Role of cloud ERP on the performance of an organization

Contingent resource-based view perspective

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Abstract

Purpose – Cloud-based enterprise resource planning (ERP) enables an organization to pay for the services they need and removes the need to maintain information technology infrastructure. The purpose of this paper is to empirically test the role of cloud-based ERP services on the performance of an organization. Here, the performance is categorized as supply chain performance and organizational performance that comprises of financial performance and marketing performance. Contingent resource-based view (RBV) theory was used to develop a theoretical framework in which supply base complexity (SBC) acts as a moderating variable on the relationship between cloud ERP and the performance.

Design/methodology/approach – Contingent RBV theory is used to explain the relationship between all identified variables in this paper. Partial least squares (PLS) based on structural equation modeling (SEM) is used to empirically test our theoretical framework.

Findings – The PLS-SEM analysis of 154 respondents supports the contingent RBV theory. Six hypotheses – out of the eight hypotheses formulated in this paper – are supported by data.

Research limitations/implications – Given this study was conducted in India where the potential of cloud ERP has not been fully implemented yet, the results may reflect more of perceived usefulness of this technology. The authors have attempted to understand the effect of SBC as a moderator in the relationship between cloud ERP and organizational performance which may not be the only moderator affecting this relationship among other potential moderators.

Originality/value – This paper empirically validates the theoretical framework based on the contingent RBV theory as it mitigates the static nature of the resource-based view approach suggested in the seminal article of Barney (1991).

Keywords India, Process management, Structural equation modelling, Organizational performance, Information technology, Supply chain performance, Supply base complexity, Cloud ERP, Logistics competences, Supply chain processes, Supply chain competences, Contingent resource-based view

Paper type Research paper

1. Introduction

Cloud enterprise resource planning (cloud ERP) provides real-time integration of business processes, and helps to manage effective cross-functional operations in a business organization (Xu *et al.*, 2012; Yu *et al.*, 2017). Organizations are currently shifting toward the

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use of cloud ERP as it offers cost-effective capabilities due to significantly less capital and human resource involvement (Repschlaeger *et al.*, 2013; Hashem *et al.*, 2015; Maestrini *et al.*, 2017). Further, the extant literature shows that integrating supply chain management systems with ERP can improve supply chain performance (SCP) as it enables timely access to crucial manufacturing, inventory and logistics-related information (Akkermans *et al.*, 2003; Gunasekaran and Ngai, 2004; Kelle and Akbulut, 2005; Min *et al.*, 2005; Addo-Tenkorang and Helo, 2017). Using ERP in order to better integrate suppliers with any associated organization provides access to information such as supply chain needs, extent of product customization (Akkermans *et al.*, 2003; Han *et al.*, 2017), delivery schedules and order status information (Kelle and Akbulut, 2005). Overall, the seamless flow of integrated information allows for improved SCP in terms of timely delivery, optimum inventory levels and cost effectiveness (Whitten *et al.*, 2012) eventually affects the overall organizational performance. Nevertheless, a business organization could have multiple suppliers forming a supply base (Choi and Krause, 2006) in which the number, reliability, differentiation and geographic dispersion of suppliers leading to a complex system could affect the SCP (Whitten *et al.*, 2012), and subsequently the organizational performance.

Based on the resource-based view (RBV) theory (Wernerfelt, 1984; Barney, 2001), an organization can attain competitive advantage by synergizing resources and capabilities. A resource may not be beneficial *per se* but multiple resources collectively emerge as capabilities when bundled together for a concrete worthwhile task (Hoopes *et al.*, 2003). These resources and capabilities work in a given context and are influenced by various contingent factors (Jeble *et al.*, 2017). RBV talks about the valuable, rare, imperfectly imitable, and not substitutable (VRIN) framework (Barney, 1991). Nevertheless, in the long run, any organization may lose out to competition because of imitation of products and this will lead to reduced market share for the organization (Jeble *et al.*, 2017). Ling-yee (2007) has explained that RBV suffers from "context insensitivity" where it becomes difficult to identify resources or capabilities which fall into the VRIN framework. The contingency theory suggests that unpredictable factors that are both intrinsic and extrinsic to organizations further impact the final realizable output of these capabilities (Grötsch *et al.*, 2013).

Overall, contingent RBV helps to understand contextual implications on resources and capabilities that eventually impact the performance of an organization (Brandon-Jones *et al.*, 2014). Utilizing a contingent resource-based perspective, we attempt to conceptualize the impact of cloud ERP to SCP and overall organizational performance with supply base complexity (SBC) acting as a contingent contextual factor. In other words, based on the seminal work of Whetten (1989), this paper aims to:

(1) develop a theoretical framework based on the contingent resource-based theory to explain the role of cloud-based ERP services on the performance of an organization; and

(2) empirically validate this framework using structural equation modeling (SEM).

