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The relationships between IT resources and dynamic capabilities: Evidence from Sudanese insurance and banking sectors

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ABSTRACT

Adaptation capabilities as a dynamic capability are essential for an organization to be adapted with the external environment, which can lead to creating a strategic advantage, knowing how these capabilities are created to help the organization to build its competitive strategies. IT resources as one of organizational resources has the ability to configure dynamic capabilities due to its evolution nature. Previous studies based on RBV and DCA investigate the relationship between IT resources and one IT dynamic capabilities. this study is aimed to investigate the relationship between IT resources by using comprehensive topography of IT resources, (core communication technology, group collaboration technology, and enterprise computing technology) and some dynamic adaptive capabilities (innovation, flexibility, and strategic capability) from the perspective of both managers and employees. Data were collected from 83 IT employees and 143 managers involved in both the banking and insurance sectors in Sudan. The questionnaire was used to collect data. Statics such as reliability and factor analysis were conducted to ensure data goodness. Partial least squares techniques (PLS) is used to test the relationships between variables. The results of the study show how IT resources affect dynamic capabilities.

1. Introduction

IT is strategic resources that could be used to support other organization resources to achieve superior performance through changing industry structure, creating new business models, or changing business processes in order to create unique firm capabilities. For IT resources to achieve their goals, they are integrated with other organizational resources to support organizational capabilities (Schryen, 2013). Scholars used different models based on different strategic theories such as dynamic capability approach and RBV to understand the mechanisms through which IT resources can impact performance at the process or firm level (Schilke et al., 2018). Evaluating this mechanism can give guidelines for both managers and IT designers to formulate their business strategies based on how attributes of IT interact with other IT resources and non-IT resources to create unique capabilities necessary for achieving competitive advantage (Schryen, 2013). For academic purposes, this will enable us to enhance the theory of IT business value (Schryen, 2013).

When organizations face changes in their environments, it becomes difficult to sustain a competitive advantage (Teece, 1997). Thus, the key business success factor is achieved when a company can increase the rate of building strategies that will differentiate the organization from the competitors as the level of dynamics in business environments (Gathungu and Mwangi, 2012). One of the higher organizational capabilities that can be considered as an enabler of sustainable competitive advantage is dynamic capability. According to Rouse and Ziestma (2008), to develop a dynamic capability of environmental adaptation, there is a need to learn how to respond to early signs of environmental changes. When the firm can adapt to its environment, it can gain a competitive advantage (Ali et al., 2017).

Many scholars suggest that dynamic capabilities may be developed through an internal approach that involves activities such as continuous in-house innovation and human resources activities and through external approaches of collaboration and acquisition. In spite of the great efforts of numerous researchers, the idea of dynamic ability and how it is

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created is still not clear (Wójcik, 2015). Some researchers reason that IT can impact these higher capabilities directly rather than performance. Thus, some recent studies investigate the relationship between IT capabilities and dynamic capabilities (Parida et al., 2016; Wang and Shi, 2011). The results of these studies indicate that different IT capabilities have different effects on dynamic capability (Wang and Shi, 2011; Parida et al., 2016). This is confirmed by RBV scholars, who considered that not each resource can contribute to building specific unique capabilities (Nguyen et al., 2015; Sambamurthy et al., 2003). Usually, RBV scholars test the impact of one resource in one capability or vice versa as a rare example that investigates how all firm IT resources impact dynamic capabilities through a comprehensive model (Nguyen et al., 2015). Dynamic capabilities have diverse topography and dimensions based on the perspective of different scholars. Some of these dynamic capabilities are necessary for the adaptation of the basic organization process when they confront change in environment such as technical change, and examples of these capabilities are innovation and flexibility (Zurub et al., 2015), and strategic fit includes flexibility and strategic capabilities. In Sudan, the investigation of the mechanisms through which IT resources influence dynamic capabilities is not clear. This is because Sudan, like most developing countries, has not yet benefited completely from the opportunities that may be offered by information systems. This may be due to poor technological potentialities of humans and infrastructures, which have the ability to rationalize the use of technology. All this sparked interest in understanding the mechanisms through which IT influences dynamic capability in Sudan, by using a comprehensive model. The main question of this study is whether different IT resources contribute to building dynamic capabilities necessary for facilitation adaptation or not. To answer this question, a comprehensive typography of IT resources is designed, and the most influential dynamic capabilities in the adaptation process of the firms were selected. RBV and dynamic capabilities approach are the most beneficial strategic approach that can explain the relationship between resources and capabilities (Wójcik, 2015).

This study contributes to RBV by explaining how various IT resources can contribute to building the dynamic capabilities necessary for the adaptation of the essential process such as innovation and contribute to the dynamic capability approach through identifying the driver of dynamic capability necessary for adapting business processes and strategic fit.

