

THE INFLUENCE OF IT CAPABILITY ON IT-BASED INNOVATION: THE MEDIATING ROLE OF ORGANIZATIONAL LEARNING CAPABILITY

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ABSTRACT: Current study aims to examine the relationship between IT capability (ITC) and IT-based Innovation (ITI), and investigate the mediation role of organizational learning capability (OLC) on ITC and ITI in the context of RBV theory among Yemeni SMEs. The present study employed four dimensions to assess ITC (IT architecture (ARC), IT infrastructure (INF), IT human resource (HR), and IT relationship resource (RR)). Also, three dimensions, namely, commitment to learning (CL), shared vision (SV), and networking (NET), were utilized to examine OLC. Data were collected from SMEs of the Yemeni food processing industry. 620 responses were returned and analyzed via SmartPLS-3 in order to validate the study model. Model measurement and structural equation modeling also were carried out to test four main hypotheses. The findings indicated that only two dimensions of ITC (ARC and RR) positively affect ITI; however INF and HR showed no significant associations with ITI. In addition, OLC dimensions mediate the relationships between all the dimensions of ITC and ITI except NET that it does not mediate HR with ITI.

Keywords: IT Capability, Organizational Learning Capability, IT-based Innovation, RBV Theory, SMEs

1. INTRODUCTION

1.1. Research Background

Organizations can attain a competitive advantage through the assistance of information technology (IT). However, numerous organizations take IT adoption slowly [1]. Thus, Roger [2] suggested that such organizations have to identify the relation of IT's perceived features and its adoption rate by organizations. Particularly, such perceived features have been established to affect the adoption level by a direct route. Yet these perceived features sole are not enough to forecast the rate of IT adoption within organizations. Therefore, Attewell [3] has stated that the adoption of complex technologies can be done by reducing knowledge barriers. Organizational learning is considered as the process which drives to the knowledge's evolution, distribution, and keeping in organizations. According to Attewell's theory, such a process will decrease knowledge barriers, and in turn, organizations will be more convinced with technology adoption.

Given these circumstances, organizations have come to the realization that they need to have technological and scientific bases in order to achieve a competitive advantage. This way, organizations will be able to solve their problems without the intervention of a third party [4]. More so, some organizations have channeled their efforts towards different development initiatives, and some of them have taken different perspectives and directions. In this light, some have focused on developing leadership capabilities and promoting the concept of strategic planning, while some other organizations have focused on the development of human resources, development of information technology and systems, reduction of operating cost, redesign processes, improvement of services, and innovation in product development. The aim of all this is to meet the demands of customers and beyond. With these, the management of organizations has also understood how important knowledge is in the construction and development of crucial capacities in individuals, organizations, and groups. As such, they are beginning to focus on development programs alongside progressive improvement in productive operations and activities. They are also channeling their efforts towards the discovery of new services and products.

Consequently, organizations have seen the need to incorporate knowledge into their operations. More so, they are also focusing on the involvement of members of the organization in the creation, development, recruitment, and investment in knowledge balance. In the same vein, the management of organizations has also realized how important it is to differentiate between external knowledge and tacit knowledge of individuals. They have also understood the importance of combining the two kinds of knowledge since the development of knowledge occurs based on the combination of the two, which has the potential of influencing the future of the organization. By combining the two kinds of knowledge, organizations can overcome the challenges and changes by taking advantage of their past experiences and present expertise. This implies that the organizations will have to adopt the ideology of the organizational learning concept. The reason why organizations will have to adopt this ideology is to ensure excellent performance of the organization. In other words, organizations are working too hard to strike a balance between excellence, the demanded upgrading, and the human desire to achieve better, and this happen only through the consecration of the concept of organizational learning and the estimation of its importance in achieving innovation [5].

On the other hand, national economies are beginning to value small and medium enterprises (SMEs) because of their strategic importance in the development of different industrial sectors globally in both developing and developed countries [6]. Thus, it can be contended that the role of SMEs in an economy is vital and cannot be underestimated as they make significant contributions to the gross domestic product. In addition to contributing to the gross domestic product of an economy, it also creates job opportunities and further develops the labor force of an economy. As a result of these critical roles, information technology has evolved, thereby changing the way organizations operate [7], as well as the strategies they have adopted in their learning processes [8]. Such organizations alongside their employees can be influenced by the combination of both learning capabilities and IT [9], which is capable of improving the IT-based innovation of the organization, and afterward enhancing its productivity [10].