This paper is divided into four sections and associated sub-sections. Section 2 focuses on academic literature review and showcases the various factors identified for the latent variables considered in this study. Section 3 presents the research methodology followed in order to perform empirical analysis on data collected through survey. Section 4 is the discussion section within which we have discussed outcomes from the perspective of theory and its practical significance. At the end of this paper, Table AI shows the constructs and measures considered in this study and the seminal articles from where these factors were drawn.

2. Literature review

In this section, we have uncovered the various latent variables and also the associated factors that explain these variables.

2.1 Cloud ERP

ERP integrates both processes and functions of an organization creating a seamless, efficient and more transparent way of executing business operations. There are broadly two kinds of ERP being employed so that organizations can use it, namely, an on-premise ERP solution and cloud-based ERP service. In an on-premise ERP solution, it is an organization's responsibility to maintain its own IT infrastructure. As on-premise ERP involves considerable investment in terms of IT infrastructure – hardware and software – and maintenance costs, business organizations nowadays are keen on cloud ERP solutions (Gupta and Misra, 2016). Cloud ERP offers the same functionality as an on-premise ERP, but at considerably lower costs due to off-site setup, maintenance and support (Hofmann and Woods, 2010; McCrea, 2011). Based on the previous literature, we have identified three major aspects, i.e. organizational, technological and people-related factors, which have an impact on successful implementation of cloud ERP (Gupta and Misra, 2016).

2.1.1 Organizational factors. Strategic goals and objectives are the basic governing forces for any business organization (Gupta and Misra, 2016). Clarity in business objectives is imperative for directing both resources and capabilities of organization in the expected direction (Somers and Nelson, 2004; Ray *et al.*, 2004). These objectives, once formulated, should be communicated effectively at all levels of the organization. Effective communication ensures role clarity among different employees and aligns their work to the strategic goals and objectives (Jacobs *et al.*, 2016). Every plan needs an effective implementation strategy. Cloud ERP implementation strategy will lead the way for deciding the operational aspects of bringing change in business processes (Mandal and Gunasekaran, 2003). While deciding the implementation strategy, the business organization is faced with issues such as choice of cloud ERP package, terms and conditions of service-level agreement, and management and measurement of ERP implementation success in relation to project budget allocated for the whole exercise (Somers and Nelson, 2004; Xue *et al.*, 2017). Also, business process re-engineering is another important aspect that needs to be considered while implementation. Cloud ERP calls for significant changes in the way organizations execute their routine operations and processes. Hence, the organization should be flexible enough for business process re-engineering that forms the basis of successful cloud ERP implementation (Mabert *et al.*, 2003). As any change has been known to cause resistance, this shift toward cloud ERP will also face organization resistance (Olson, 2007). This can be countered through effectively communicating the benefits of using cloud technology and adequate training and support. All of the above mentioned aspects should be well organized and coordinated which further calls for a competent team and a proficient team leader. The success of cloud ERP depends on effective project management by these people.

2.1.2 People factors. Cloud ERP implementation and success depends on people both within an organization (employees and top management) as well as outside (ERP vendor). Involving employees as a part of the implementation process facilitates the transition as employees become familiar with the technology. The transition can be even smoother if employees are made to realize personal relevance and positive consequences of using such technology (Hartwick and Barki, 1994). Training of employees acquaints them with cloud ERP functionalities and equips them to perform their task in a better and more efficient way (Françoise *et al.*, 2009). Additionally, commitment and support from top management keeps employees motivated (Françoise *et al.*, 2009; Remus, 2007).

Besides support and involvement of people within the organization, there is a need to look at the factors outside the boundaries of organization such as cloud vendors. Selecting a cloud vendor is a crucial decision. Trustworthiness – based on personal experiences and feedbacks about vendor reputation – and competence – based on SLA guarantees – of cloud

vendor affect this decision (Ghosh *et al.*, 2015) apart from mapping the organization needs to the service offerings of vendor. Trust in a vendor develops through the interactions of the client and vendor organizations and is based on their relational capabilities (Garrison *et al.*, 2012). Another important factor to be considered is the project team.

Project team members must be involved from the requirements stage to the final implementation stage. The competence of project team deployed to handle the cloud ERP implementation is a crucial factor for its success (Stratman and Roth, 2002).

