintenance costs, improving business processes, reducing inventory, and standardizing data (Markus and Tanis, 2000; Umble, Haft and Umble, 2003).

However, the packaged nature of an ES commonly requires an organization to adapt its way of working (Davenport, 1998; Markus and Tanis, 2000). Therefore, organizations often reengineer their business processes to fit the ES. Hence, the implementation of an ES implies large-scale organizational change, which places a heavy burden on an organization. The problems that come with implementing and using an ES are well-known in the academic literature (Chang, Gable, Smythe and Timbrell, 2000). ES implementation is often resource-intensive (Seddon, Calvert and Yang, 2010) and benefits are hard to quantify and attain, while the implementation involves high risks for an organization (Besson and Rowe, 2001; Markus and Tanis, 2000). In some cases, ES implementation failure leads to the bankruptcy of an organization. As a consequence of the high risk involved and the complex nature of ES, there exists ample research on ES implementations (Ifinedo, Rapp, Ifinedo and Sundberg, 2010). More specifically, ES literature addresses what contributes to the success of an ES implementation (Al-Mashari, Al-Mudimigh and Zairi, 2003; Nah and Delgado, 2006; Nah, Lau and Kuang, 2001; Somers and Nelson, 2001; Umble et al., 2003). However, success is relative, depending on who you ask and when (Van den Hooff, 2012). We argue less is known about success (and its contributing factors) during different moments of an ES implementation.

An important stage in the ES implementation process is the shakedown phase (Markus and Tanis, 2000). In this phase, an organization tries to come to grips with the ES. The phase starts from the “go-live” of the system and ends when the

organization reaches “routine use” of the ES. Most of the unresolved issues from prior phases surface during this phase, so the level of success of an ES implementation usually becomes apparent. An organization learns how to work with the system in the shakedown phase. Initially, this results in a performance dip (Ross and Vitale, 2000). When an organization faces too many difficulties it may decide to terminate and abandon the system (Markus and Tanis, 2000). In order to increase the success chances in this important phase of ES implementation, it is appropriate to consider what influences those chances. We will address this by answering the following research question:

*What determines the success of an ES implementation in the shakedown phase?*

Answering this question is of both scientific and practical relevance. Although studies on ES, as well as on IS success, are abundant, we believe limited empirical research exists on success in the specific phases of ES implementation, such as the shakedown phase. The practical value of this work lies in that a better perception of what influences ES implementation success may actually lead to more ES implementations ending well.

The remainder of this paper is structured as follows. First, we discuss the relevant theory, specifically the phases of an ES implementation, zooming in on the shakedown phase. We also review the concept of success in the ES literature. This leads to a conceptual model about critical success factors and their relation to the various success dimensions. Next, we explain the research method for the empirical part of this study: a survey and interviews conducted at a large Dutch university that implemented an ES. Following this, we present our results and lastly we discuss the implications of our work.

## THEORY & CONCEPTUAL MODEL

The implementation of an ES takes considerable time (and resources). Consequently, ES implementations occur in a number of phases. In the IS literature, numerous studies aim to describe the typical phases of an implementation (e.g. Markus and Tanis, 2000; Marnewick and Labuschagne, 2005; Ross and Vitale, 2000; Somers and Nelson, 2004). Of these, the two most widely cited studies (according to Google Scholar’s citation count) are those of Markus and Tanis (2000) and Ross and Vitale (2000). We compare their phasing in Table 1.

Study	Year	Phases				
Markus and Tanis	2000	Chartering phase	Project phase	Shakedown phase	Onward and upward phase	
Ross and Vitale	2000	ERP design	Implementation	Stabilization	Continuous improvement	Transformation

**Table 1. Two ES implementation frameworks**

Ross and Vitale (2000) describe five stages for ES implementation; the framework of Markus and Tanis (2000) has four phases. Both models discuss the full scope of an ES implementation (as opposed to e.g. Marnewick and Labuschagne, 2005) and how an organization can achieve business value from its implementation. Markus and Tanis (2000) differ from Ross and Vitale (2000) in acknowledging the underlying principles that drive an implementation to a successful outcome. Also, the former argue that the outcomes of one phase become starting conditions for the next. Lastly, their framework acknowledges that the interaction between uncontrollable events and purposeful actions result in the eventual outcomes of a phase in the model. This means that there is the possibility that problems remain undetected in one phase, but surface in another phase, causing major disruptions in the implementation progress. As Markus and Tanis (2000) make these explicit assumptions about the process of ES implementation and how these assumptions affect the optimal level of success, we adopt this model and their “shakedown phase” for our current work.

