

Examine the influence of Enterprise Resource Planning Quality Dimensions on Organizational Performance Mediated through Business Process Change Capability

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Abstract

This study examines the influence of enterprise resource planning (ERP) quality dimensions on organizational performance using the theoretical lens of dynamic capability theory by taking business process change capability as a mediator in the relationship of ERP system quality dimensions and Organizational Performance. Respondents were information technology (IT) managers from firms using ERP system in Pakistan. Statistical analysis was carried using variance based partial least square (PLS) method. The results revealed the business process change capability mediates the relationship between ERP quality dimensions and organizational performance. This research provides practical as well as theoretical implications by highlighting the business change capabilities in translating ERP system quality into enhanced organizational performance.

Keywords

Enterprise Resource Planning, Business Process change capability, Dynamic capability theory, Organizational Performance

Introduction

In order to gain a competitive edge against their competitors, firms have invested heavily in information technology to improve their performance (Kwak, Seo, & Mason, 2018). The adoption of such technologies facilitates the transmission of real-time information which helps fast decision making. Consequently, this decreases uncertainties in the risk projection in corporate deals. In this regard, the ERP system facilitates the centralization of all business operations and management in a firm. (Nandi & Vakkayil, 2018; Olson, Johansson, & De Carvalho, 2018; Ullah, Baharun, Nor, & Yasir, 2018).

Enticed with the prospect of performance improvement after the adoption of ERP, many businesses have made its adoption a strategic priority and have put its substantial investment in the related technologies. Firms are spending billions of dollars to acquire ERP packages to strengthen their competitive instance (Nandi & Vakkayil, 2018; Xu, Ou, & Fan, 2017). Several studies stated that ERP adoption has become a catalyst for increased business performance (Ahmed, A., & Sarim, 2017; Balasubramanian & Selladurai, 2018; Rouhani & Mehri, 2018). However, even though there is strong interest in these systems, studies and firms have reported that there are inconsistencies between ERP and organizational performance linkage. Studies like (Baskaran, 2018; Liao, Huang, & Lin, 2018) reported financial gains by firms that adopted ERP (Balasubramanian & Selladurai, 2018; Xu et al., 2017), others have found that the adoption of ERP does not bring the anticipated benefits (Alraddadi, Champion, & Lagna, 2018; Thomas, Mmerekki, & Boy, 2018).

Present academic literature presents little guidance on best way ERP can be used to ensure increased firm's performance (Mihailescu, Mihailescu, & Carlsson, 2018). This is primarily caused by the lack of theoretical understanding on how ERP brings benefits to a firm. To date, there is still no widely accepted theories on the relationship between ERP capabilities and organizational performance despite many claims on the strategic importance of ERP (Rouhani & Mehri, 2018) and ERP research has largely focused on competitive advantage. (Badewi, Shehab, Zeng, & Mohamad, 2018). A major portion of studies examining the link between ERP capabilities and organizational performance is merely theoretical and exploratory (Badewi et al., 2018). Scholars introduced several theory-based explanations based on IS success model (Delone & McLean, 2003), firm's resource-based view (RBV) and its products, as well as the dynamic capabilities perspective (Asamoah & Andoh-Baidoo, 2018; Badewi et al., 2018; Ma'arif & Satar, 2018; Queiroz, Tallon, Sharma, & Coltman, 2018). In this regard, it could be argued that the dynamic capabilities perspective explains how ERP operates within firms and how the adoption of ERP increases firm performance.

The dynamic capabilities theory explains that organizational performance reflects a firm's ability to transform its resources. Such ability is very useful in the current rapidly changing business climate. Thus, the dynamic capabilities theory is deemed as a promising theoretical basis for the study of IT strategic values and to study the link between ERP and firm performance (Badewi et al., 2018).

Based on the discussion above, Teece's conceptualization is particularly significant in explaining how ERP affects firm performance (Teece, Pisano, & Shuen, 1997). There some studies that have used dynamic capabilities for theoretical guidance (Asamoah & Andoh-Baidoo, 2018;

Ma'arif & Satar, 2018; Queiroz et al., 2018). However, there are limited studies that offer an input on the use of dynamic capabilities perspective in the area of ERP due to the novelty of this application. In response to the literature gap mentioned above, this develops a conceptual model of ERP-enabled organizational benefits that based on dynamic capabilities for strategic management. In this regard, the model developed here clearly distinguishes these components and contributes to a more detailed conceptualization of the relationship between ERP and organizational performance.