2.1.3 Technological factors. An ERP system entails a change in the operational functioning of the organization. Hence, an ERP system should be selected in accordance with the requirements of organization's processes (Bagchi *et al.*, 2005). There is a need to map the functionality of cloud ERP to the current business processes (Jede and Teuteberg, 2016). Any mismatch in the same may cause problems and delay in implementation. This is resolved by opting for customized cloud ERP solutions which may vary across different vendors. The decision involves issues like selecting the cloud layers such as infrastructure-as-a-service (IaaS), software-as-a-service (SaaS) or platform-as-a-service (PaaS), and deployment models (private cloud, public cloud or hybrid cloud). Another important factor to be considered is the integration of data with the implemented cloud ERP solution. Care must be exercised during the conversion of data to ensure its accuracy and validity for proper system operation (Bruque Camara *et al.*, 2015). Routine and timely system testing can avoid implementation delays due to data integration. Simulation based testing is desirable before starting actual use of cloud ERP package. Along with the above factors, IT infrastructure (hardware and software) is another technological factor to be considered as it is the basic foundational block for any kind of ERP implementation (Somers and Nelson, 2004; van Oosterhout *et al.*, 2006). On-premise cloud ERP entails considerable investment in terms of both hardware and software whereas this requirement in the case of cloud ERP implementers is much less. Cloud ERP vendors provide these services to the client where the latter can utilize all functionalities similar to on-premise ERP in a cost-effective way.

2.2 SBC

"Supply Base" is the group of suppliers from which the organization purchases its requirements (Choi and Krause, 2006). Generally, there are multiple suppliers that cater to these requirements and these together with the business organization form a system. The relationship between the "supply base" and buying business organization, as well as among the suppliers forming the "supply base" can be seen as interactional (Choi and Krause, 2006). Since these interactions often form a complex web, these can be viewed as the basis for the complexity in the system (Choi and Hong, 2002). Thus, SBC is a function of the complexity in the supply side of the business firm.

SBC may have direct implications for the organizational performance, since it has a potential to disrupt the plant functioning and affect the plant performance (Brandon-Jones *et al.*, 2015). Thus, SBC has been identified as one of the vulnerability drivers that is present on the supply side (Wagner and Neshat, 2010). Imperatively, organizations need to control their SBC. This can be achieved in many ways amongst which we have identified four relevant factors.

2.2.1 Number of suppliers. The number of suppliers is a quantitative dimension of the SBC as identified by previous works, such as Choi and Krause (2006). It takes into account the number of suppliers associated with the business organization, and can be seen as the measure of density of connections between various nodes. Organizations may strive to keep the number of suppliers in control in order to check the SBC and thus the input material quality (Saranga and Moser, 2010).

2.2.2 Delivery reliability of suppliers. Delivery reliability of suppliers is a qualitative dimension for the SBC. The delivery reliability is an important parameter of supplier performance (Vonderembse and Tracey, 1999; Shin *et al.*, 2000). It represents an important vendor attribute that is used as a selection parameter in case of multiple vendors (Verma and Pullman, 1998). Delivery reliability of supplier may have implications on the delivery reliability of the client organization (Hallikas *et al.*, 2002).

2.2.3 Differentiation between suppliers. Differentiation between suppliers is another qualitative dimension that distinguishes suppliers from each other. Various researchers have discussed different criteria based upon which suppliers can be differentiated, such as the perceived quality of components (Rese, 2006); price (Kazakov, 2007); delivery time, financial stability (Ibrahim *et al.*, 2014); value addition and competency (Bhattacharya *et al.*, 1995); organizational cultures and operational practices (Choi and Krause, 2006); or technology capability (Chang *et al.*, 2007).

2.2.4 Geographic dispersion. Geographical dispersion is a spatial dimension for the SBC. Different suppliers may be visualized as different nodes (Craighead *et al.*, 2007) of the interactional network that are distributed across geographical locations. With increasing globalization, the dispersion of the suppliers is extending globally (Bozarth *et al.*, 2009). This geographical distribution of the suppliers has bearing on the supply chain risk (Lorentz *et al.*, 2016). Unlike Choi and Krause (2006), we do not subsume "Geographic Dispersion" within "Differentiation between Suppliers."