2. Literature review

2.1. RBV and dynamic capability approach

RBV is concerted in how the firm can achieve a competitive advantage by focusing on the inside of the firm (Wójcik, 2015). According to RBV, improvement in firms' performance from IT can be obtained if the firm can develop unique technological capabilities and skills which complement resources within the organization (Dong et al., 2009; Chi and Sun, 2015). Thus, RBV provides guidance on how to differentiate among various types of information system usage, including the importance of differentiating between resources and capability. Furthermore, the theory provides a basis for comparison between IT and non-IT resources and thus can facilitate cross-functional research (Wade and Hulland, 2004). This will lead to understanding the strategic value of IT resources, even though RBV suffers from some limitations. Nevo and Wade (2010) reviewed the following: Firstly, RBV research tends to disregard resources that are not strategic in themselves, like IT assets. Secondly, the RBV neglected the mechanisms through which resources can create a strategic advantage. Thirdly, because treating resources is a cornerstone of RBV, the approach fails to conceptualize the outcome of a complementary relationship between IT resources and other organizational resources. Additionally, although the complementarity between resources represents new value, the RBV neglected the mechanisms of the interaction between different firm resources over time to create new value through generic model (Nonaka and Takeuchi, 1995). Other limitations are the static nature of RBV that disables it from explaining the change in the environment (Božič and Cvelbar, 2016).

Many challenges in empirically testing the RBV constructs are also observed. For example, Rouse and Daellenbach (1999) found that using the RBV will not enable predicting the impact from different sources such as industry, environment, and strategy. Thus, some scholars propose a detailed model to distinguish the source of impact.

To sum up, the RBV gives guidelines for understanding the benefits of IT resources to create value, despite the fact that the mechanisms of creating this benefit are not well investigated.

The dynamic capability approach (DCA) has evolved due to the limitations in RBV, specifically because RBV is used in static conditions. DCA is based on different theoretical approaches (Wójcik, 2015; Schilke et al., 2018), such as strategic management (Schilke et al., 2018; Wójcik, 2015). Thus, it is classified as an interdisciplinary approach (Wójcik, 2015). The DCA is concerned with how dynamic exchange systems integrate different types of resources in order to affect the operational capabilities and, ultimately, evolutionary fitness (Wilden et al., 2016).

With the DCA, capabilities are classified differently by scholars (Schilke et al., 2018). The hierarchical approaches indicate that dynamic capabilities are of a higher order than resources (Wójcik, 2015) that contribute to building these capabilities (Schilke et al., 2018). The outcome of dynamic capabilities from either resource base or performance could not be generated either through

the moderator effect of organizational and/or environmental factors or mediated by resource base (Schilke et al., 2018). Thus, the dynamic capabilities are generated according to how a resource is combined; thus, it is confirmed with RBV. The generation of dynamic capabilities from a resource base differs according to industry or sector or organization is the basis of sustainable competitive advantage (Wójcik, 2015). Thus, we can support RBV to explore how IT resources impact dynamic capabilities.

2.2. Dynamic capability

Dynamic capabilities can be perceived as "the routines in a firm that guide and facilitate the development of the firm's organizational capabilities by changing its underlying resource base" (Eisenhardt and Martin, 2000). The key implication of the concept of dynamic capabilities is that the firms are competing not only in terms of their ability to use their existing resources and organizational capabilities but also in terms of their ability to renew and develop these capabilities (Schilke et al., 2018). Accordingly, the difference between organizational and dynamic capabilities is in their outcome. While the outcome of dynamic capability is ensuring the renewal and development of organizational capabilities, the outcome of organizational capabilities enables the firm to produce goods and services (Schilke et al., 2018). However, capabilities are found in the hierarchy, and the dynamic capability in the high level of the hierarchy can influence firm performance (Schilke, 2014). Moreover, dynamic capabilities give the organization the ability to respond effectively to changes in the environment and leverage performance (Schilke et al., 2018).

Most researchers assume that dynamic capabilities are unique and essential for the specific firm (Teece et al., 1997; Barreto, 2010) and the key to competitive advantage (Teece et al., 1997; Li and Liu, 2014) or performance (Osisioma et al., 2016; Lin and Wu, 2014). However, building dynamic capabilities is a necessary condition but not sufficient for achieving a suitable competitive advantage. Investigation on how dynamic capabilities evolve allows managers to achieve success in their business process and construct their strategies to gain an advantage over the competitors (Wójcik, 2015).

Dynamic capabilities are classified into different typologies as follows: procedural (coordinating/learning, reconfiguring, and sensing/seizing/transforming), routinization (routine-/heuristics-based), functional (alliancing, new product development, mergers, and acquisitions, and internationalization), hierarchical (zero-, first-, second-, and higher-order capabilities), and by unit of analysis (individual, group, firm, and beyond firm boundaries) (Schilke et al., 2018). These classifications overlap, according to Wilden et al. (2016).

