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ORIGINAL STUDY

The Impact of Enterprise Resource Planning (ERP) Implementation on Performance of Firms: A Case to Support Production Process Improvement

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Abstract

Competitive globalization and automated process management through a functional information platform that supports technologies such as enterprise resource planning (ERP) are critical to improving the performance of any business. Research studies show that a large number of (ERP) projects fail during implementation. Other studies have shown that the effectiveness of ERP implementation in improving production processes is modest or low, even for well-designed systems. This study takes an in-depth look at the critical success factors of ERP implementation that impact business success and conducts a case study to analyze the results obtained and assess their impact on performance.

Keywords: AMOS (analysis of moment structures), Case study, Critical success factors, Enterprise resource planning, Implementation

1. Introduction

The development of engineering and technology, along with globalization and the increasingly complex business environment, necessitates the efficient flow and processing of vast amounts of information encompassing various domains such as procurement, inventory management, finance, and human resources. This information is crucial for timely and informed decision-making (Krunoslav and Maja, 2020; Vukovic et al., 2007). In the digital age, technology has transformed from a secondary to a primary strategy in achieving a company's mission and vision. However, the implementation of technology often falls short of meeting business expectations. Enterprise Resource Planning (ERP) is one such technology that exemplifies these challenges. Originally emerging as an evolution of Manufacturing Requirements Planning (MRP) and Manufacturing Resource Planning (MRP II) systems in the 1980s, ERP systems expanded to encompass other enterprise functions such as finance, marketing, and HR (Hodak, 2021; Duan et al., 2013; Handoko et al., 2015). They comprise a suite of applications automating back-end operations like financial management, inventory control, scheduling, order fulfillment, cost management, accounts payable, and accounts receivable, as well as front-end operations like Point of Sale (POS) and field services. The implementation of ERP systems can lead to enhanced efficiency, improved quality, productivity, and profitability (Candra, 2012).

Recent studies indicate a steady and, in some markets, higher-than-anticipated demand for ERP systems (Anaya and Qutaishat, 2022). This increased demand can be attributed to the fact that ERP systems offer more advantages and strategic benefits to companies than small-scale information systems (IS). Moreover, ERP systems play a crucial role in implementing best practices and achieving operational excellence within organizations (Pohludka et al., 2018; Seddon et al., 2010). They have

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demonstrated the potential to facilitate business development, growth, and sustainability (Pohludka et al., 2018; Chofreh et al., 2020; Lin and Chang, 2019; Simmonds et al., 2018). Notably, the implementation of ERP systems is associated with numerous sustainability indicators in economic, social, and environmental domains (Ranjan et al., 2016). Effective ERP implementation has been shown to contribute to the development of sustainable organizations (Pohludka et al., 2018). This expanded role of ERP systems can be attributed to their capability to integrate data and processes across multiple business functions. Research has indicated that ERP implementation improves organizations' ability to capture and integrate information for sustainability reporting (Simmonds et al., 2018). Additionally, aligning business processes with ERP functionalities has been proposed as a means to further promote the sustainable implementation of ERP systems (Lin and Chang, 2019).

The primary aim of this paper and the conducted research is to assess the current state of ERP systems and investigate the perspectives of ERP system users regarding the critical success factors influencing ERP implementation. By doing so, this study intends to assist companies in avoiding common mistakes associated with ERP system implementation. Specifically, the focus is on identifying the factors that impact the performance of ERP systems, particularly in relation to critical success factors.

The article is structured as follows: the second section provides a literature review on ERP implementation, critical success factors, and the influence of ERP systems on organizational performance. The third section outlines the background and hypothesis development, while the methodology is presented in the fourth section. Furthermore, results and discussion are conducted in the fifth section. The paper concludes with a summary of findings in the sixth section.

2. Literature review

The selection of ERP technology is a critical and primary concern for decision-makers at the enterprise level in organizations aiming to maintain sustainable competitiveness, as it represents a significant investment decision (Ranjan et al., 2016). The successful implementation of ERP systems can yield numerous benefits for companies. Conversely, a poorly executed project can lead to disastrous consequences for organizations that struggle to navigate the implementation process (Bambang Purwoko Kusumo Bintoro, 2015; Esteves, 2009). The ERP implementation literature is vast and encompasses various topics, including uncertainty management during the deployment of ERP systems (Møller et al., 2004; Koh et al., 2006), specific methods for ERP requirements analysis (Vilpola et al., 2007), the significance of local or cultural considerations in implementation (Liang and Xue, 2005; Yusuf et al., 2006), and pre-implementation issues (Brem et al., 2008). While the existing literature is comprehensive and intricate, it highlights the clear necessity for a deeper comprehension of ERP implementation success. There is also a need for a centralized source of literature that can serve as a reference point for practitioners and researchers, aiding in their understanding of the nature of implementation success, its potential causes, and how to mitigate risks to enhance the likelihood of successful future implementations. The current failure rate for ERP implementations remains alarmingly high, capturing significant attention and generating substantial interest within the research community. This aspect also contributes to a substantial expansion of knowledge in the field (Liu and Seddon, 2009). Several well-known companies, including FoxMeyer, Nike, Hershey, among others, have experienced failures in ERP implementation (Cotteleer, 2002; Peterson et al., 2001). Additionally, the study's findings reveal that 25% of projects exceed their budget, 20% of projects are terminated for various reasons, and the remaining 55% of projects fail to achieve their desired objectives even a year after project completion (Malik and Khan, 2020).