1.2. Research Problem

Research has shown that the performance of SMEs can be significantly enhanced through the use of IT resources [11]. IT capabilities give SMEs many competitive advantages like the interaction of experiences and expertise, organizational functions, and the provision of vital information at the right time [12]. Findings of previous studies have revealed that the effect of IT on performance is intervened through the organization's learning capability [4, 13]. It is important to note that such information technology resources do not directly provide a competitive edge; rather, a competitive advantage is created through the use of other complementary resources that require experiential learning, time, and efforts [14].

Even though researchers have shown an increasing interest in organizational learning capability within the domain of IT use as an effective strategy for organizational performance, there is a lack of empirical studies on the relationship between organizational learning capability, IT capability and IT-based innovation in Middle Eastern countries, especially in SMEs of the Yemeni food industry.

2. LITERATURE REVIEW

2.1. The Role of Food Processing Sector in Yemen Economy

Due to changes in the global environment in terms of the control of major economies on the global market and the consequent adoption of most governments in developing countries, including Yemen, are moving towards a market economy [15]; these fluctuations give an indication of increased competition facing or will face such companies in most of their target markets, both internal or external ones [16], since organizations compete depending on quality, advanced technology and innovation, and low cost that creates competitive prices. As a result, food processing firms will be able to cope with it only through the adoption of strategies that enable them to face those challenges resulting from the increasing competition [17]. The food processing sector has considered as one of the most important sectors in the manufacturing industries in Yemen which accounts for about 44% of the entire industrial sector [18]. According to the statistics of Yemeni Ministry of Planning, such industry and its diverse groups have not only helped push the economy of Yemen in terms of gross domestic product but it is also contributing to providing numerous jobs in several positions. The importance of the food industry in Yemen due to several aspects of the most important: it depends on some of its production on the domestic raw materials and meets part of the needs of the population in Yemen. Furthermore, it also avoids the country from spending foreign exchange on the importation of food commodities, and at the same time provides the country of foreign currencies against the export of some products abroad. Further, during the period 2015-2017, the food processing sector record 40% of the overall workforces in industrial activity [19].

2.2. IT Capability (ITC)

In information systems (IS) and information technology (IT) literature, ITC has been debated by many researchers from various views. These debates have covered the notion of ITC that repeatedly relies on practitioner literature rather than academic journals. Also, ITC has been studied from different standpoints comprising power

relationships, business process transformation, work design, and coordination [8]. Nevertheless, the ITC definitions still narrowly accepted, and the agreement about to what comprises a company's ITC and how it is measured is quite limited.

Organizations contain several kinds of complicated conditions that are interlaced in a dynamic and changing environment. So, ITC can provide a competitive advantage for firms to exceed their competitors and concurrently turn into one of the critical sources for the organization. In the current century, a lot of studies dealt with this concept that led to ITC is a vital and essential resource to the organizations [20]. However, not enough attention has been consecrated toward understanding how and why these capabilities and investments impact on learning and innovation process besides firm performance.

As for using IT in the context of SMEs, a lot of current running SMEs still do not utilize IT resources strategically [8], thus, the matter of ITC is substantial in the context of SMEs in particular. In doing so, SMEs should leverage IT resources to own the capacity to decrease costs, enhance customer relationships, build up relations with suppliers, distinguish product/services, and allow innovations [21]. Further, Iyengar et al. [10] referred that these firms need to build the processes of their value-added by the means of knowledge creation and then exploit such knowledge through the intensive knowledge services, and therefore, their interest will be concentrated on how to acquire, accumulate, and integrate information.

In accordance with existing literature of ITC, some researchers [22] have defined IT capability based on its managerial capabilities while others [23] have defined based on technological skills. In this study, the researcher will consider the definition that presented by Zhang [8], as it includes a combination of definitions of IT capability concept in which IT capability is described as "a firm's ability to acquire, deploy, and leverage its IT investment in combination with other resources and capabilities as well as to support and enhance its distinctive competencies and skills in other business functions in order to achieve business objectives through IT implementations".