Wang and Ahmed (2007) stated examples of medium to highly specific dynamic capabilities, which are knowledge management capabilities, acquisition capabilities, and drug development capabilities (Pettus et al., 2009). Another capability that can be considered as dynamic capability is the strategic capability (Johannesson and Palona, 2010). Strategic flexibility is also considered as a dynamic capability that is affected by environmental factors such as environmental dynamism (Jiao et al., 2013). On the other hand, Lawson and Samson (2001) also considered innovation as a dynamic capability.

Adaptive capabilities are one of the dynamic capabilities that can allow the firm to adapt to external environment firms through the alignment of internal resources with a requirement of its environment (Ali et al., 2017). Thus, it has the ability to innovatively apply ideas for the external environment. Therefore, innovation capabilities can lead to the adaptation of the firm to an external environment. Another dynamic capability that facilitates the firm's adaptation to its environment necessary for achieving a competitive advantage is strategic flexibility due to its ability to react and adapt to changes in the environment (Cingöz and Akdoğan, 2013).

Strategic capability is not clearly conceptualized in literature; it refers to the degree that the company can change the organization based on its environment (Johannesson and Palona, 2010). Thus, it is related to how the firm can adapt to its environment.

Despite the importance of dynamic capability to the adaptation process, which is necessary for the firm to gain strategic advantage, there is no agreement about what the dynamic capabilities are and how they evolve (Schilke et al., 2018).

2.3. IT resources

RBV generally uses a wide definition of IT resources broadly to include assets, infrastructure, skills, etc. (Pan et al., 2015). For IT resources to create effects on firm performance, they may first complement with other resources (Wade and Hulland, 2004). RBV conceptualized the resources complementarity in the following directions. The first one is complementarity among resources, which occurs when the use of one resource changes the impact or value of another resource. Another perspective conceptualizes resource complementarity based on how resources are channeled and utilized. That is how the firm chooses the resources/capabilities and deploys them (Wade and Hulland, 2004). The third one is "suppressing," which occurs when a certain resource usage reduces the impact of other resources (Wade and Hulland, 2004).

However, many conceptual models are built to investigate this complementarity (Melville et al., 2004), despite the fact that limited work has been undertaken to examine the effects of complements between various IT resources and how this

complement can affect other firm capabilities such as Ravichandran et al. (2005) and Tanriverdi (2006), and Zand et al. (2011). Most of these studies are considered implicitly, if not explicitly. However, the mechanisms of the complementarity of resources remain under development (Schryen, 2013).

The scholars of IT-based on RBV usually classified IT (usage) resources into different typographies in order to understand which IT resources are most likely to contribute to competitive advantage (Wade and Hulland, 2004; Wu et al., 2006) or IT business value (Melville et al., 2004). Most of these studies that aim to investigate IT business value focus on the impact of IT business performance, neglecting the black box of how IT resources can create such an effect. Studying the mechanisms through IT can create such an impact that enables us to highlight the mechanism through which IT resources interact and complement and support core capabilities (Schryen, 2013). Thus, managers can create a road map of how to pick the resource in order to build the capabilities necessary for generating performance (Wójcik, 2015).

Some IT usage (resource) classifications are abstract definitions that do not allow predicting the effects from a variety of sources (Wade and Hulland, 2004) or cannot be operationalized (Zand et al., 2011). This brings some challenges relating to RBV empirical work, which raises the need for typologies that would classify resources/capabilities in order to identify their contribution to the performance or sustainability of competitive advantage (Kraaijenbrink et al., 2010).

In this paper, the author used a comprehensive typology of IT resources that depends on the nature of IT projects, thus, allowing the identification of project management resources that can create dynamic capabilities necessary for achieving competitive advantage. Thus, it can be easier for IT managers and designers to select the IT resources necessary for building dynamic capabilities.

2.4. IT resources and dynamic capability

Many researchers indicate that IT may affect dynamic capability (Paschke et al., 2008). However, some studies indicate that IT resources may complement each other to create dynamic capability. This is because it has the ability to improve business process improvement and integrates, builds, and reconfigures internal competencies in value chain activities, all of which can lead to improving the performance and competitive advantage (Yoshikuni and Albertin, 2017).

Scholars refer to the relationship between IT resources, such as a network in creating adaptive capability, because it has the ability to facilitate communication with external parties.

Information systems affected organizational dynamic capabilities due to the following: the firms which have a technological system are typically treated as "evolution" in their nature. This has, in turn, at least, had the following implications: firstly, there are differences in generating mechanisms that depend on "routine." The second implications are the "evolution" of these capabilities, which is determined through the selection of the "market forces." Thus, this points to environmental analysis. Accordingly, the "actors and relationships" of which a technological system is composed are curable in determining the dynamics of the firm.