Numerous studies have focused on Critical Success Factors (CSFs) in ERP implementation, aiming to identify factors that contribute to project success or failure. These factors serve as guidelines for managers to take proactive measures in areas that could influence the outcome of ERP implementation projects (Saade and Nijher, 2016). Ram et al. (2015) reported the CSFs in ERP implementation case studies were consolidated, resulting in the identification of 22 distinct factors out of the 64 reported. In (Barth and Koch, 2019) the authors identified 46 CSFs and classified them into organization-related, technology-related, project-related, and people-related factors. The authors emphasized the importance of empirical testing for designating factors as “critical”. In the context of ERP upgrade projects, a study compared the identified CSFs with those for ERP implementation projects and found that implementers and consultants involved in the ERP team were critical factors in both cases (Barth and Koch, 2019). The significance of the project team was highlighted, particularly from the users' perspective, and stressed the role of external

consultants as intermediaries when organizational expertise is insufficient (Reitsma and Hilletofth, 2018). The interactions between key players in ERP projects were explored in a study, which investigated factors facilitating top management support and indicated that communication and training within the company positively influenced such support according to end users' perceptions (Bueno and Gallego, 2017). Additionally, managing conflicts between parent and subsidiary companies was identified as a vital prerequisite for ERP implementation (Gavidia, 2016; Kala Kamdjoug et al., 2020). The implementation of ERP systems in enterprises can contribute to their development, enhance competitiveness, and generate various benefits and advantages. Research findings from (Njihia and Mwirigi, 2014) indicate that ERP systems have an impact on business performance (Jade Setiabudi et al., 2021). Enterprise performance refers to the level of success achieved by the organization as a whole within a specific time period in terms of its business activities. Performance can be measured using both financial and non-financial indicators (Kharuddin et al., 2015). Non-financial categories encompass aspects such as on-time delivery, improved forecast accuracy, reduced lead time, enhanced customer service, and inventory reduction (Acar et al., 2017). The implementation of ERP systems leads to the enhancement of organizational capabilities, including enterprise capability (productivity, efficiency, effectiveness), flexibility capability, speed capability (fast product delivery to customers), and responsiveness capability (Aburub, 2015). Operational performance, which signifies achievements and increased competitiveness, can be measured through various metrics such as reduced operating costs, customer satisfaction, inventory reduction, increased flexibility based on given conditions, and improved resource utilization (Tarigan et al., 2020a). ERP implementation also offers users, key users, and management the opportunity to improve enterprise performance. This improvement is evident through enhanced decision-making abilities, streamlining of business processes, efficient resource allocation, reduced enterprise inventory, and facilitation of analysis and improvement within the organization (Tarigan and Lianto, 2019; Tarigan et al., 2020b).

3. Background and hypothesis development

Initially, ERP systems were predominantly utilized by large manufacturing organizations in an on-premise setting to manage communication and information regarding raw materials, work-in-progress, and finished goods. However, in recent times, ERP systems have been adopted by businesses across various industries, revolutionizing traditional business practices due to their remarkable benefits. Over the past decade, ERP systems have undergone advancements and continuous innovations, further enhancing their efficiency and functionality (Kenge and Khan, 2020). The rapid global progress of ERP systems has compelled companies to establish connections with their suppliers and customers not only within their host country but also worldwide. When implemented effectively, ERP systems can contribute to the success of firms and assist in decision-making across all aspects of the organization, including strategic and operational contexts, as well as goal-setting and objective formulation (Shafi et al., 2019). An evaluation of the impact of ERP system implementation on user performance indicates a positive overall effect. Specifically, the data and information suggest that ERP implementation has a positive influence on various components of user performance, including Quantity of Work (number of tasks completed within a specific period), Quality of Work (adherence to predefined standards), Job Knowledge (knowledge and understanding of work responsibilities), Creativeness (ability to devise solutions for work-related problems), Dependability (awareness and commitment to task completion), and personal qualities (worker attributes such as personality, leadership, attitude, and integrity). Collectively, these components are positively influenced by the utilization of ERP systems within an organization (Andrianto, 2019). Based on these findings, the following hypotheses are formulated as shown in Fig. 1:

3.1. H1: ERP system contributes significantly and is positively related to increase firm's performance

In today's professional landscape of Enterprise Resource Planning (ERP) software, technical expertise alone is not sufficient. Professionals in this field also require “soft skills” which encompass a person's Emotional Intelligence Quotient (EQ), including personality traits, social graces, effective communication, language proficiency, personal habits, friendliness, and optimism. Soft skills complement the hard skills necessary for job-specific requirements and various activities. Human factors play a crucial role in ERP implementation projects, as they encompass individual capabilities, knowledge, skills, behaviours, and characteristics that can influence the project's outcome. Numerous studies have examined the impact of organizational experience with ERP systems on overall performance. Wieder et al. found that organizations with greater