This study aims to answer the following research question:

1. How does ERP system quality dimensions influence organizational performance through Business process change capability (conceptualized as a component of dynamic capabilities) in Pakistani firms?

The next section presents the literature review which summarizes the relevant works on ERP and ERP adoption to enhances firm performance. This section will also discuss the theoretical foundations of the study, specifically the RBV and dynamic capabilities theories. It will also present the research model and discuss the study's hypothesis. The subsequent research method section describes the methods used to test the research model and hypothesis. The next sections present data analysis and implications and limitation of the study.

Literature Review

ERP combines a firm's processes and functions to ensure that business operations can be executed seamlessly, efficiently and more transparently (Ahmed et al., 2017; Balasubramanian & Selladurai, 2018; Nandi & Vakkayil, 2018; Xu et al., 2017). Researchers used different theoretical perspectives to investigate the role of ERP in firms and the relationship between ERP and organizational outcomes such as the dynamic capabilities perspectives, the information systems (IS) success model (Delone & McLean, 2003) and the resource-based view (Barney, 1991), and the dynamic capabilities perspective (Teece et al., 1997). It was argued that despite the fact that the IS success model has influenced several studies on organizational, it is not sufficient to explain how a mechanism benefits from the use of technology being studied

A firm's resource-based view (RBV) is a theoretical perspective that plays a crucial role in ERP research where firm performance is considered as a dependent variable (Badewi et al., 2018; Gupta, Misra, Kock, & Roubaud, 2018). RBV presents an organizational level theory that suggests that a firm's resources are valuable, rare, inimitable, and non-substitutable and in order to gain competitive advantages, a firm's resources should be heterogeneously distributed across the market (Barney, 1991). Despite its popularity in the research of IT investment value as part of strategic management, it has received several critiques over the years. Under RBV, firm value is obtained from resources that are themselves valuable and scholars have argued that this has made the theory repetitive in nature (Priem & Butler, 2001). Furthermore, it is claimed that it is challenging to sufficiently operationalize and test the tenets of the theory as the definition of resources is too broad. It is also deemed as a static theory as it claims that resources are deemed as expensive and challenging to create or to transfer among firms (Priem & Butler, 2001). By using this notion of resource 'stickiness', firms are seen as not able to change its path and are

restricted to a specific course of action Hence, it could be argued that RBV is not suitable to explicate firm performance in dynamic environments(Teece, 2007).

To extend the view of RBV, recent studies have used the idea of business change capabilities to link between ERP system quality and organizational performance. In this regard, we can define a firm's capabilities as its capacity to deploy individual or a combination of different resources through organizational processes to achieve the desired goal. Thus, ERP capabilities are normally conceptualized as a firm's ability to use ERP technology and staff members to come out precious information outputs. The idea of ERP capabilities is useful in combining different findings of ERP research as it comprises many aspects contained in the existing operationalizations and measures of IS success. ERP, as an organizational capability, indicates the impact of using ERP technological resources, IT, human actors and organizational processes interactions, and the utility of ERP output. Thus, rather than viewing it as a technical asset, we should consider ERP as an organizational capability and studies should clarify the relationship between ERP and firm performance (Asamoah & Andoh-Baidoo, 2018; Ma'arif & Satar, 2018; Queiroz et al., 2018).

In the meantime, dynamic capabilities refer to "the firm's ability to integrate, build, and reconfigure internal and external competencies to address a rapidly changing environment" (Teece et al., 1997). These capabilities comprise of structured, stable, and patterned organizational processes employed to change a firm's ordinary capabilities allow it to gain a competitive advantage by adapting to the constantly changing environment. According to Teece (2007), dynamic capabilities comprise of a firm's abilities to identify environmental stimuli, to find the most fitting course of action, and to transform the organization. For this study, we use Teece (2007) notion as he has provided one of the most comprehensive models for dynamic capabilities in strategic management. Such a perspective on dynamic capabilities is beneficial for analyzing the relationship between ERP and firm performance. It is also believed that creating mutual understanding is crucial to overcoming organizational inertia and acts precursor of successful strategic action to initiate organizational change. Strategic decisions on how a firm can invest its resources can only be made after there is a mutual understanding among the members of the firm. In this light, the process of decision making requires evaluating the risk/reward scenario linked action versus inaction (Teece, 2007) and to create and impose a plan of action plan to adopt an organizational business model that fully utilizes opportunities or to mitigate threats and to overcome threats (Ambrosini & Bowman, 2009). Consequently, determining how to sustainable competitive advantage is the key driver behind the development of the dynamic capabilities' perspective (Teece et al., 1997).