As indicated in the introduction, during the shakedown phase an organization tries to achieve normal operations while working with the new system (Markus and Tanis, 2000). Typical activities during the shakedown phase are: process changes, problem resolution, (re)training users, cleaning up data errors, fixing bugs, and adding new hardware. It is during shakedown that the organization is confronted with wrong decisions made in preceding phases. Major problems that typically arise at this stage are: excessive reliance on the knowledge of project team members, and employees that work around the system.

In sum, the shakedown phase is a pivotal stage of the ES implementation process, and the importance and difficulty of activities in this stage are easily underestimated. Organizations that do not successfully manage the issues of the shakedown phase may have to abandon the implementation project.

## ES Success Dimensions

Organizations often have difficulties in reaping the benefits from an ES implementation. ES implementations are known for costing a substantial amount of time and money (Umble and Umble, 2002). Also, the implementation process is complex and difficult to manage. From the above discussion, it becomes clear that ES implementations can disrupt the organizational culture, create excessive training requirements, and disturb productivity (Barker and Frolick, 2003; Ross and Vitale, 2000; Umble and Umble, 2002). ES are known for implying their own logic on an organization's processes and structures (Davenport, 1998). ES implementations are more than IT projects; they are organizational change projects and should therefore be managed as such (Boonstra, 2006).

Considering the impact of an ES implementation, it is not surprising that the ES literature has discussed the most important factors that contribute to the success of an ES implementation (Umble and Umble, 2002). Based on literature study (see Table 2), we argue the following widely-cited critical success factors are relevant in the shakedown phase: business process reengineering (BPR) and customization, communication, system testing and troubleshooting, data accuracy, training and education, and user involvement (Al-Mashari et al., 2003; Ehie and Madsen, 2005; Holland and Light, 1999; Nah and Delgado, 2006; Nah et al., 2001; Ngai, Law and Wat, 2008; Somers and Nelson, 2001; Umble et al., 2003; Wang, Shih, Jiang and Klein, 2008; Zhang, Lee, Zhang and Banerjee, 2003).

	Al-Mashari et al. (2003)	Ehie and Madsen (2005)	Holland and Light (1999)	Nah and Delgado (2006)	Nah et al. (2001)	Ngai et al. (2008)	Somers and Nelson (2001)	Umble et al. (2003)	Wang et al. (2008)	Zhang et al. (2003)
<b>BPR and customization</b>	X	X	X	X	X	X	X			X
<b>Communication</b>	X		X	X	X	X	X			
<b>System testing and troubleshooting</b>	X		X	X	X	X				
<b>Data accuracy</b>				X		X	X	X		X
<b>Training and education</b>	X			X			X	X		X
<b>User involvement</b>			X	X					X	X

**Table 2. Widely-cited success factors included in this study**

With all these success factors, it is important to realize that success is multidimensional and that there is no one superior measure of success. Success depends on the *perspective* from which it is being measured (Larsen and Myers, 1997), and is relative to the *time* at which it is measured (Markus and Tanis, 2000). An organization can achieve significant success in the early stages of an implementation project, but the project may still fail at a later stage. Similarly, a business manager can consider a system a success, whereas the IT department views it as a disaster. To cluster the above success factors, we use the framework of Van den Hooff (2012), which takes this relativity of success into account. It is based on earlier ES literature, more specifically on the works of Al-Mashari et al. (2003), DeLone and McLean (1992), and Shang and Seddon (2002). The framework of Van den Hooff addresses success from five different perspectives: management, project, system, correspondence, and user success. We apply this framework to the shakedown phase of an ES implementation project, leading to the conceptual model presented in Figure 1.