Investigating how IT resources can impact dynamic capabilities enables the firm to assign which IT resources can contribute to building dynamic capability. Thus, this can allow allocating IT resources when designing competitive strategies.

Despite the importance of the relationship between IT resources and dynamic capabilities, there is still a lack of knowledge about the driver of these capabilities and about how IT resources can contribute to building dynamic capability.

3. Model specifications and hypotheses

Based on the previous literature review and the lens of both RBV and DCA, which can give insight into the relationships between resources and capabilities, the research model is designed. The main components of the framework are shown in Fig. 1. IT resources represent the independent variable; the organizational dynamic capabilities represent the dependent variables. IT resources are comprehensively defined to ensure the validity of the relation (Wade and Hulland, 2004).

IT resources constructs are chosen through adapting the classification of Bardhan et al. (2007), which depends on the nature of interdependencies that exist in different projects. Bardhan et al. (2007) categorized IT into core communications technology, group collaboration technology, and enterprise computing technology. These classifications make it easier for the designer to decide what resource is needed. However, this classification is operational as it has the ability to define IT resource to functionalities with respect to how to support the operational routines of the company (Wright and Capps, 2011).

Enterprise computing technology and grouped collaboration technology are put in separate items and labeled as inter-organizational systems usage. The objective is to show how various components of IT resources can create dynamic capabilities. Fig. 1 shows the role of IT resources in the organizational capability framework.

This paper selects the following dynamic capabilities: Innovation, integration and flexible capability, and strategic capabilities to examine the effects of IT resources on dynamic capabilities. These capabilities are important to the adaptation of the essential process of the organization (Levinthal, 1991; Miller, 2003); thus, the paper gives them any attention.

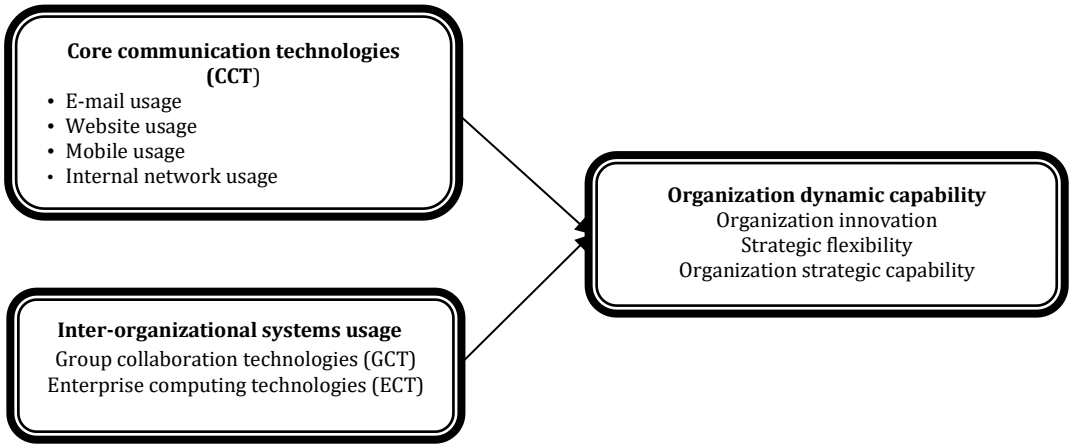

Fig. 1: The role of IT resources in organizational capability framework

3.1. IT core resources and dynamic capabilities

The literature indicates that IT resources can affect organizational dynamic capabilities. An example of these effects is illustrated by many authors such as Mikalef et al. (2016), who indicated that IT could enable dynamic capability and Paschke et al. (2008), who investigated how IT-enabled organizational flexibility. Besides, Huang et al. (2009) indicated that IT could be used to support product innovation for the purpose of determining one position. Moreover, they determined the potential substitute as a source of innovation. In addition, information systems that can support operation capabilities can support internal organizational strategy.

Accordingly, hypothesis one can be stated as follows:

- There is a positive relationship between IT resources and organizational dynamic capabilities.

3.2. Inter-organizational systems and dynamic capabilities

According to Woodworth (2013), the use of enterprise system resources has direct effects on dynamic capability.

Accordingly, hypothesis two can be stated as follows:

- Inter-organizational systems have positive relationships with dynamic capability.

3.3. Core communication technologies and inter-organizational systems

According to Thuraisingham (2008), enterprise computing technology (EPR) depends on its works on web services as web services ease integration and reduce the cost. Moreover, the client and vendor want to access information without access to EPR. This can be easy through web service (She and Thuraisingham, 2007). Thus, core communication technology is important for the availability of EPR.