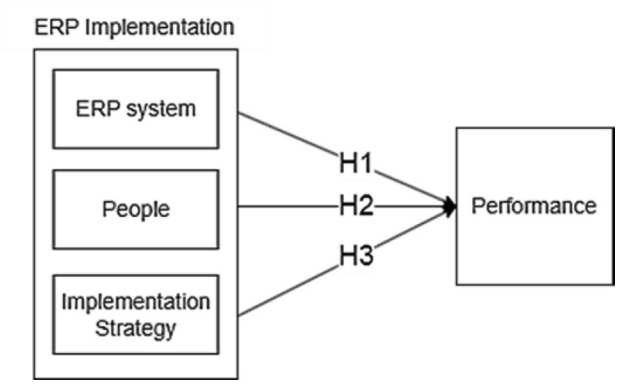

Fig. 1. The proposed conceptual model.

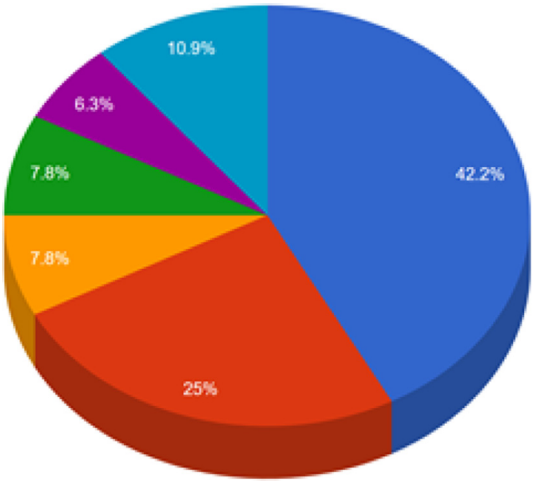

Fig. 2. The percentage of industries.

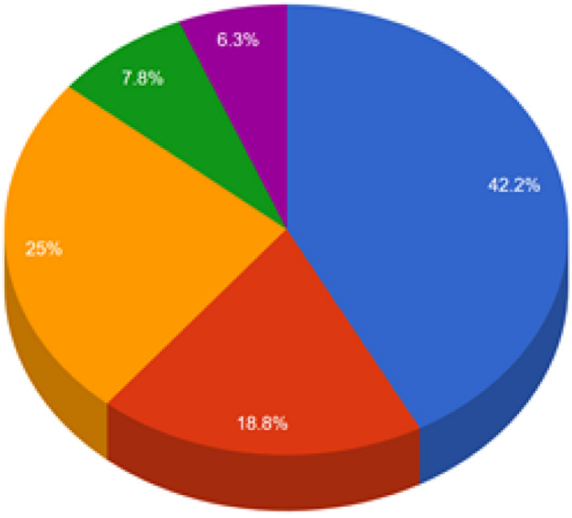

Fig. 3. The percentage of period of ERP implementation.

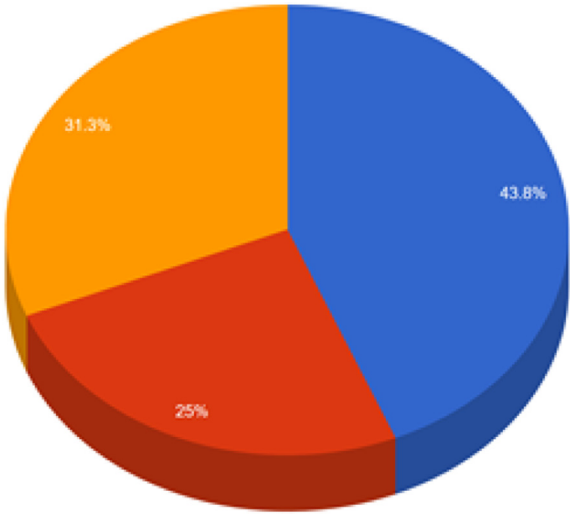

Fig. 4. The percentage of company sizes.

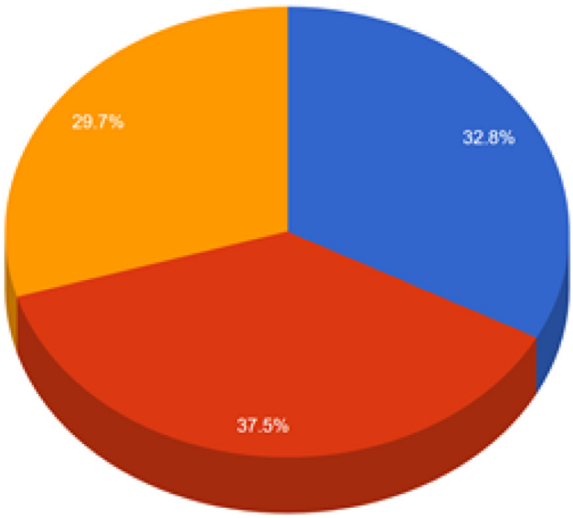

Fig. 5. The percentage of respondent's experiences.