We now discuss the relevance of each of the success dimensions and their corresponding success factors for the shakedown phase. *Management success* is the extent to which an IS contributes to achieving managerial goals. *Project success* is the extent to which the implementation project results in an up and running system with agreed-upon requirements delivered within schedule and budget. As both management and project success are not believed to be relevant for the shakedown phase (Van den Hooff, 2012), we only elaborate on the three remaining perspectives.

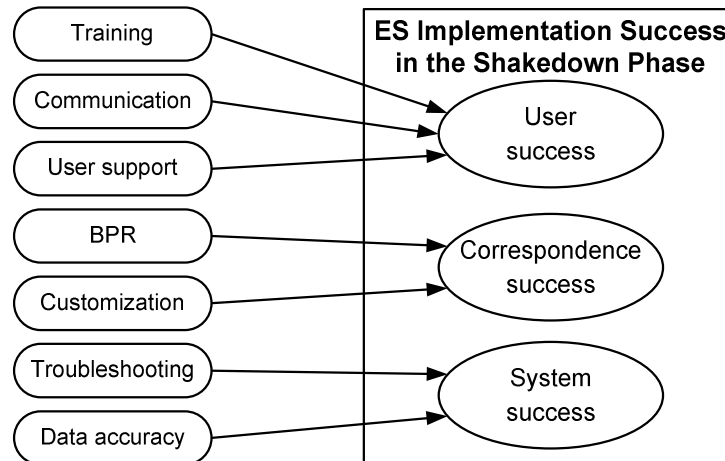


Figure 1. Conceptual model

### User Success

*User success* is the extent to which users have a positive attitude towards the system, and the system meets their expectations (DeLone and McLean, 1992). More specifically, user satisfaction determines user success. Sabherwal, Jeyaraj and Chowa (2006, p. 1851) define user satisfaction as “the extent to which the user believes that the system meets his or her information requirements”. Many IS studies regard user satisfaction as a critical measure of IS success (DeLone and McLean, 1992). ES are notorious for changing the structure and culture of an organization. This can create resistance to change from users (Sabherwal et al., 2006). Often, substantial training and communication can help users cope with change and accept and work with the ES (Ifinedo et al., 2010). This is the reason why user satisfaction is such an important determinant of ES implementation success. Many ES implementations fail as a result of dissatisfied users not (effectively) using the system (Sabherwal et al., 2006). Three factors contribute to user success in the shakedown phase: training, effective communication, and user support.

*Training* is important because an organization can reap the full benefits of an ES when users know how to work with it (Umble et al., 2003). The main goal of the training should be to educate users about the business processes supported by the ES (Al-Mashari et al., 2003). In the shakedown phase, the organization tries to learn how to work with the system effectively (Markus and Tanis, 2000). Therefore, additional training of users is a key activity during the shakedown phase.

Effective *communication* is often mentioned as critical success factor in ES implementation (Al-Mashari et al., 2003; Holland and Light, 1999; Nah and Delgado, 2006; Nah et al., 2001; Ngai et al., 2008; Somers and Nelson, 2001). Communication entails information about scope, objectives, and tasks of an ES project (Al-Mashari et al., 2003; Nah et al., 2001). Learning to work with the system results in a temporal decrease in productivity and employee morale. Communication can be used to influence users’ attitudes towards the system (Aladwani, 2001). This can result in more involvement and a positive attitude towards the ES and its implementation.

*User support* entails the participation of key users in the development and implementation of the ES (Wang et al., 2008). It decreases the resistance to change by users as they feel that they play an important role in decision making regarding the ES. Hence, through participation, users restore a feeling of control over their work (Zhang et al., 2003).

### Correspondence Success

*Correspondence success* is the extent to which there is a fit between the IT system and the business process requirements (Al-Mashari et al., 2003). If an organization wants to achieve business value from investing in an ES, it has to align its own business processes with the best practices embedded in the ES software (Davenport, 1998). Markus and Tanis (2000) call the extent to which the industry-specific needs of an organization match the ES package “feature-function fit”. A lack in feature-function fit is often an important reason for an organization to not or only partially adopt an ES. Two factors influence correspondence success of an ES implementation in the shakedown phase: BPR and customization.