Over time, how we view the relationship between dynamic capabilities and competitive advantage has evolved (Asamoah & Andoh-Baidoo, 2018; Ma'arif & Satar, 2018; Queiroz et al., 2018). Earlier studies posited that the relationship between these constructs is direct and necessary. Scholars believed that sustained competitive advantage can be achieved when a firm has strong dynamic capabilities (Teece et al., 1997). It is believed that dynamic capabilities cannot be direct sources of a sustained competitive advantage as they are characterized as imitable and everchanging. Consequently, it is expected that competitive advantage gain is temporary and not sustained especially in hypercompetitive environments that require firms to continuously renew their ordinary capabilities (Badewi et al., 2018).

Current research has highlighted how important the decision-making process ensure that the accurate use of dynamic capabilities. Thus, an organization must apply its dynamic capabilities “sooner, more astutely, or more fortuitously than the competition to create resource configurations that have that advantage”. In this regard, performance could be influenced by the timing of managerial decisions and managerial responses to environmental events. This indicates while a firm could benefit from the successful use of these capabilities, a firm could also be negatively affected by the failure to use them successfully. These effects include the increase in opportunity costs, the cost of maintaining the capability, and the market-based penalty for choosing an ineffective strategy (Helfat et al., 2009). Thus, instead of focusing on competitive advantage, the performance of dynamic capabilities could be measured based on whether dynamic capabilities could allow firms to make a change (Helfat et al., 2009).

Research Model and Hypotheses

The framework of this study as shown in figure 1 is developed based on TOE containing complexity, top management support, competitive pressure as technological, organizational and environmental factors that precede ERP assimilation which further influence the ERP value.

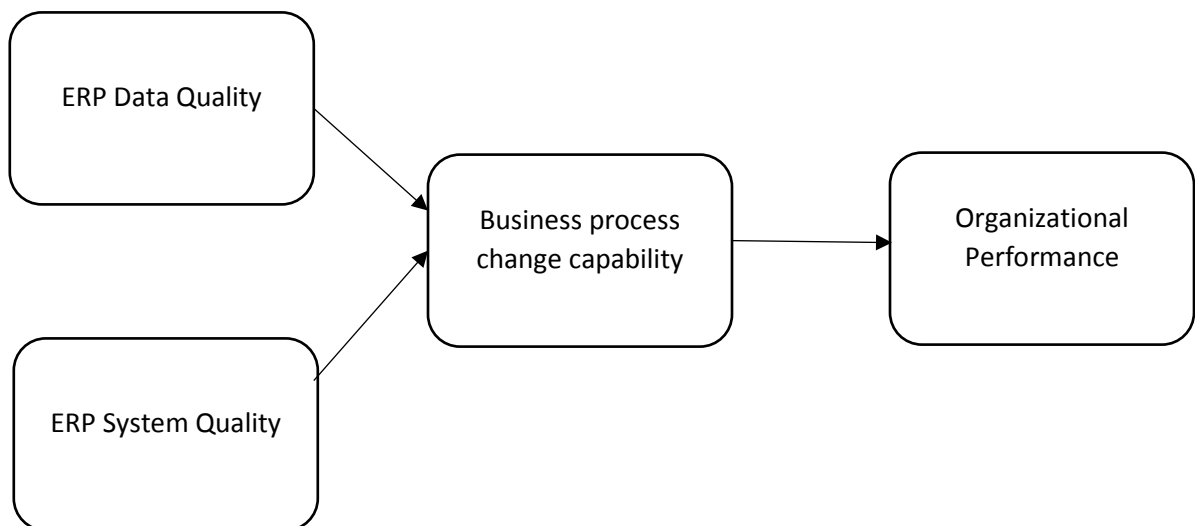


Figure 1: Research Model

Above mentioned framework derives following hypotheses:

- H1: ERP data Quality positively associated with Business process change capability.
- H2: ERP system Quality positively associated with Business process change capability
- H3: Business process change capability positively associated with organizational performance.