2.3 SCP

Supply chain is inherently a complex system leading to difficulties associated with appropriate measures it is difficult to come up with an appropriate measure for it (Beamon, 1999; Foropon and McLachlin, 2013). Consequently, there are many different ways in which SCP measurements can be carried out at a strategic, tactical or operational level (Ballou, 1998). Traditionally, supply chain has been insulated internal functions from the suppliers and customers, thus creating a functional approach (Stewart, 1995). However, with changing times, researchers have adapted the measurements drastically to suit a customer centric and responsive approach (Gunasekaran *et al.*, 2004). In the present study, we rely on the responsive approach to supply chain and use operational-level measures to ensure a customer centric attitude. Accordingly, we have selected five pertinent measures from the scale developed by Whitten *et al.* (2012) and Gunasekaran *et al.* (2017), as described below.

2.3.1 Ability to deliver value-added services to final customers. Today, value-added services are required in order to neutralize the high market competition (Ryan, 1996) and add a competitive edge to the offerings being made (Vandermerwe and Rada, 1988). Thus, the success of the supply chain lies in its ability to take value-added services generated in the business organization to the final end customer; else, the value-added services will perish on the way.

2.3.2 Ability to eliminate late, damaged and incomplete orders to final customers. Only if the supplied orders are on time and wholesome, they do live up to the expectations of the customers (Collins *et al.*, 2001) and pave the way for customer satisfaction (Gaudenzi and Borghesi, 2006). Late, damaged and incomplete orders would incur an extra cost of transportation and reworking (Heskett, 1971) and hinder the customer satisfaction.

2.3.3 Ability to quickly respond to and solve problems to final customers. The supply chain responsiveness factor is central for the supply chain of the business organizations to be customer oriented (Reichhart and Holweg, 2007). The response to the customer query should be fast and accurate in order to ensure customer satisfaction (Gunasekaran and Ngai, 2004).

2.3.4 Ability to minimize channel safety stock throughout the supply chain. In supply chain, each supplier becomes a seller for the next step in the process. Thus, each step keeps some safety stock to ensure consistent movement of goods/services. The concept of lower

"channel safety stock" in selling/marketing is equivalent to low "in-process inventory" in manufacturing (Germain *et al.*, 1994). Thus, overall safety stock should be minimized in supply chain for a better performance.

2.3.5 Ability to minimize total product cost to the customers. The efficiency of the supply chain has financial implications that get transferred to the customer(s). Some of the major costs associated with the supply chain are information processing cost (Gunasekaran and Ngai, 2004), order management cost, material acquisition cost and inventory carrying cost (Stewart, 1995). Cost-containment is therefore critical (Won Lee *et al.*, 2007) to minimize the burden on customer(s).

2.4 Organizational performance

Organizational performance has been measured by the following two parameters: financial performance (FP) and marketing performance (MP).

2.4.1 FP. Any supply chain which is able to ensure customer orientation in the competitive market is eligible to grow and excel. Previous studies have shown how customer satisfaction gets captured in the form of better FP (Fornell, 1992). Further, it is noted that better customer service ensures higher return on investment (revenue) and profits for the firm (Rust *et al.*, 1995). Similarly, the rewards of the customer orientation of the supply chain can be reaped in the form of better FP (Vickery *et al.*, 2003) which is ensured through customer satisfaction (Yu *et al.*, 2013). As Fisher (1997) points out, increased supply chain responsiveness yields financial benefits. FP metrics remains one of the most prominent metrics employed to access performance in corporations (Marsden, 1996). Thus, we incorporated three most important parameters from Whitten *et al.* (2012), Ji-fan Ren *et al.* (2016), Fosso-Wamba *et al.* (2017) and Gunasekaran *et al.* (2017) to measure the FP, namely, average return on investment, average profit and profit growth.

2.4.2 MP. The financial rewards of the SCP are closely associated to the market rewards (Vickery *et al.*, 2003). MP can be understood as a relative indicator that contrasts the sales and market share of the business organization with respect to its competitors (Green and Inman, 2005). Thus, MP is also associated with customer satisfaction derived at the end of the supply chain (Anderson *et al.*, 1994) that improves its competitive position (Li *et al.*, 2006). Then, the supply chain that has a customer orientated marketing strategy should improve the competitive advantage of the organization (Min and Mentzer, 2000). Also, both FPs and MPs have been used together in past to understand the outcome of the supply chain process (see e.g. Li *et al.*, 2006; Wu *et al.*, 2010). Green *et al.* (2008) found that logistics (supply chain) performance has a positive impact on the MP of the organization which translated into its FP. Thus, we incorporated MP as another variable in our model. We use three parameters previously used by Whitten *et al.* (2012), Ji-fan Ren *et al.* (2016), Fosso-Wamba *et al.* (2017) and Gunasekaran *et al.* (2017), to capture the MP, namely, average market share growth, average sales volume growth and average sales (US dollars) growth.