ES are developed to improve the business processes of an organization (Al-Mashari et al., 2003; Davenport, 1998). Therefore, organizations typically undertake *BPR* efforts to accomplish a fit between business processes and the ES. In the

shakedown phase, an organization learns to work with the ES (Markus and Tanis, 2000) and during this process, new ideas can come up for the reengineering of its business processes (Nah et al., 2001).

*Customization* implies changing the software code of an ES package. Customization is associated with increased IS costs, longer implementation time, and inability to benefit from upgrades and maintenance from an ES vendor (Somers and Nelson, 2001). However, in this 'learning-how-to-work'-process, organizations may still decide to customize the software (Markus and Tanis, 2000; Nah et al., 2001), as this may improve the similarity between how the system works and the organization wants to work, i.e. increase feature-function fit.

### System Success

*System success*, based on DeLone and McLean (1992), is the extent to which the system meets criteria in terms of data accuracy, maintenance, reliability and structure. Users can lose trust in the new ES when it does not function properly (Häkkinen and Hilmola, 2008). As a result, the organization cannot reap the full benefits of a costly ES implementation, as the users will not effectively use the system (Xu, Nord, Brown and Nord, 2002). Two factors affect system success in the shakedown phase of an ES implementation: troubleshooting and data accuracy.

When the ES is up and running in the shakedown phase, it is typical for an organization to experience performance problems and bugs in the software (Markus and Tanis, 2000). A quick response, patience, and problem-solving capabilities are important to overcome the issues experienced (Nah et al., 2001). With effective *troubleshooting*, an organization can improve the reliability and performance of an ES.

Data availability, timeliness, and accurateness are fundamental for the effectiveness of an ES (Somers and Nelson, 2001; Umble et al., 2003). *Data accuracy* problems can lead to serious delays in the project (Nah and Delgado, 2006). In the shakedown phase, data input errors are typical problems as users still need to learn how to work with the new ES (Markus and Tanis, 2000).

## METHOD

The empirical part of this study is conducted at a large university in the Netherlands, consisting of twelve faculties, over 2,750 scientific staff members, and approximately 25,000 students. Due to an aging IS for students and administrative personnel, management decided to implement a new IS. The university opted to initiate a project to purchase and implement a standard system package. They chose an ES from vendor SAP called Student Lifecycle Management (SAP/SLM). Data collection occurred about a year and three months after the go-live of SAP/SLM and took place within seven weeks. The university was then still in its first academic year with the new system and made efforts to handle the performance dip that resulted from the implementation, indicating the university was in the shakedown phase.

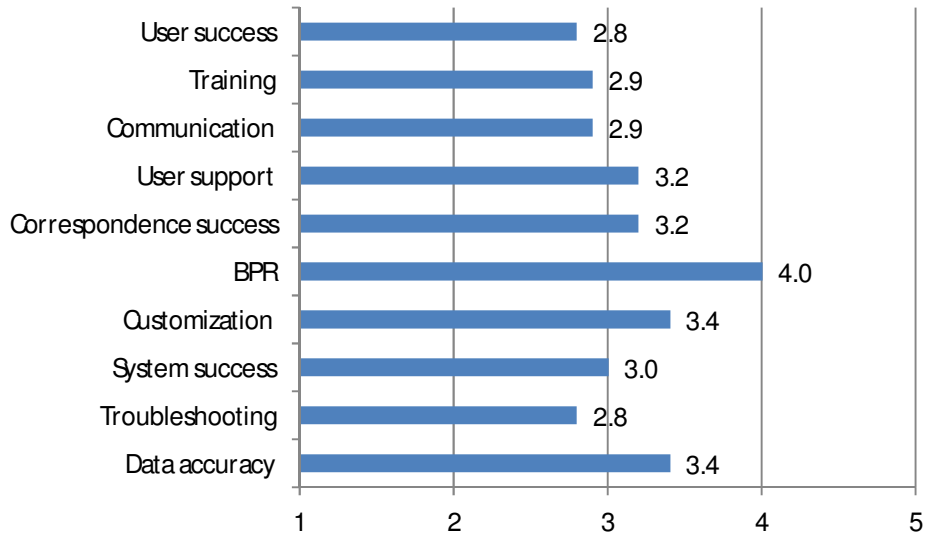
To investigate the factors that contribute to the different success dimensions, we conducted interviews and a survey. Six frequent users of the system were approached for an interview: four from the Faculty of Economics (the largest faculty), and two from important administrative departments. The employees would receive an e-mail inviting them for an interview. Every employee accepted the invitation and gave permission to record and transcribe the interview. The questions address the factors of the three success dimensions. An example for user success: "*did you receive training to work with the system?*", for correspondence success: "*did you have to alter your way of working as a consequence of the system?*", and for system success: "*is the data in the system accurate?*".