Thus, hypothesis three can be stated as follows:

- Core communications technology has a positive relationship with inter-organizational systems.

4. Methods

4.1. Measurement and data collection

This study is a part of a study concerned with the impact of IT on firm performance in a Sudanese bank and insurance company, which analyzes the mechanisms of this impact at different organizational levels.

To develop the research constructs, three steps are involved. First, research constructs were adapted from existing studies, as well as from relevant constructs in the literature. Second, original scales had to be engineered based on theoretical contributions and extensive discussions with academics and IT managers during the pretesting phase of questionnaire development. The items are then modified to reflect the applicability within the Sudanese context. The questionnaires are translated into the Arabic language because most respondents are not familiar with the English language. Table 1 provides a summary of the variables utilized and supporting literature. All the items in the questionnaire are rated on a five-point Likert scale.

4.2. Research instruments

The data are proposed to be collected by a questionnaire, but as the IT senior staff were not able to assess the company's strategy and capabilities, the functional managers also were not able to assess IT performance. Therefore, the questionnaire is divided into two parts: one for IT senior staff and the other for functional managers.

The first part deals with organizational dynamic capabilities, which are innovation capabilities, strategic flexibility, and organization strategic capability. The second part is about IT resources, which are divided into IT core communications technology and inter-organizational usage, which includes group collaboration technology and enterprise computing technology.

Table 1: Summary of the variables utilized and supporting literature

Dimension	Description	Support reference
	IT resources	
Core communication	Includes e-mail usage, internal network usage, website usage, and mobile communication.	Eraqi (2006), Bruque et al. (2003), Merisavo et al. (2007)
Enterprise computing technology	Institutionalizes sequential interactions between work units and supports structured, sequential interactions between the users, which enable them to access and exchange data in a structured format.	Bardhan et al. (2007)
Group collaboration technology	Collaboration among individuals engaged in a common task using electronic technology.	Bardhan et al. (2007)
	Organizational dynamic capability	
Innovation capability	Innovation includes both new technologies and new ways of doing things. Innovation can be manifested in new product design, new production processes, new marketing approaches, or a new way of conducting training.	Zhou et al. (2005)
Strategic, flexible capability	The ability to adapt when confronted with new circumstances.	Tallon and Kraemer (2003)
Strategic capability	The ability to change the organization and create change in business environments.	Porter (1985), Johannesson and Palona (2010), Parnell (2011)

4.3. Population, sampling, and unit of analysis

This study is focused on Sudanese banking and insurance sectors. In order to get better results and achieve an acceptable level of generalization, the whole population has been chosen as a sample for this research.

The unit of observation for the first part is the middle manager at the headquarter in each department that is related to customers, who had worked for several years in the institution. Thus, he had the capability to assess dynamic capabilities. A single respondent is used in each business unit because only one or two members of the top management team had a complete picture in each department. Accordingly, a total number of 143 questionnaires are distributed to 90% of the total targeted institutions. The sample has the following characteristics: (1) 77.7% are from the banking sector; (b) the average age of the respondents is 41.43 years; (c) 66.4% are males. More than 78.4% are graduates or postgraduates.

The unit of observation for the second part is an IT senior staff member at the headquarter who can evaluate the effects of IT on performance. A single respondent is used in each business unit because only one or two members of the top management team had a complete picture in each department. The unit of analysis for this study is the institute. Accordingly, a total number of 83 questionnaires are distributed to 84% of the total targeted institutions. The sample has the following characteristics: (1) 77.7% are from the banking sector; (b) the average age of the respondents is 36.5 years; (c) 83.4% are males. More than 92% are graduate or postgraduate.

5. Analysis and results

An initial exploratory factor analysis was performed on the sample data to determine whether each of the items is reliable to measure the intended construct. The factor analysis is also conducted to determine if the dimensions could be summarized into smaller sets of factors, thereby allowing the formation and refinement of the theory.

Although the three types of IT resources constructs (core communication technology, group collaboration technology, and enterprise computing technology) are treated as one construct in some previous study such as Bardhan et al. (2007), in this study each type is treated as a separate construct in order to add some more fine-grained analysis to the understanding of the firm-level IT resources. In addition, this helps to test for constructing convergence with maximally similar sets of variables as well as to avoid violating recommended minimal sample size to parameter estimate ratios suggested by Kerlinger (1986).

The factor analysis is conducted for 10 items of core communication technology statements. The results obtained a four-factor solution that met the requirements (the items have a factor loading greater than 0.65). It should be noted here that factor with eigenvalue less than 1 was deleted. Therefore, only three factors will explain IT resources, which can be explained as follows: The first factor includes only items of e-mail usage and website usage. The second factor consists of items of mobile usage. The third factor consists of two factors from internal network usage. Accordingly, core communication technology is divided into three components. The first component is labeled as internet usage, which includes both website usage and e-mail usage, the second one is mobile usage, and the third one is termed as internal network usage.