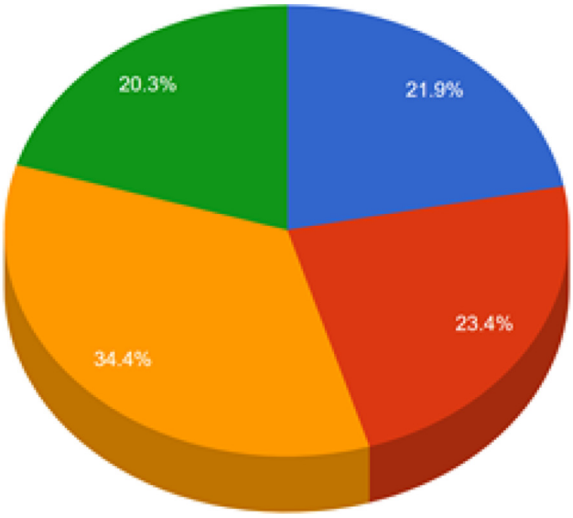

Fig. 6. The percentage of respondent's roles.

experience in ERP systems tend to achieve higher levels of performance (Wieder et al., 2006). However, during ERP implementation, employees may experience a sense of insignificance as they perceive a reduced level of control over business operations. They may feel that their input is undervalued, considering themselves mere operators of the software. This drastic change in operational activities can lead to a lack of enthusiasm among employees. To address this issue, business owners must assume responsibility. Ensuring employee comfort and proficiency in using the ERP system is crucial for successful implementation and long-term sustainability. Employee engagement becomes paramount, and strengthening employee connections becomes imperative. Employee retention becomes a common challenge during ERP system implementation (Patel, 2020). Based on the aforementioned arguments, the following hypothesis is proposed.

3.2. H2: People contribute significantly and are positively related to increase firm's performance

There are various strategies available for transitioning to a new ERP system, each with its own advantages and disadvantages. The implementation of an ERP solution requires collaboration among stakeholders with the common objective of achieving business success. In recent years, Huang and Yasuda conducted a survey to explore different

Table 1. Questions.

Constructs	Code	Measuring items
ERP System	SY-01	User-friendly-system.
	SY-02	Completeness of the system's functionality (module completeness, proper function, security).
	SY-03	Ease of data items system's adaptation.
	SY-04	High reliability system (stability, data backup, data recovery)
	SY-05	Manufacturer system support (warranties, consultants' services, training, troubleshooting rate and experience).
	SY-06	High quality system and perfect reporting at any process.
	SY-07	Failures due to ERP customizations.
	SY-08	Software manufacturer's reputation.
	SY-09	System's ease of adaptation new data items and processes.
	SY-10	Manufacturer system support provides updating on time.
People	PE-01	ERP project team has a high level of technical experience.
	PE-02	User involvement in ERP implementation (level of initiative, knowledge, and employee's desire to increase the level of information).
	PE-03	Top management reinforces the adoption of ERP as a top priority.
	PE-04	ERP team implements all the system details and requirements efficiently.
	PE-05	Employee's fear of losing job affects the success of the implementation.
Implementation Strategy	IS-01	Re-engineering of business processes affects the performance.
	IS-02	Quality of system reports is an important step in decision-making and improves business performance.
	IS-03	Data quality plays an important role in implementation and system success.
	IS-04	Implementation strategy targets full data integration among departments.
	IS-05	Implementation strategy targets the use of complete engineering data for the production stages.
	IS-06	Implementation strategy targets the use of complete engineering data for quality control stages.
	IS-07	Implementation strategy target operational management approaches (accurate order forecasting, optimized inventory levels …).
	IS-08	Implementation strategy targets quality approaches (quality control policy, cause and effect analysis).
	IS-09	Implementation strategy target performing statistical thinking approaches to reduce processes variability.
Firm Performance	FP-01	Implementation period affects the general performance.
	FP-02	Profitability increases.
	FP-03	Customer's satisfaction.
	FP-04	Better utilization of resources.
	FP-05	Productivity increase with a perfect implemented ERP system.
	FP-06	Reduction of defects.
	FP-07	Reduction of costs.
	FP-08	Reduction of wastes.
	FP-09	Reduction of repair processes.
	FP-10	Reduction of quality costs.

aspects and phases of ERP research. The study categorized the literature into three phases: pre-implementation, implementation, and post-implementation. Analysis of the data revealed that the implementation phase received relatively less attention compared to the pre-implementation and post-implementation phases. Within the post-implementation phase, the topics that garnered more attention included critical success/failure factors, real benefits, business process re-engineering, ERP selection criteria, ERP impact, change management, implementation strategy, and performance evaluation at the organizational level, as well as user satisfaction, which received less attention. Notably, none of the studies specifically focused on the impact of implementation strategies on performance within the ERP context, highlighting the significance of exploring this area (Huang and Yasuda, 2016). Similarly, K. Vadivelu et al. conducted a study that superficially analyzed ERP by examining implementation strategies and the main challenges involved. By understanding these strategies and challenges, ERP companies can successfully implement the system for their business applications (Vadivelu et al., 2018). Based on the aforementioned arguments, the following hypothesis is formulated.