H4: Business process change capability mediates the relationship between ERP data quality and organizational performance.

H5: Business process change capability mediates the relationship between ERP system quality and organizational performance.

Research Method

The population of study containing 560 Companies in the industrial sector of Pakistan using the ERP system. The list of companies has been obtained through telephonic calls and emails from the official partners of commercial packaged ERP like SAP, Oracle, Microsoft operating in Pakistan.

GPower software has been used to calculate an adequate sample size to collect data. GPower analysis revealed the sample size of 119 is sufficient to get data having three predictors as shown in figure 2. However, census technique is deployed to get maximum response from respondents. Unit of analysis is organization and manager working at the middle and top position are informants of organizations using ERP system.

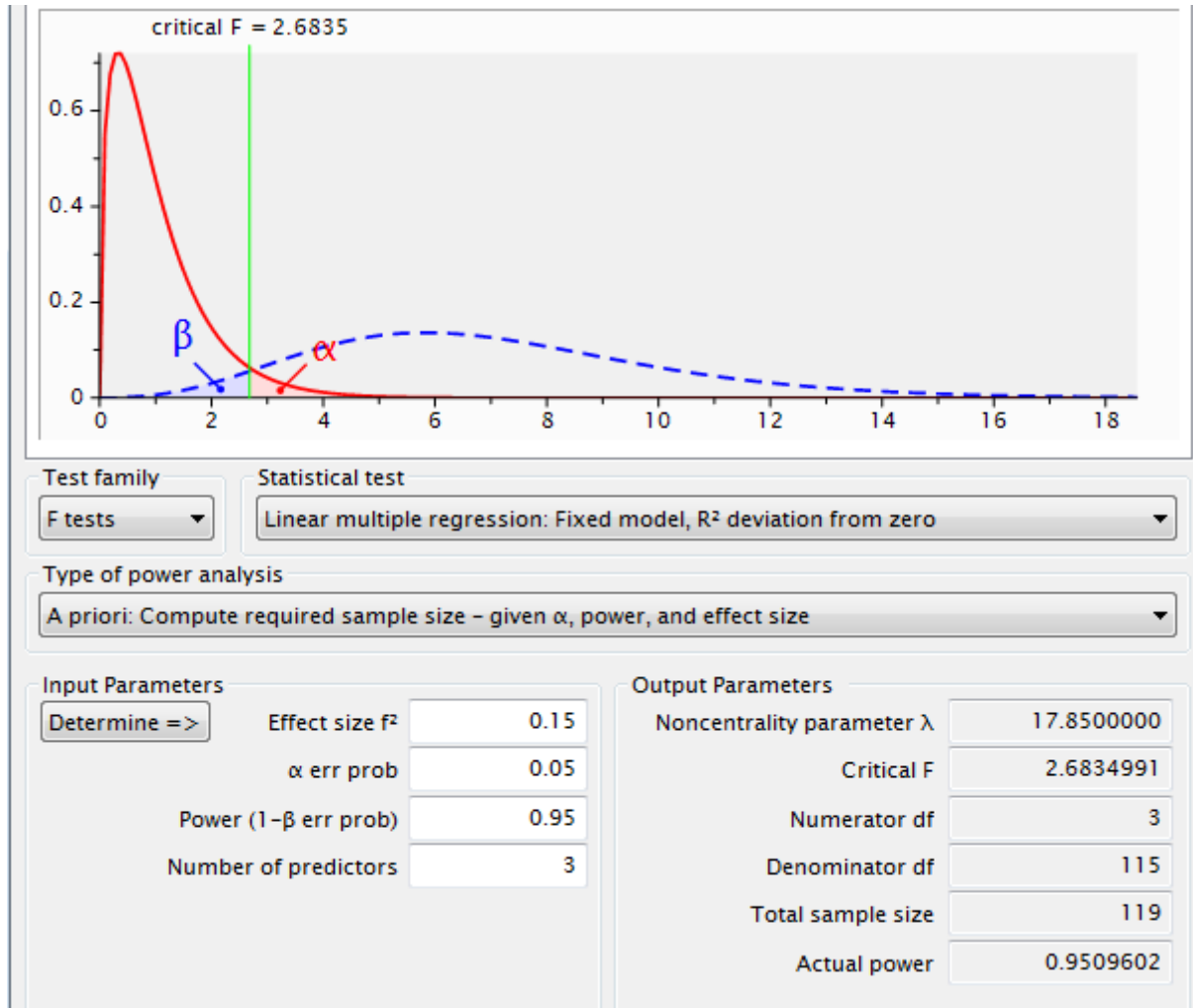


Figure 2
GPower Results

The close-ended questionnaire instrument used to collect data. Items of constructs have been adapted from past literature as shown in Table 1. The questionnaire has been pre-tested by sending to experts of field and academia. After necessary corrections in the questionnaire, it has been couriered to all 560 companies at their official address which obtained through their official websites. While 276 companies responded resulting the 53% response rate where thirty questionnaires were partially filled so these excluded from the study. Analysis has been performed on 246 usable questionnaires.

Table 1:
Survey Instrument details

Construct	Items	Source
Data Quality	4	(Ifinedo, 2007; Wixom & Watson, 2001)
System Quality	4	(Ifinedo, 2007; Wixom & Watson, 2001)
Business Process Change Capability	5	(Protogerou, Caloghirou, & Lioukas, 2011)
Organizational Performance	4	(Ifinedo, 2007)

Analysis and Findings

Respondents' Profile