3. Research design

The research methodology employed in this study includes developing a theoretical framework which will be tested by empirical analysis; conducting an online survey to collect data; and using SEM for data analysis. We discuss them below.

3.1 Theoretical framework

Figure 1 shows the theoretical framework used in this study, which is based upon the contingency RBV theory. This model also depicts the path coefficients for each latent variable and the corresponding *p*-values. Cloud-based ERP services forms the resources and capability of an organization and thus its impact on the various parameters of performance is crucial to

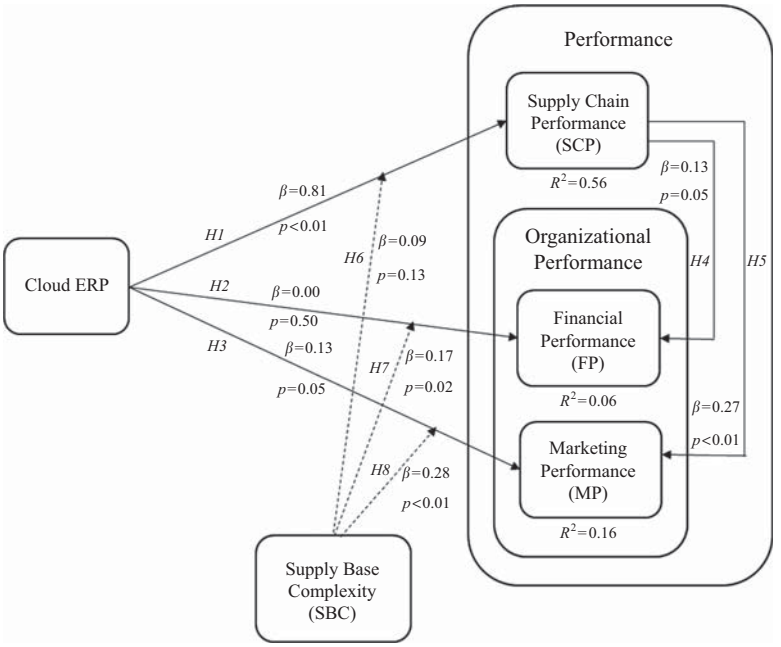

Figure 1.
Conceptual model after SEM

know the effectiveness of this service. Here, the performance has been broadly categorized as SCP and organizational performance. Both of these performances have been explained in Sections 2.3 and 2.4. The relationship between cloud-based ERP services and the performance is not a purely linear relationship and it has been hypothesized that it is moderated by the SBC.

Based on previous academic literature review, the hypotheses formulated in this study are as follows:

H1. Cloud-based ERP services have a positive impact on the supply chain performance.

H2. Cloud-based ERP services have a positive impact on the FP of an organization.

H3. Cloud-based ERP services have a positive impact on the MP of an organization.

H4. Supply chain performance has a positive impact on the FP of an organization.

H5. Supply chain performance has a positive impact on the MP of an organization.

H6. SBC has a moderating effect on the relationship of cloud ERP and supply chain performance.

H7. SBC has a moderating effect on the relationship of cloud ERP and FP.

H8. SBC has a moderating effect on the relationship of cloud ERP and MP.

3.2 Survey technique

An online survey was conducted in 2017 in India wherein the questionnaire was first pre-tested by eight respondents to ensure the validity, readability and usefulness of the questions. A total of 154 fully filled questionnaires were considered for this study and the data were standardized wherein there was no case of missing data, no zero variance and no rank-related problems found. A Likert scale of 1-5 was used where 1 was considered as strongly disagree, 2 as disagree, 3 as neutral, 4 as agree and 5 was considered as strongly agree.

This scale was used in this study as the distance between any two consecutive parameters was identical. For instance, the distance between categories 2 and 3 is same as distance between categories 4 and 5 of the Likert scale (Hair *et al.*, 2014). In Table I, we can see the respondents' profile that has been considered for this study.

3.3 Data analysis

WarpPLS version 5.0 has been used to perform the partial least squares (PLS-) based SEM. There are two types of SEM techniques, namely, variance-based and covariance-based SEM. PLS-based SEM is a variance-based technique, and in Table II, the model fit and quality indices can be seen. We have chosen PLS-SEM over covariance-based SEM as this study can be termed as more exploratory than confirmatory research (Hair *et al.*, 2014), and there is no requirement for normally distributed data (Hair *et al.*, 2011; Kock, 2016). Also, PLS-SEM is a more effective technique if the objective of the study is to predict and explain the target constructs (Hair *et al.*, 2014). The efficiency is higher in case of PLS-SEM for parameter estimation, and this augments the likelihood of any relationship to be termed as significant if it is indeed significant for the respondents (Hair *et al.*, 2014). In Table II, average path coefficient, average R^2 are significant as the p-value is less than 0.05 and average block VIF value is less than 3.3 in an ideal case (Kock, 2015).