4. Methodology

This study utilized scale items sourced from the technology adoption literature to assess the identified constructs based on the proposed conceptual model: ERP system (SY), people engaging the ERP system (PE), and implementation strategies (IS). The survey method was employed in this phase to examine the status of ERP system implementation. A pilot study was conducted involving the distribution of 13 questionnaires to owners, managers, and ERP implementers in the Middle East. Participants were requested to provide feedback if they encountered any difficulties in comprehending and responding to the questionnaire. Subsequently, the questionnaire items were reviewed to ensure they were appropriately structured, clear, and linguistically accessible. A questionnaire, distributed via email, serves as the research instrument for this study. Drawing on a comprehensive review of the literature, the questionnaire encompasses questions related to the ERP system (SY), people engaging with the ERP system (PE), and implementation strategies (IS). Its primary objective is to explore the connection between an Enterprise Resource Planning (ERP) system and its impact on a firm's performance. Finally, The survey consists of ten well-designed questions that delve into various aspects of the ERP system and its influence on the organization's overall performance. Additionally, five questions will focus on the role of individuals contributing to the ERP system and how their involvement affects the firm's performance. Furthermore, nine questions will assess the implementation strategy itself and its subsequent impact on the firm's performance. Lastly, the questionnaire will incorporate nine questions that evaluate the resulting performance of the firm after the implementation of the ERP system, covering measures such as profitability, customer satisfaction, resource utilization, and productivity.

By collecting insights through this comprehensive questionnaire, the aim is to gain a deeper understanding of the complex relationship between ERP systems, individual contributions, implementation strategies, and the overall performance of the firm.

The researchers utilized a five-point scale to assess the degree of respondents' agreement or disagreement with statements in the questionnaire. This type of psychometric response scale allows participants to indicate their level of agreement

Table 2. Descriptive statistics.

Variable	Skewness	Kurtosis
Q5FP	−1.113	−0.304
Q1FP	−1.028	−0.511
Q2FP	−1.070	−0.383
Q3FP	−1.145	−0.256
Q4FP	−1.169	−0.222
Q6FP	−1.244	−0.058
Q7FP	−1.171	−0.244
Q8FP	−1.140	−0.374
Q9FP	−1.208	−0.128
Q5PE	0.108	−0.850
Q4PE	0.427	−0.180
Q3PE	0.040	−0.258
Q2PE	0.205	−0.568
Q1PE	0.162	−0.949
Q9IS	−1.167	−0.251
Q8IS	−1.139	−0.322
Q7IS	−1.119	−0.269
Q6IS	−1.136	−0.359
Q5IS	−1.127	−0.310
Q4IS	−1.229	−0.095
Q3IS	−1.109	−0.325
Q2IS	−1.138	−0.246
Q1IS	−1.065	−0.348
Q10SY	−0.888	−0.651
Q9SY	−0.960	−0.440
Q8SY	−1.021	−0.322
Q7SY	−0.661	−0.782
Q6SY	−1.223	0.047
Q5SY	−1.110	−0.133
Q4SY	−1.064	−0.280
Q3SY	−1.074	−0.152
Q2SY	−1.216	0.473
Q1SY	−1.067	−0.148

Table 3. Reliability statistics.

Category	Cronbach's Alpha	Number of Items
ERP system	0.979	9
People	0.763	5
Implementation Strategy	0.991	9
Performance	0.988	9
Overall Questions	0.992	33

using the following options: (1) Strongly disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree, and (5) Strongly agree. In the subsequent phase of the questionnaire, a cover letter was sent via email to a selection of firms in the Middle East, requesting their participation in the study and providing a link to the online questionnaire. The intention was to gain insights into the challenges and issues associated with ERP system implementation. The survey was conducted over a period of three months. To ensure a diverse representation, firms from various sectors and of different sizes were targeted for participation. Ultimately, a total of 61 completed questionnaires were received, resulting in an overall response rate of 30.5%.

5. Results and discussion

In Fig. 2, the questionnaire demonstrates that 42.2% of the of the respondents belong to manufacturing industry, 25% belong to technology industry, 7.8% belong to constructions industry, 7.8% belong to textile industry, 6.3% belong to food industry, and 10.9% belong to other industries.

In Fig. 3, the questionnaire demonstrates that 42.2% of the respondents implemented an ERP system for more than five years, 18.8% implemented an ERP system within three and five years, 25% implemented an ERP system for one year 7.75% stated that ERP system is in progress, and 6.25% confirmed that there were no plans for ERP system implementation.

In Fig. 4, the questionnaire demonstrates that 43.75% of the respondents companies are small (10–49 employees), 25% companies are medium (50–249 employees), and 31.25% respondents companies are large (250 employees or more).