The demographics of respondents reflected that only 4% are female while 96% are male IT managers working in the industrial sector of Pakistan; 14.8% of respondents have less than 1-2 years' experience; 85.2 % respondents have more than two years' experience supervising ERP system activities in their organizations. While screening of data responses having more than five percent missing values comprising thirty questionnaires was excluded from the study.

Multivariate Skewness And Kurtosis

As well-known researcher Hair Jr, Sarstedt, Ringle, & Gudergan (2017) and Cain, Zhang, & Yuan (2017) studies have suggested that we have to check the multivariate skewness and kurtosis using the software available at: <https://webpower.psychstat.org/models/kurtosis>. After perform this results showed that, the present study data (collected survey data) was not multivariate normal, Mardia's multivariate skewness ($\beta = 2.632$, $p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 25.093$, $p < 0.01$) in below Figure showed the result, thus, we continued to using the SmartPLS which is a non-parametric analysis software due to multivariate normality issues.

Measurement Model

The Partial Least Squares-Structural Equation Modeling (PLS-SEM) technique used to analyze the reliability and validity of the instrument. Model for path analysis shown in Figure 3. The reliability was checked through the internal consistency method. Two types of validity were examined in the measurement model, i.e., convergent validity and composite reliability (Jr, Hult, Ringle, & Sarstedt, 2016). After running the PLS algorithm, the results as shown in Table 2 confirm the convergent validity of the variables AVE is greater than the 0.5 cut off value; while composite reliability is greater than 0.7 as suggested (Hair Jr, Hult, Ringle, & Sarstedt, 2016). Fornell & larger (1981) demonstrated Fornell-Larcker criterion to test discriminant validity (see table 3) by the HTMT method (see table 4); results depict that measurements have discriminant validity.