Apart from interviews, this study also draws from an online survey among users. The sample consisted of employees from two administrative departments of the university and from the Faculty of Economics. All users in the sample received an invitation by e-mail, which contained a link to the survey. In total, 69 users were invited and 25 of them completed the survey; leading to a response rate of 36 percent. The survey also measures the success factors, using a 5-point Likert-scale ranging from "totally disagree" to "totally agree". Where possible, existing constructs are used, e.g. those from Xu et al. (2002) for items measuring BPR, customization, and troubleshooting. In the survey, every topic ends with an item asking to indicate the importance of that construct for the success of the ES implementation. For example, the importance of user support for the success of the ES is measured through: "*The following grade represents the importance of user support for the success of the system:*". Each of these questions is based on the study of Somers and Nelson (2004).

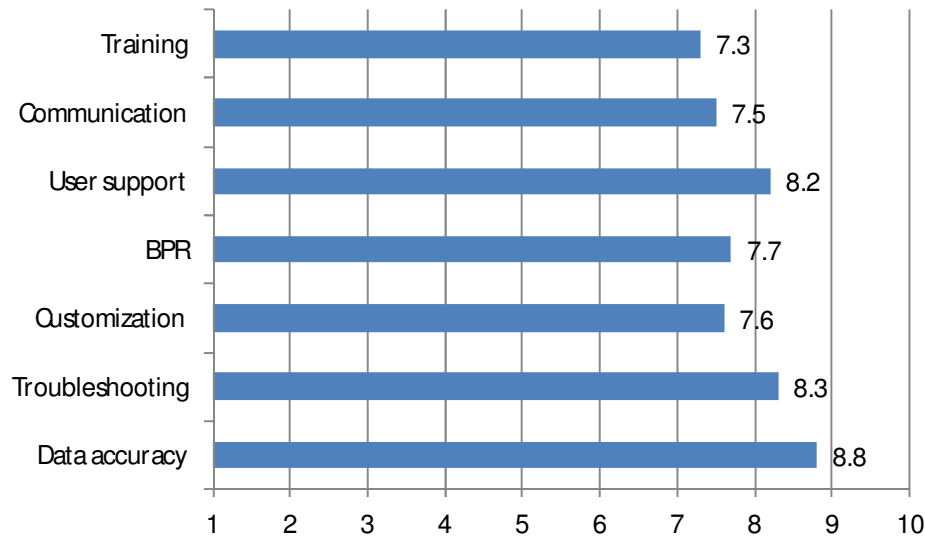
Finally, this study also uses documents to support the findings from the interviews and the survey, i.e. memos, meeting reports, e-mails, project documents, and notes. These documents provide a vast amount of information about the project phases, goals, and the general approach towards the project.

**RESULTS**

Figure 2 shows the ratings of the different success dimensions and their underlying factors, based on the survey. BPR clearly scores the highest, while training and communication (together forming user success), and troubleshooting are rated the lowest. In Figure 3, the importance of the different success factors based on the survey is shown, where data accuracy scores the highest, followed by troubleshooting and user support. Note that the scores in Figure 2 regarding importance often differ from the scores of Figure 3, their perceived importance. Due to space limitations, we omit quotes from the interviews; transcripts are available upon request.