In Fig. 5, the questionnaire demonstrates that 32.8% of the respondents have an experience for more than ten years, 37.5% have an experience

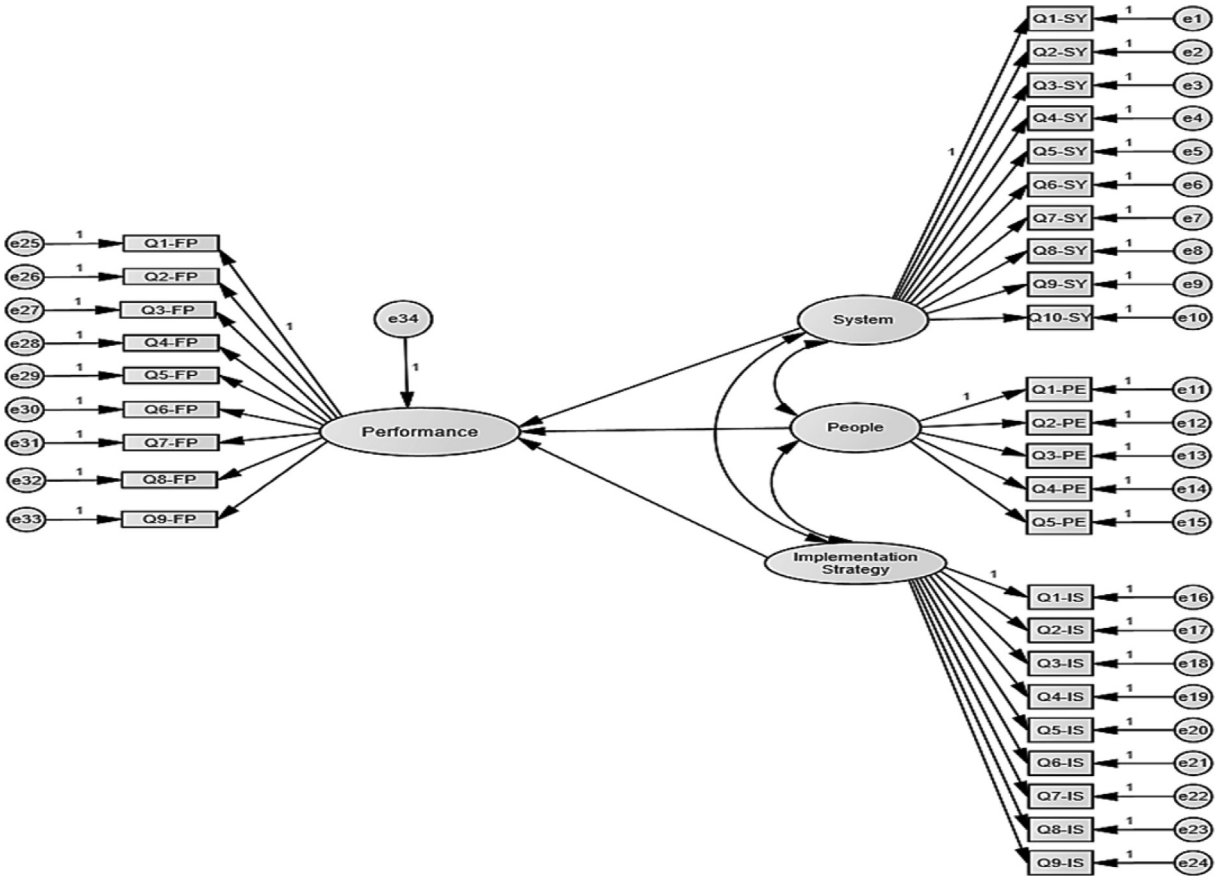

Fig. 7. The schematic diagram model.

within five and ten years, and 29.7% of the respondents have an experience less than five years.

In Fig. 6, the questionnaire demonstrates that 21.9% were general managers, 23.4% of the respondents were firm's consultant/supervisors, 34.4% were engineers, and 20.3% were employees.

Table 1 shows the full measuring items that were sent to the firms. The study utilized descriptive statistics to measure the variable items, including means and standard deviations. Additionally, the normality of the distributions was assessed by examining skewness and kurtosis. Skewness reflects the balance of distribution, while kurtosis indicates the peakedness of the distribution. A normal distribution would have skewness and kurtosis values close to zero (Hair et al., 2013).

For the current study, the acceptable values of skewness and kurtosis in Table 2 were determined to be −2.5 and + 2.5 (Abde, 2020) when employing structural equation modeling (SEM) techniques. Values falling within this range are considered acceptable and do not represent significant violations of assumptions. It is mentioned that SEM is a robust analytical method, so small deviations may not have a substantial impact on the results. Based on the results obtained, the skewness and kurtosis values were found to fall within the acceptable range, indicating a reasonably normal distribution for the variables under investigation.