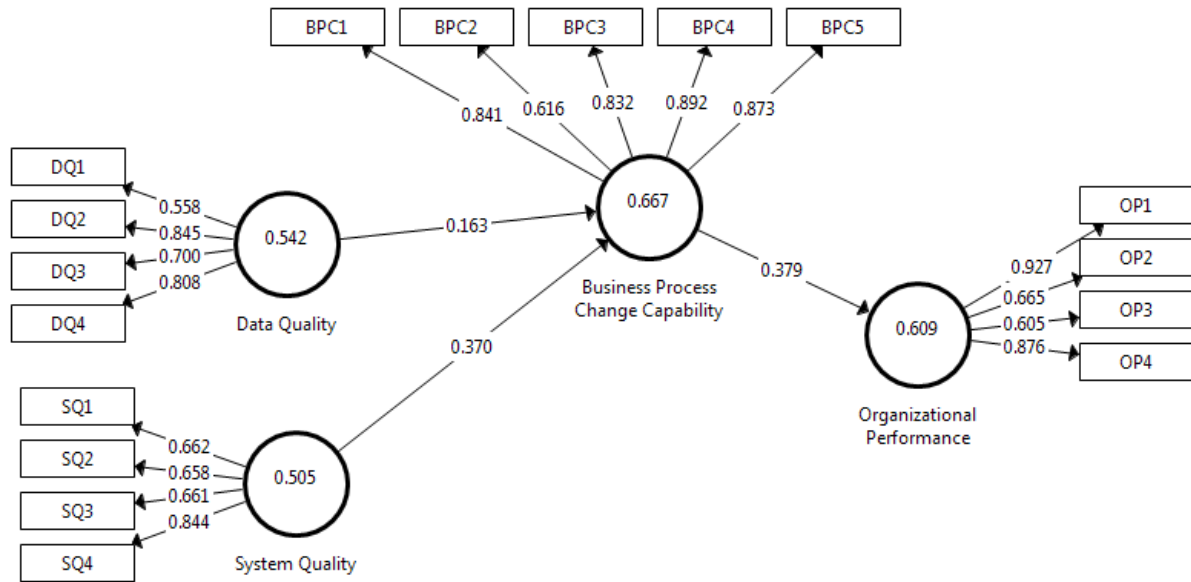


Figure 3
Measurement Model

Table 2:
Reliability and Validity Results

Construct	Items	Loading	CR	AVE
Business Process Change Capability	BPC1	0.841	0.908	0.667
	BPC2	0.616		
	BPC3	0.832		
	BPC4	0.892		
	BPC5	0.873		
Data Quality	DQ1	0.558	0.822	0.542
	DQ2	0.845		
	DQ3	0.700		
	DQ4	0.808		
Organizational Performance	OP1	0.927	0.858	0.609
	OP2	0.665		
	OP3	0.605		
	OP4	0.876		
System Quality	SQ1	0.662	0.801	0.505
	SQ2	0.658		
	SQ3	0.661		
	SQ4	0.844		

Table 3:
Discriminant Validity Results

	Business Process Change Capability	Data Quality	Organizational Performance	System Quality
Business Process Change Capability	0.817			
Data Quality	0.282	0.736		
Organizational Performance	0.379	0.374	0.780	
System Quality	0.422	0.323	0.547	0.711

Diagonal values in Table 3 shows the Average Variance extracted (AVE).

Table 4:
Heterotrait-Monotrait (HTMT) Results

	Business Process Change Capability	Data Quality	Organizational Performance	System Quality
Business Process Change Capability				
Data Quality	0.346 CI.90 (0.193,0.453)			
Organizational Performance	0.438 CI.90 (0.316,0.563)	0.496 CI.90 (0.363,0.614)		
System Quality	0.376 CI.90 (0.273,0.501)	0.308 CI.90 (0.207,0.402)	0.566 CI.90 (0.446,0.659)	

HTMT values passed the criteria and zero value is not straddled in any confidence interval.

Structural Model

Figure 4 shows the structural model measurement through bootstrapping in SmartPLS 3.0.