Causality assessment indicates whether the directions of the hypothesis made are correct or it can be bi-directional. In Table III, four indices suggest that the theoretical model considered in this study is appropriate. The maximum value of each of the indices here can be 1 and it can be seen that the value of all four of these indices is more than the threshold value.

Causality assessment indices:

- Sympson's paradox ratio (SPR) = 0.750, acceptable if ≥ 0.7, ideally = 1.
- R^2 contribution ratio (RSCR) = 0.943, acceptable if ≥ 0.9, ideally = 1.
- Statistical suppression ratio (SSR) = 0.875, acceptable if ≥ 0.7.
- Nonlinear bivariate causality direction ratio (NLBCDR) = 0.875, acceptable if ≥ 0.7.

Designation	
Vice president	44
General managers	38
Senior managers	37
Deputy managers	35
Nature of the firms	
Shipping companies	36
3 PL companies	41
Trucking companies	25
Project logistics companies	52
Annual turnover	
> 150 m USD	66
100 m USD-150 m USD	30
50 m USD-99 m USD	23
< 50 m USD	35

Table I. Respondent's profile

Average path coefficient (APC)	0.236, $p < 0.001$
Average R^2 (ARS)	0.257, $p < 0.001$
Average block VIF (AVIF)	2.458, acceptable if ≤ 5, ideally ≤ 3.3

Table II. Model fit and quality indices

	Cloud ERP	SCP	FP	MP	SBC	SE	*p*-value
OF1	*0.193*	−0.404	−0.137	0.01	0.083	0.077	0.007
OF2	*0.053*	−0.088	−0.312	0.519	0.251	0.08	0.254
OF3	*0.236*	−0.23	−0.083	0.312	0.185	0.077	0.001
OF4	*0.057*	−0.351	−0.198	0.232	0.477	0.08	0.237
OF5	*0.849*	−0.063	0	−0.045	−0.489	0.067	< 0.001
OF6	*0.801*	−0.017	−0.042	0.042	−0.563	0.068	< 0.001
OF7	*0.851*	−0.151	−0.032	−0.029	−0.472	0.067	< 0.001
PF1	*0.817*	−0.037	−0.034	−0.012	−0.545	0.067	< 0.001
PF2	*0.863*	−0.06	0.045	−0.118	−0.408	0.067	< 0.001
PF3	*0.872*	0.379	0.011	0.067	−0.326	0.067	< 0.001
PF4	*0.889*	0.356	0.016	0.034	−0.329	0.066	< 0.001
PF5	*0.87*	0.599	−0.024	0.1	−0.273	0.067	< 0.001
PF6	*0.846*	0.701	−0.028	0.11	−0.267	0.067	< 0.001
TF1	*0.62*	−0.612	0.092	−0.106	1.278	0.07	< 0.001
TF2	*0.619*	−0.552	0.056	−0.107	1.231	0.07	< 0.001
TF3	*0.603*	−0.529	0.006	−0.053	1.244	0.071	< 0.001
TF4	*0.586*	−0.487	0.084	−0.134	1.194	0.071	< 0.001
SCP1	0.02	*0.948*	−0.026	0.003	−0.135	0.065	< 0.001
SCP2	−0.081	*0.941*	0.04	0	0.167	0.066	< 0.001
SCP3	0.061	*0.967*	−0.011	−0.006	−0.034	0.065	< 0.001
SCP4	−0.148	*−0.007*	−0.184	0.218	0.493	0.08	0.465
SCP5	−0.179	*0.017*	−0.198	0.253	0.445	0.08	0.418
FP1	−0.07	−0.351	*−0.059*	0.232	0.477	0.08	0.229
FP2	−0.057	−0.029	*0.816*	−0.179	0.081	0.067	< 0.001
FP3	0.052	0.004	*0.822*	0.194	−0.047	0.067	< 0.001
MP1	0.002	0.351	0.551	*0.545*	−0.259	0.072	< 0.001
MP2	0.032	−0.065	−0.197	*0.879*	0.023	0.066	< 0.001
MP3	−0.034	−0.153	−0.145	*0.876*	0.139	0.067	< 0.001
SBC1	0.209	−0.527	0.014	−0.098	*0.918*	0.066	< 0.001
SBC2	0.199	−0.558	0.052	−0.103	*0.926*	0.066	< 0.001
SBC3	−0.202	0.537	−0.04	0.101	*0.928*	0.066	< 0.001
SBC4	−0.203	0.542	−0.025	0.099	*0.928*	0.066	< 0.001