Reliability assessment is an important step in evaluating the consistency and accuracy of measurement items within a questionnaire or scale. It helps determine the degree to which the items measure the same underlying construct and the extent to which they are free from error. Cronbach's alpha is a commonly used measure to assess the reliability of a scale. It quantifies the internal consistency by measuring the correlation between the items and indicates the extent to which they are measuring the same construct. A Cronbach's alpha value greater than 0.70 (Krunoslav and Maja, 2020) is generally considered acceptable and indicative of high reliability. In the present study, the Cronbach's alpha coefficient for the scale used was calculated in Table 3 to be 0.992. This high value indicates a strong level of internal consistency among the

Table 4. Regression weights.

			Estimate	S.E.	C.R.	*P*	Label
Q1SY	<—	System	1.000				
Q2SY	<—	System	0.962	0.064	15.065	***	par_1
Q3SY	<—	System	1.002	0.064	15.561	***	par_2
Q4SY	<—	System	1.044	0.072	14.578	***	par_3
Q5SY	<—	System	1.161	0.077	15.010	***	par_4
Q6SY	<—	System	1.100	0.067	16.412	***	par_5
Q7SY	<—	System	1.000	0.097	10.309	***	par_6
Q8SY	<—	System	1.056	0.068	15.524	***	par_7
Q9SY	<—	System	1.037	0.063	16.363	***	par_8
Q10SY	<—	System	0.873	0.067	13.050	***	par_9
Q1IS	<—	Implementation_Strategy	1.000				
Q2IS	<—	Implementation_Strategy	1.020	0.050	20.561	***	par_10
Q3IS	<—	Implementation_Strategy	1.032	0.053	19.551	***	par_11
Q4IS	<—	Implementation_Strategy	1.056	0.050	21.198	***	par_12
Q5IS	<—	Implementation_Strategy	1.026	0.058	17.736	***	par_13
Q6IS	<—	Implementation_Strategy	1.090	0.055	19.702	***	par_14
Q7IS	<—	Implementation_Strategy	1.028	0.051	20.296	***	par_15
Q8IS	<—	Implementation_Strategy	1.081	0.050	21.416	***	par_16
Q9IS	<—	Implementation_Strategy	1.081	0.053	20.551	***	par_17
Q2PE	<—	People	0.944	0.197	4.782	***	par_18
Q4PE	<—	People	0.751	0.173	4.330	***	par_19
Q5PE	<—	People	1.087	0.217	5.003	***	par_20
Q1FP	<—	Performance	1.000				
Q9FP	<—	Performance	0.958	0.046	20.883	***	par_21
Q8FP	<—	Performance	1.061	0.062	17.045	***	par_22
Q7FP	<—	Performance	0.977	0.048	20.204	***	par_23
Q6FP	<—	Performance	0.982	0.057	17.120	***	par_24
Q5FP	<—	Performance	0.952	0.054	17.490	***	par_25
Q4FP	<—	Performance	0.981	0.056	17.565	***	par_26
Q3FP	<—	Performance	1.001	0.054	18.432	***	par_27
Q2FP	<—	Performance	0.974	0.048	20.460	***	par_28
Q1PE	<—	People	1.000				
Q3PE	<—	People	0.773	0.165	4.694	***	par_43

measurement items and suggests that they are reliably measuring the intended construct. It demonstrates that the scale is suitable for further analysis and can be relied upon to assess the relationships between variables in the study. By ensuring high reliability, researchers can have greater confidence in the consistency and accuracy of the data collected through the questionnaire, leading to more reliable and valid research findings.

Structural equation modelling (SEM) is a statistical analysis technique used to examine complex relationships between variables, including both observed variables and latent variables. AMOS 26 (Analysis of Moment Structures) is a widely used software package that facilitates SEM analysis (Abde, 2020). In the context of this study, AMOS 26 was used to analyze the data and generate results. These results were then presented in a schematic diagram as shown in Fig. 7. Table 4 displays scalar estimates and regression weights. Convergent validity is assessed by examining the regression weights. In general, regression weights higher than 0.5 are considered indicative of convergent validity, indicating that the variables in the model are positively related and measuring the same underlying construct. It is mentioned that all the regression weights in the analysis are higher than 0.5, suggesting good convergent validity. The p values being significant for all cases indicate that the relationships between variables in the model are statistically significant, meaning that the observed effects are unlikely to occur by chance (Ryu et al., 2010).

In Table 5, the loadings of the items on their respective variables were found to be within the acceptable range. Loadings indicate the strength of the relationship between the observed items and the underlying latent variables. The fact that all the loadings are within the acceptable range suggests that the items are successfully measuring their intended constructs. Additionally, the standardized regression weights for all the items were found to be above the minimum criterion of 0.40 (Ryu et al., 2010). Regression weights represent the strength and direction of the relationships between the observed items and the latent variables in the model. The fact that all the regression weights meet the criterion of 0.40 indicates that the items have a significant impact on their corresponding latent variables (Tabachnick et al., 2007). Table 6 shows the ranking of the three factors affecting ERP implementation. Finally, it emphasizes that the critical factors of the ERP implementation are the implementation strategy, followed by the ERP system, and then the people involved.

Table 5. Standardized regression weights.