**Figure 2. Mean ratings success dimensions and their underlying factors**



**Figure 3. Mean importance success factors**

### User Success

In the survey, *user success* scores low. This is in line with the interviews. Users were critical when asked how they felt about the system. In general, users believed the system is good for the university. Also, users appreciated the possibilities of the ES. However, they felt frustrated about the problems with the system as it sometimes does not work optimally. Regarding *training*, users were positive about the organization of the training sessions. The university employed a method called “train-the-trainer”. However, users did complain training was insufficient as they trained with test components and not the operational system. Users explained that training sessions after go-live with the operational system would refresh their knowledge and familiarize them with the possibilities of the ES. The interviewees believed that *communication* was sufficient. Users were informed about project progress, participation in workgroups, and test sessions. However, because of the large impact of the implementation, information was very generic. With respect to *user support*, the university invested a lot of time and energy in analyzing and designing the work processes. Users were frequently contacted to assist in designing these processes. The university relied on knowledge and involvement of users to assist in designing the ES. Users participated in frequent meetings and workgroups.

### Correspondence Success

The survey results show that *correspondence success* is the highest rated success dimension in the survey. The interviews support this high rating. Generally, the users believed the university needed the system. The old student system was outdated and a new system could offer possibilities that better suited the processes involving students and administration. The high score of *BPR* in the survey is no surprise. To fit with the best practices in the ES, the university spent two years adjusting its business processes. Interviewees gave many examples of how their work changed as a result of the ES. To fully benefit from the ES, the university keeps optimizing its business processes. In terms of *customization*, the university adjusted the ES after the go-live to make it more efficient. The university made special adjustments for smaller departments with different business process needs, such as the postgraduate department. However, improvements are still needed for those departments.

### System Success

The relatively low score for *user success* in the survey is in line with the interview results. Overall, users felt that the system was reliable. However, users also indicated that the system did not function consistently. Technical problems were hard to understand for users and made them insecure. For *troubleshooting*, users could approach key-users regarding small problems with SAP/SLM. More complex problems were handled by the university’s IT department. Users expressed frustration with the slow response time of the department, especially directly after the go-live of the system. Eventually, the performance of SAP/SLM improved leading to less problems and a better performance of the IT department. Users mainly experienced difficulties with *data accuracy* directly after go-live due to data conversion. Over time, this problem diminished as users entered new data into the system. The ES contained built-in checks to prevent erroneous data. Users also reported structural problems with the accuracy of the data. The university still makes efforts to improve system performance.

## CONCLUSION & DISCUSSION

This study started with the question what determines the success of ES implementation in the shakedown phase. We addressed this question with theory describing the typical activities during the shakedown phase, the different success dimensions relevant in this phase, and their critical success factors; resulting in a conceptual model about the contribution of every success factor to the success dimension it pertains to. Next, we conducted interviews and a survey at a large Dutch university. The findings of this research provide support for what factors contribute to the success of ES implementation in the shakedown phase. For the user success dimension, interview and survey findings show high scores on user support, but low scores on training and communication. The factors BPR and customization both contribute highly to correspondence success. Data accuracy contributes positively to system success, troubleshooting less so. Interestingly, the values given in the survey to the *importance* of the success factors often contradict these scores. This is a finding that deserves further investigation.

In terms of limitations, we mention the limited quantitative power of our results. Further studies consisting of larger samples would be desirable. Through this larger *n*, it may be possible to statistically identify relationships between success factors and dimensions. Future research could also focus on the success dimensions in other phases of ES implementation. Here, we only focused on the shakedown phase, but as discussed, Markus and Tanis (2000) also describe three other stages in their framework. E.g. top management support, project management, a project champion, and project team expertise could be important factors in the chartering stage (Nah et al., 2001). Important in the project phase could be BPR, customization, training, troubleshooting, and testing. Finally, performance evaluation could be a relevant factor in the onward and upward

phase. Furthermore, studying different phases of ES implementation gives the opportunity to conduct a longitudinal study, which could provide data over an extended period of time. This could lead to more empirical insight into the ES implementation process and possibly changes in contributing factors over time. Finally, to assess the validity of the results of the current study, the same research method could be applied to organizations in other sectors and/countries, implementing different ES types.

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