Notes: Loadings are unrotated and cross-loadings are oblique-rotated. SEs and *p*-values are for loadings. *p*-Values < 0.05 are desirable for reflective indicators

Table III. Combined loadings and cross-loadings

Confirmatory factor analysis is used to know the reliability and validity of the theoretical model. In Table III, we can see that the loading for most of the factors is more than 0.50 and thus it can be considered as significant factor (Hair *et al.*, 2006).

In Table IV, we see that the values of Cronbach's α and composite reliability is more than the threshold value of 0.70, and this is a good measure for the reliability of the constructs (Nunnally and Bernstein, 1994; Tellis *et al.*, 2009). The average variance extracted (AVE) should be more than 0.50 (Hair *et al.*, 2006), and this is evident in Table IV for all the latent variables.

	Cloud ERP	SCP	FP	MP	SBC
R^2 coefficients		0.555	0.06	0.156	
Adjusted R^2 coefficients		0.549	0.041	0.139	
Composite reliability coefficients	0.927	0.783	0.763	0.82	0.96
Cronbach's α coefficients	0.909	0.735	0.721	0.765	0.944
Average variances extracted (AVE)	0.576	0.544	0.549	0.612	0.856
Variance inflation factor (VIF)	2.556	2.873	1.242	1.295	3.213

Table IV. Latent variable coefficients

Variance inflation factor (VIF) is a measure of multi-collinearity among the various variables and its value should be less than 5 (Kock and Lynn, 2012). In Table IV, we see that the VIF value of each of the variable is well within the limit. The values of R^2 coefficients explain the magnitude to which all the constructs for each variable is able to explain the latent variable. SCP is well explained by the constructs but there is a scope for improvement in terms of FP and marketing performance (MP) variables.

In Table V, discriminant validity test is used to identify if indicators are associated with the wrong constructs. Here, the value of the square root of the AVE should be more than the construct correlations (Fornell and Larcker, 1981; Hair *et al.*, 2006).

Table VI shows the result of all the hypotheses considered for this paper in a more concise manner.

4. Discussion

In this section, we discuss the outcome of the findings drawn out of the data analysis from the theoretical perspectives, as well as how it can add value to the managerial aspects. This section is divided in the following three sub-parts: theoretical contributions, managerial implications, and limitations and further research.

4.1 Theoretical contributions

We have used the contingent resource-based theory to explain the role of cloud-based ERP services on the performance of an organization. Extant literature considers supply chain as a valuable resource and supply chain capabilities as differentiating factors for success (Priem and Swink, 2012). Supply chain integration with the help of ERP has proven significant in terms of better delivery, customer problem solving, optimizing inventory and minimizing costs to customers (Whitten *et al.*, 2012). On the other hand, ERP functionalities can be availed on a utility basis and a much more cost-effective way by switching to

Table V.
Correlations among latent variables with sq. rt. of AVEs

	Cloud ERP	SCP	FP	MP	SBC
Cloud ERP	*0.79*				
SCP	0.741	*0.738*			
FP	−0.171	−0.18	*0.67*		
MP	−0.131	−0.253	0.419	*0.782*	
SBC	0.69	0.72	−0.176	−0.216	*0.925*

Note: Square roots of average variances extracted (AVEs) shown on diagonal

Table VI.
Results of hypotheses testing

Hypothesis	β and p-value	Supported or not-supported
H1: cloud-based ERP services have a positive impact on the SCP	$\beta = 0.81$ $p < 0.01$	Supported
H2: cloud-based ERP services have a positive impact on the FP of an organization	$\beta = 0.00$ $p = 0.50$	Not-Supported
H3: cloud-based ERP services have a positive impact on the MP of an organization	$\beta = 0.13$ $p = 0.05$	Supported
H4: SCP have a positive impact on the FP of an organization	$\beta = 0.13$ $p = 0.05$	Supported
H5: SCP have a positive impact on the MP of an organization	$\beta = 0.27$ $p < 0.01$	Supported
H6: SBC has a moderating effect on the relationship of cloud ERP and SCP	$\beta = 0.09$ $p = 0.13$	Not-Supported
H7: SBC has a moderating effect on the relationship of cloud ERP and FP	$\beta = 0.17$ $p = 0.02$	Supported
H8: SBC has a moderating effect on the relationship of cloud ERP and MP	$\beta = 0.28$ $p < 0.01$	Supported