The results of factor analysis for group collaboration technology and enterprise computing technology suggest that all assumptions for factor analysis have been met.

Factor analysis was done for three types of dynamic capabilities separately to test for constructing convergence with maximally similar sets of variables as well as to avoid violating recommended minimal sample size to parameter estimate ratios, as suggested by Kerlinger (1986). The results of theanalysis suggest that all constructs appeared valid except the organization's strategic capability scale, which contains one item with its factor loading below 0.65, which is deleted.

5.1. Construct validity and confirmatory factor analysis

This study uses partial least squares (PLS) to examine the research modelas it is suitable to deal with a larger complex model capturing attitudes and behaviors particularly in MIS research (Ringle et al., 2012) such as resource complement capability to leverage firm performance.

Following Anderson and Gerbing (1988), the analysis is performed through two levels. The first level is concerned with assessing construct validity and reliability. At the second level, the conceptual model is tested through estimating the relationships and path coefficients of the concerned constructs.

Table 2 shows the validity and reliability score of the construct. Convergent validity was tested by calculating the average variance extracted (AVE) by each factor. The convergent validity is varied as the variance for each factor is greater than the minimum recommended standard of 0.50, as suggested by Hulland (1999). Reliability is also assessed through Cronbach's alpha coefficient. Table 2 shows that all items are above 0.7 and consequently were able to meet the guidelines of Hair et al. (2010) for reliability. Reliability also is assessed through confirmatory factor analysis (CFA). By using the PLS approach cross-loading, factor loadings exhibit very high values of above 0.8 and above the common threshold value of 0.4, as suggested by Hulland (1999), which is accepted, accordingly supporting item reliability. Thus, any items are not satisfied, and this criterion is deleted. Accordingly, one item is deleted from internal network usage, and one item is deleted from mobile usage. Composite reliability for internal consistency is asserted since values for all constructs are above the suggested threshold of 0.7, as suggested by Ringle et al. (2005), as shown in Table 2.

Table 2: validity and reliability, and composite reliability

Core communication technologies (CCT)	Factor loading
Website usage ($AVE = 0.667$)	($\alpha = 0.827$)
The use of E-mail to facilitate the delivery of services is high.	0.904
The use of E-mail to receive client complaints and inquiries is high.	0.872
The use of E-mail for facilitating the business office, such as a call for meetings, inquiries, and file transfer is high.	0.905
The use of a website for facilitating the selling and buying process is high.	0.522
Mobile communication usage ($AVE = 0.88$)	($\alpha = 0.764$)
The use of mobile for facilitating receiving client complaints and inquiries is high.	0.946
The use of mobiles for facilitating sending periodic reports to clients such as balance sheet reports is high.	0.839
Internal network usage ($AVE = 1$)	($\alpha = 1$)
The use of multiple interfaces or entry points (e.g., web access) to external users is high.	1.00
Group collaboration technologies (GCT) ($AVE = 0.785$A)	($\alpha = 0.732$)
The use of instant messaging software is high.	0.921
The use of video-conferencing technologies is high.	0.849
Enterprise computing technologies (ECT) ($AVE = 0.592$)	($\alpha = 0.769$)
The use of enterprise application software is high.	0.735
The use of knowledge management is high.	0.825
The use of customer relationship management software is high.	0.703
The use of document management applications is high.	0.729
Organizational innovation ($AVE = 0.65$)	($\alpha = 0.91$)
Technical innovations based on research results are accepted.	0.801
The employees are rewarded for the new ideas that lead to improved performance.	0.836
The focus on innovation is to cut costs.	0.934
The focus on innovation is on doing a new service that differs from that offered by the competitors.	0.920
Flexibility and integration capability ($AVE = 0.684$)	($\alpha = 0.843$)
The institution has a high degree of flexibility in responding to change in the customers' demand.	0.864
The institution has a high degree of flexibility in responding to competitors' actions.	0.918
The institution has a high degree of flexibility in responding to change in the demands of business activities.	0.931
The institution has a high degree of integration between the organization processes and their trade partners process.	0,529
Organization strategic capability (AVE = 0.648)	($\alpha = 0.768$)
The institution is characterized by the ability to introduce a wide range of services more than the competitors that satisfied different customers' needs.	0.762
The institution is characterized by the ability to introduce services at a lower price.	0.903
IT planning adequately takes into account institutional goals/strategies.	0.739

Discriminant validity is assessed through two approaches. First, the indicators' cross-loading is examined, which reveals that no indicator loads higher on the opposing endogenous constructs. The second is the square-root of AVE of any construct higher than the correlations between it and all other constructs in our model. The results of the analysis indicate in all cases, the square root of AVE of each construct greater than the correlations between it and all other constructs in the model, as shown in Table 3.