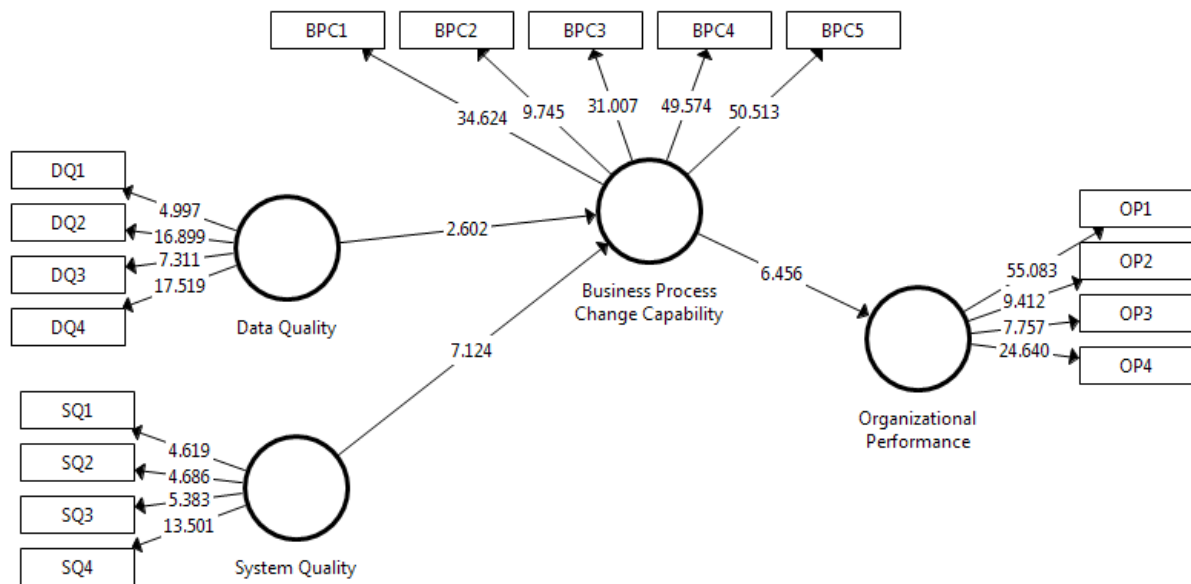


Figure 4
Structural Model direct relationships

Results are depicted in table 5 which show all hypothesis having direct relationships supported.

Table 5:
Hypotheses Testing Results

	Hypotheses	Std. Beta	Std. Error	T Value	P Values	Decision
H1	DQ -> BPC	0.163	0.063	2.602	0.009	Supported
H2	SQ -> BPC	0.370	0.052	7.124	0.000	Supported
H3	BPC-> OP	0.379	0.059	6.456	0.000	Supported

Note: DQ=Data Quality, SQ=System Quality, BPC=Business Process Change, P=Organizational Performance

Table 6:
Mediation indirect effect Results

	Std. Beta	Std. Error	T Value	P Values	LL	UL	Mediation
H4	0.062	0.029	2.169	0.030	0.011	0.119	Supported
H5	0.140	0.038	3.735	0.000	0.068	0.212	Supported

Note: DQ=Data Quality, SQ=System Quality, BPC=Business Process Change, OP=Organizational Performance

Table 6 demonstrates that Hypothesis H4 and H5 are supported which shows the Business process change mediate the relationships between ERP data quality and organizational performance and ERP system quality and Organizational Performance.

Importance-performance Map Analysis

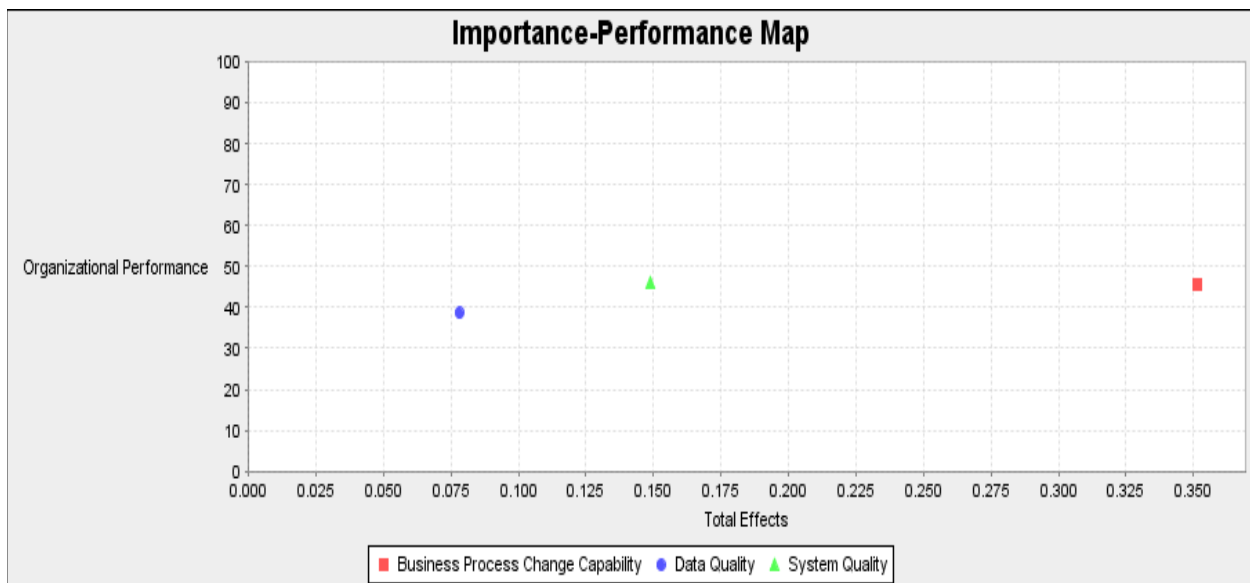


Figure 5
Importance-performance Map

Importance-performance Map as shown in Figure 5, depicts that System quality has the highest performance and importance to organizational performance with respect to data quality and Business process management.