cloud-based ERP (Baun *et al.*, 2011). Although the extant literature talks about the significance of ERP integration of supply chains (Akkermans *et al.*, 2003; Gunasekaran and Ngai, 2004; Kelle and Akbulut, 2005; Min *et al.*, 2005), impact of SCP on organizational performance (Li *et al.*, 2006), effect of SBC on SCP (Choi and Krause, 2006) and the significance of cloud ERP for business organizations; the relationship among the above mentioned phenomenon was not fully explored and empirically verified. Hence, the findings of the present work contribute to the existing literature in terms of understanding the relationship of cloud ERP with SCP and overall performance of the organization with SBC acting as a contextual influencer or moderator in the above relationship utilizing the contingent RBV. As the organization's need to adapt and adjust to the ever changing internal and external environment, we used the contingent RBV theory to explain the conceptual model (Brandon-Jones *et al.*, 2014). This theory mitigates the static nature of the RBV theory and this is evident from Figure 1, where it is seen that the latent variables used in this study keep on changing based on the internal and external environments.

4.2 Managerial implications

Now, more than ever, business organizations are looking for ways to improve their cost efficiency and increase overall performance. Based on the findings of our current study highlighting the positive impact of cloud ERP on SCP moderated by SBC, interested business organizations should consider implementing cloud ERP, which is a cost-effective way of integrating the business processes and improving the work efficiency (Fosso-Wamba *et al.*, 2015).

In the present work, we have tried to empirically verify the impact of cloud ERP on SCP moderated by SBC. It has implications for managers in terms of understanding the positive impact of cloud ERP on SCP. Understanding how various aspects of SBC (number of suppliers, reliability, differentiation among suppliers and geographic dispersion) can moderate the performance can help managers formulate appropriate strategies and streamline their operations.

4.3 Limitations and future research

Although the present work generates insights on a significant aspect of cloud ERP-based organizational performance, some limitations exist in terms of sample size and location. First, since we conducted the study in India where the potential of cloud ERP is still not fully realized, the results may reflect more of perceived usefulness of this technology. Second, increasing the sample size may also lead to more significant results. Third, we have attempted to understand the effect of SBC as a moderator in the relationship between cloud ERP and organizational performance which may not be the only moderator affecting such relationship. Hence, future research may be conducted to identify and empirically verify other supply chain-related aspects like supply chain resilience or supply chain risk as moderators. Also, cloud-based ERP system can be employed to analyze large data sets and this capability will be a big boost in clubbing the benefits of cloud computing and big data predictive analytics. Finally, the theoretical lens (contingent resource-based theory) led to assumptions about both identified variables and relationships, which should lead to further empirical investigation in the near future.

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Further reading

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Appendix

Latent variable	Measurement constructs	Journal paper considered
Organizational factors (OF)	Strategic goals and objectives Communication Implementation strategy Business process re-engineering Project management Project budget Organization resistance	Gupta and Misra (2016)
People factors (PF)	User involvement Selection of vendor Project team Top management support Training of user Trust on vendor	Gupta and Misra (2016)
Technological factors (TF)	Selection of ERP package IT Infrastructure Data integrity and system testing Functionality	Gupta and Misra (2016)
Supply base complexity (SBC)	Number of suppliers Delivery reliability of suppliers Differentiation between suppliers Geographic dispersion	Choi and Krause (2006), Brandon-Jones *et al.* (2015)
Supply chain performance (SCP)	Ability to deliver value-added services to final customers Ability to eliminate late, damaged and incomplete orders to final customers Ability to quickly respond to and solve problems to final customers Ability to minimize channel safety stock throughout the supply chain Ability to minimize total product cost to the customers	Whitten *et al.* (2012), Gunasekaran *et al.* (2017)
Financial performance (FP)	Average return on investment Average profit Profit growth	Whitten *et al.* (2012), Ji-fan Ren *et al.* (2016), Fosso-Wamba *et al.* (2017), Gunasekaran *et al.* (2017)
Marketing performance (MP)	Average market share growth Average sales volume growth Average sales (US dollars) growth	Whitten *et al.* (2012), Ji-fan Ren *et al.* (2016), Fosso-Wamba *et al.* (2017), Gunasekaran *et al.* (2017)

Table AI. Constructs and measures

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