5.2. Structural equation modeling, testing hypothesis

As the objective of the PLS-SEM is prediction, the primary evaluation criteria comprise the R^2 measures and the significance of the path coefficients (Hair et al., 2010). Evaluation of the prediction oriented PLS path modeling method's results for the structural model centers on the R^2 values. The R^2 values (0.28–0.44) are acceptable for this explorative study.

Good model fit is established with significant path coefficients, acceptable high R^2, and internal consistency being over 0.70 for each construct. Only flexibility and integration capability have a low value of R^2 ($R^2 = 0.264$). This means that the levels of relationship of variables in the structure have mutually influenced one another. In accordance with the structural equations, here is a weak level of relationship of enterprise computing technology ($R^2 = 0.434$). Group collaboration technology ($R^2 = 0.542$) has moderate R^2. This means that the levels of the relationship of variables in the structure have mutually influenced one another in accordance with the structural equations at a moderate level.

Table 3: Discriminant validity

		1	2	3	4	5	6	7	8
1	Enterprise computing technology usage	0.707							
2	Flexibility and integration capability	0.206	0.827						
3	Group collaborative technology usage	0.678	0.260	0.886					
4	Innovation capability	0.138	0.700	0.117	0.875				
5	Internal network usage	0.289	-0.302	0.374	-0.274	1.00			
6	Mobile usage	0.338	0.322	0.525	0.251	-0.123	0.894		
7	Organization strategic capability	-0.212	0.524	-0.207	0.533	0.001	-0.202	0.805	
8	Website usage	0.587	0.295	0.547	0.221	0.057	0.504	-0.100	0.817

Since traditional parametric tests are inappropriate in the PLS method, a bootstrapping method of sampling with replacement was used to test the hypothesis. Table 4 shows the results of the analysis. The results of the analysis indicate that website usage has a strong influence on enterprise computing technology, and internal work usage has a relation with flexibility and integration capability.

Table 4: Structural model assessment and hypothesis testing results

	Path coefficient	Mean	Standard deviation	t-value	p-value
Enterprise computing technology usage x flexibility and integration capability	0.039	-0.090	090.361	0.109	0.941
Enterprise computing technology usage x innovation capability	0.094	0.066	0.321	0.293	0.770
Enterprise computing technology usage x organization strategic capability	-0.182	-0.095	.0452	0.402	0.688
Group collaborative technology usage x flexibility and integration capability	0.323	0.426	0.489	0.660	0.510
Group collaborative technology usage x innovation capability	0.053	0.136	0.356	0.149	0.881
Group collaborative technology usage x organization strategic capability	-0.144	0.022	0.401	0.284	0.776
Internal network usage x enterprise computing technology usage	0.248	0.242	0.185	1.540	0.124
Internal network usage x flexibility and integration capability	-0.436	-0.458	0.231	1.886	0.060
Internal network usage x group collaborative technology usage	0.407	0.268	0.343	1.187	0.236
Internal network usage x innovation capability	-0.315	-0.309	0.231	1.365	0.173
Internal network usage x organization strategic capability	0.071	-0.078	0.314	0.266	0.821
Mobile usage x enterprise computing technology usage	0.128	0.113	0.239	0.761	0.104
Mobile usage x flexibility and integration capability	0.030	0.22	0.299	0.104	0.917
Mobile usage x group collaborative technology usage	0.417	0.238	0.356	1.172	0.242
Mobile usage x innovation capability	0.094	0.078	0.266	0.345	0.723
Mobile usage x organization strategic capability	-0.128	-0.05	0.320	0.401	0.689
Website usage x enterprise computing technology usage	0.479	0.505	0.177	2.707	0.007
Website usage x flexibility and integration capability	0.105	0.103	0.303	0.347	0.729
Website usage x group collaborative technology usage	0.313	0.269	0.279	0.279	0.263
Website usage x innovation capability	0.108	0.601	0.278	0.287	0.707
Website usage x organization strategic capability	0.130	0.136	0.305	0.305	0.761

6. Discussions

This paper followed the RBV and DCA in order to investigate the mechanisms through which IT resources affect selected adaptive dynamic capability and how IT resources complement each other in order to generate dynamic capability, by using a detailed model of IT resources that enable disentangling the effects of IT resources on selected dynamic capabilities that support organization adaptively. The estimation of a structural equation enables us to understand not only the general causal relationships between IT resources and dynamic capabilities but also the significant aspects which cooperate to create bank capacities leading to improvement in performance.