			Estimate
Q1SY	<—	System	0.934
Q2SY	<—	System	0.922
Q3SY	<—	System	0.931
Q4SY	<—	System	0.914
Q5SY	<—	System	0.922
Q6SY	<—	System	0.943
Q7SY	<—	System	0.806
Q8SY	<—	System	0.930
Q9SY	<—	System	0.942
Q10SY	<—	System	0.883
Q1IS	<—	Implementation_Strategy	0.953
Q2IS	<—	Implementation_Strategy	0.965
Q3IS	<—	Implementation_Strategy	0.957
Q4IS	<—	Implementation_Strategy	0.970
Q5IS	<—	Implementation_Strategy	0.939
Q6IS	<—	Implementation_Strategy	0.958
Q7IS	<—	Implementation_Strategy	0.963
Q8IS	<—	Implementation_Strategy	0.972
Q9IS	<—	Implementation_Strategy	0.965
Q2PE	<—	People	0.637
Q4PE	<—	People	0.565
Q5PE	<—	People	0.674
Q1FP	<—	Performance	0.955
Q9FP	<—	Performance	0.966
Q8FP	<—	Performance	0.961
Q7FP	<—	Performance	0.960
Q6FP	<—	Performance	0.931
Q5FP	<—	Performance	0.935
Q4FP	<—	Performance	0.936
Q3FP	<—	Performance	0.945
Q2FP	<—	Performance	0.931
Q1PE	<—	People	0.624
Q3PE	<—	People	0.622

Table 7 provides the results of the structural model analysis utilizing maximum likelihood estimation. The model fit indices are used to assess the goodness of fit of the model to the observed data (Christmann and Van Aelst, 2006; Farahian, 2017). The study aimed to investigate the relationship between ERP implementation, including the ERP system, people involved in the system, and the implementation strategy. The results of the SEM analysis revealed statistically significant correlations, indicating support for the three hypotheses (H1, H2, and H3). This suggests that there are meaningful relationships between the variables being studied; further validating the importance of ERP implementation factors in influencing overall organizational performance.

Table 6. Critical role of the ERP implementation.

			Estimate
Performance	<—	Implementation_Strategy	0.770
Performance	<—	System	0.194
Performance	<—	People	0.038

Table 7. Model fit summary.

Parameter	Values	Criteria	Reference
CMIN	767.662		
DF	481		
CMIN/DF	1.596	<5	Nazrul Islam et. al. (2018) (Islam et al., 2018)
CFI	0.938	>0.9	
TLI	0.932	>0.9	
IFI	0.939	>0.9	
RMR	0.036	<0.08	
RMSEA	0.09	Medium fit <0.08 to 0.1	Hasan tehrani et al., 2019

6. Conclusion

Based on the findings and analysis presented in this study, it is evident that the implementation of Enterprise Resource Planning (ERP) systems has a significant impact on firm performance, particularly in terms of improving production processes. The study's results provide valuable insights into the factors that contribute to firm performance.

Firstly, the study demonstrates a positive and significant relationship between the ERP system and firm performance. A well-implemented ERP system can streamline production processes, improve operational efficiency, and enhance overall performance. Selecting an appropriate ERP system that aligns with the organization's needs and goals is crucial.

Secondly, the analysis highlights the importance of individuals involved in the ERP implementation process. The active participation and expertise of employees contribute to successful ERP adoption and utilization. By fostering a culture of training, knowledge sharing, and continuous improvement, organizations can harness the full potential of their workforce and maximize the benefits of ERP implementation.

Lastly, the study emphasizes the significance of the implementation strategy in influencing firm performance. A well-designed and comprehensive implementation strategy provides guidance for successful ERP adoption, ensuring effective project management, resource allocation, and change management. By prioritizing the implementation strategy, organizations can mitigate risks, minimize disruptions, and optimize outcomes.

The main contribution of this study emphasizes the critical role of the ERP implementation strategy, followed by the ERP system and the individuals involved, in driving firm performance and improving production processes. By addressing the factors identified in this research, organizations can make informed decisions, gain a competitive edge, and achieve sustainable growth through ERP implementation.

Author contributions

Conceptualization, Mona Abou-Eleaz.; methodology, Mona Abou-Eleaz., Kareem A. El-Baz., Magdy S. Ghattas, and T.T. El-Midany.; software, Mona Abou-Eleaz., Kareem A. El-Baz.; validation, Magdy S. Ghattas, and T.T. El-Midany.; formal analysis, Mona Abou-Eleaz., Magdy S. Ghattas, and T.T. El-Midany., and Kareem A. El-Baz.; investigation, Kareem A. El-Baz and Magdy S. Ghattas, and T.T. El-Midany.; resources, Mona Abou-Eleaz.; data curation, Mona Abou-Eleaz and Kareem A. El-Baz; writing—original draft preparation, Kareem A. El-Baz and Magdy S. Ghattas, and T.T. El-Midany.; writing—review and editing, Mona Abou-Eleaz; visualization, Kareem A. El-Baz and M.A.A.; project administration, Mona Abou-Eleaz. All authors have read and agreed to the published version of the manuscript.

Conflicts of interest

The authors declare no competing interests.

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