Discussion

Theoretical Implications

This study is aimed to evaluate the dynamic capabilities framework as a theoretical foundation to conceptualize how ERP system quality can influence organizational performance. The measurement model supports the proposed definition and operationalization of business process change capability and achieves the study's research objective. In this light, this study has found the positive link between ERP system quality, data quality and business process change capability. This supports the notion that firms that are capable to do different competitive actions will have better opportunities and advantages compared to firms with no such capability. This study's findings have two significant contributions to the literature on ERP and dynamic capabilities, first, they present a constructive theoretical framework to examine the quality of the ERP system quality on firm performance. Next, this study is one of the first studies that operationalized, and empirically tested business process change as dynamic capabilities. In this light, the dynamic capabilities perspective specifically deals with factors facilitating better firm performance which presents a prospective theoretical lens that can be used to study the link between the dimensions of ERP system quality and enhanced organizational outcomes. This is in line with the popular view of ERP as a strategic investment tool. This study also confirms that process change capabilities, to a large extent, mediates the relationship between ERP system quality dimensions and organizational performance.

Practical implications

The findings of this research will significantly help firms finding a way to optimize the use of their ERP systems to improve performance. First, we found that ERP is a strategic investment that could affect firm performance. This study also provides empirical evidence that could justify the use of ERP. It demonstrates the causal chain between ERP and firm performance while the research framework is very much in line with the conventional role played by ERP in a firm. Furthermore, for practitioners, it presents an instinctive theoretical guidance that could help understand the sophisticated relationship that is required to derive value from ERP. This study's finding offers a new perspective on how leveraging a firm's ERP assets as dynamic resources could facilitate the continuous development and adaptation to cope with the constantly changing environment. In this light, we believe that studies should go beyond providing an insight of ERP to realize its benefits. Therefore, firms must reconfigure organizational resources and use the information provided by ERP systems adequately to inform their decisions. It is found that a firm's failure to capture value from ERP is caused not only by the lack of ERP outputs but also to their failure to use and responds to this information. Based on these findings, it can be derived that a firm should evaluate the benefits of ERP in line with evaluating the management of organizational process and transformation of management practices.

Limitations

Similar to other academic literature, this article is not without limitation. The first limitation that there are more to be learned about how ERP system quality and dynamic capabilities are linked to each other. Moreover, there is limited empirical research that justifies choosing one modeling approach over another, hence, the conceptualization of dynamic capabilities is relatively novel. On the other hand, the mediation model is in line with other theorization in the context of dynamic capabilities. Therefore, the mediation approach was chosen to model dynamic capabilities components. Consequently, it is recommended that future research could focus on interaction effects and identifies third-party data sources to confirm the findings of this study.

Another limitation is that the data collected are highly concentrating on ERP as they are related to distinctive elements of ERP. Thus, it is suggested that future research could expand the measures and incorporate a broader set of aspects such as technical readiness, decisions/processes that require the use of ERP, and an organizational culture where ERP is implemented. Lastly, as the cross-sectional research method is used for this study, the result might be not as in-depth as expected despite the fact that it often takes longer for dynamic capabilities to develop and their impact on organizational performance can only be observed over time. In this light, future studies could use the longitudinal research method which takes into account how the elements grow over time to see how the organizational performance influences the growth of these capabilities.

Conclusions

A theoretical framework has been presented in this research that explains how ERP could help achieve firm performance that is based on the RBV and dynamic capability theory to address the gap in the literature. In this regard, ERP facilitates organizational transformations and helps increase organizational outcomes. ERP capabilities development requires the combination of streamlined managerial processes and state of the art technical infrastructure. Moreover, ERP conceptualization is an important component of dynamic capabilities that helps to explain how ERP could enhance organizational outcomes. This study will become one of the pioneering researches on the use of ERP at the organizational and strategic levels and how it could affect firm performance. This study shows how ERP allows firms to identify opportunities and threats and use them to improve their decision making. It examines how the use of ERP transforms business processes improves organizational outcomes based on the premise that IT value is reflected through how its use affects a firm's value-generating processes. This study empirically tests a model integrating several theoretical perspectives which will add a new perspective into the present research on ERP, IS success and firm performance. Finally, the findings of this study will provide a comprehensive and detailed outlook of the organizational impacts of ERP to both academicians and practitioners.

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