The findings of the study indicate that the only internal network usage affects the flexibility and integration capability, which is confirmed with the dilemma of Jin et al. (2014) that indicated that IT enables sharing capability, which affects the flexibility of the supply chain of the organization. Thus, the organization needs to create a flexible organization that can adapt to the external environment to generate competitive advantage, to build their internal network infrastructure, and to use it effectively. This will be the maximum gain from their IT investment.

Other IT resources have no impact on creating dynamic capabilities, which is contradicting some previous studies such as Heydarabadi et al. (2018), who indicated that IT resources have an impact on innovation capacity. The findings also do not match with results of Miah and Yeoh (2018), who pointed out strategic capabilities can be built through using Business Intelligence Applications. The difference

between the previous studies and this study is the comprehensive view of IT resources. However, the insignificant relationship is perhaps due to the poor IT infrastructure of Sudan that does not allow the company to grip the benefits of IT resources. Moreover, IT designers may not focus on building dynamic capabilities while adopting these systems (Chang et al., 2015). This raises the need for investigating the influence of mediating and moderating factors on creating dynamic capabilities from IT resources. Moreover, website usage has a strong influence on enterprise computing technology usage. This coincided with Azevedo et al. (2014) when ERP back systems are integrated with the online system, it will become more successful. This may be because the vendor of enterprise computing technology emphasizes the availability of basic communications technology to run ERP systems (Al-Mashari and Zairi, 2000).

6.1. Theoretical implication

The study bridges the existing gaps between theory and practice using a holistic measure of IT resources that enables overcoming some limitations of previous studies that are based on RBV: for example, the use of a single major IT usage or organization capabilities, or factors to explain how IT resources integrated with other organizational capabilities, which can lead to lack of understanding of source of competitive advantage (Božič and Cvelbar, 2016).

This paper contributes to theory and practice in the following way. First, this paper is expected to contribute to the RBV theory through a comprehensive classification of IT resources to explain how they are deployed and utilized.

The framework of the study used a comprehensive classification of IT resources, which gives details about how IT resources are utilized in IT projects to describe the relationships between IT resources and dynamic capabilities. This supports some implications of RBV of how the resource can be allocated to impact performance under a certain condition. This framework can be used in future researches to detect how a firm can create a competitive advantage.

Moreover, the results of the study contribute to IT in business-level strategy by providing a validated measurement of IT-enabled dynamic capabilities that can help scholars in the MIS domain refine the methodology and consistency of empirical examinations on the business value of IT (Drnevich and Croson, 2013).

Additionally, the study contributed to IT project management through identifying project management resources and their contribution to building dynamic capability, which can be further used in the adoption of new systems to build dynamic capabilities necessary for achieving organizational goals.

The study contributed to DCA by explaining the antecedences of dynamic capabilities and gave support to the argument that dynamic capabilities could be built from different resources.

6.2. Managerial implication

The study offers a detailed framework for measuring the level of IT usage and some adaptive dynamic capabilities. This can be useful for both the internal assessment and the evaluation of the IT service providers. In addition to that, the study also offers a tool for the Sudanese decision-makers in insurances and banking to evaluate dynamic capability in order to enable them to prioritize among their companies' gaps in dynamic capabilities compared to competitors. Thus, they can create a plan that generates a greater return on IT investment.

6.3. Limitations of the study and future research

The first limitation is the use of aggregate data which does not look at individual variations. Accordingly, using traditional statistical techniques may lead to violating the assumption of independence and could bias the results. This is known as the atomistic fallacy (Bryk and Raudenbush, 1988). The second limitation of this study is that it takes a static cross-sectional picture of capabilities. This makes it difficult to address the issue of how capabilities are created over a run of several years. A future study that focuses on "state changes" over long periods of time can add more depth to the understanding of how to create and leverage capabilities for the business value of IT (Yin and Yang, 2011).

The paper takes a snapshot of how IT resources impact dynamic capabilities neglecting the impact of the role of IT capabilities in creating dynamic capabilities and the condition under which this is achieved, as recommended by Wilden et al. (2016).

Future researchers should concentrate on how IT resources impact dynamic capabilities in Sudan due to rapid changing in technology, which may change the impact of IT resources in dynamic capabilities. This will enable Sudanese managers and IT managers to design effective strategies.

To get benefited from IT resources in building dynamic capabilities of organizations, IT designers should take into consideration how to build dynamic capabilities in the earlier stages of building these systems as proposed by Chang et al. (2015). This should be aligned with the strategies of the business. Thus, future studies should focus on how basic computing technology could be adopted for creating dynamic capabilities necessary for achieving organizational goals.

Taking the lens of DCA into consideration, building dynamic capabilities is achieved through routines that are represented by operational capabilities under ascertained conditions; thus, to have a complete picture about the driver of DCA, future research should explore the impact of IT

operation resources and the condition after these relations.

Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

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