Thus, IT capability is seen in this study as a multidimensional construct. In analyzing existing IT literature, nine models of IT capability were recognized which have dimensions that underpin the IT capability construct. Through these models, the resultant dimensions that were derived and synthesized are IT architecture, IT infrastructure, IT human resource, and IT relationship resource. IT Architecture refers to the degree to which a firm can effectively select and deploy its corporate IT resources. IT Infrastructure refers to the extent to which data and applications through communication networks can be shared and accessed for organizational use. IT Human Resource refers to the level of IT staff's technical skills, business understanding, and problem-solving orientation. IT Relationship Resource refers to the level of trust and mutual respect, the willingness of sharing risk and responsibility.

2.3. Organizational Learning Capability (OLC)

Referring to the existing literature, organizational learning capability can be considered as a closely related concept with organizational learning [7], [24]. Gomez et al. [20] defined organizational learning capability as an

organizational capability with the possibility to create effectual organizational learning through managing and directing the organizational learning process. Organizational learning capability consists of the characteristics that form the organizational learning process. Further, it can be defined as the firm's capacity series and an organizational action patterns that permit it to address the knowledge and experience, evolve new knowledge based on existing knowledge and experience, and finally, store the knowledge to use it when needed. Therefore, the capabilities of organizational learning can be stored in multiple action patterns, such as architectural properties, policies, and practices, which enable the firm to learn and then utilize what it has learned [7].

Some researchers have treated both concepts in their studies. For example, DiBella et al. [25] mentioned that organizational learning can be boosted by being constructed on the existing capabilities or recently-developed capabilities. While Yeung et al. [26] have pointed out that organizational learning capability is the potentiality to generate and popularize thoughts effectively by means of the organization's specified management practices and initiatives. In sum, the organizational learning capability is formed of three organizational activity patterns: 1- Producing (realizing, exploring, discovering or purchasing the ideas), 2- Generalizing (sharing the ideas within organizations), 3- Identifying the learning barriers (discovering and solving the problems or difficulties which restrain producing and generalizing) [7]. The study of Hsu [27] proposed that only one feature of the capability has been underlined during the time that previous studies have determined the organizational learning capability notion in two sides which are the capability to incorporate or adopt and capability to transfer. According to Watad [28], the capability to incorporate is aimed to use and evaluate the external knowledge; it asserts the external components of the capability. In contrast, as for Garud and Nayyar, the capability to transfer asserts the internal components of the capability; it refers to the capacity to choosing technology, developing the chosen technologies over time, and combine those technologies with technology development efforts and restore them [24]. Referring to previous studies, Hsu [27] describes the organizational learning capability as the ability to combine and transfer the new knowledge, and using this knowledge in the process of new product development for the competitive advantage and high level of production ratio. Argyris and Schon stated that organizational learning happens through detecting and correcting failure in the behavioral theory effective in the organization, reacting to the changes in the internal and external environment, and recording the new acquisitions on the organizational memory [20].

In this study, three dimensions (commitment to learning, shared vision, and networking) are employed in activating the construct of organizational learning capability in this research. Commitment to learning refers to the values placed on learning activities within an organization and the extent to which these values are viewed as axiomatic for the firm. Shared vision refers to a destination towards which everybody in the organization strives. It is a public comprehension of where and what the organization and its individuals want to go on doing and become. Networking refers to intra-organizational knowledge sharing that

means to what extent there are collective beliefs or behavioral routines related to the spread of learning among different units within an organization [29].

2.4. IT-based Innovation (ITI)

A considerable step in the revolution of information technology has viewed over the last two decades. The evolution in information technology has converted the way business is managed. One of the extraordinary aims of information technology is innovation. Indeed, information technology has considered as the main impetus for product, service, and process innovation besides presented forward capacities that formerly were just viewed as fiction novel material.

Rogers [2], defined innovation as an idea, application, or entity that is recognized as new by an individual or another part of adoption. Also, Harkema [30] defined innovation as the knowledge process that permits the creation, sharing, and assimilation of new information at a specific context. Concurrently, innovation can be understood as IT-based if it involves a significant integration of IT applications [28]. Thus, organizations need to analyze the opportunities and challenges new technology offers and apply them to the specific context of the organization. However, it is likely that organizational groups may have different views on the impact of the new technology and how the organization should respond to it [21].

Actually, instituting IT-based innovations is a complicated process that has the possibility to completely change organizational processes. Several studies [28], [31] have visualized IT-based innovations as complex design and decision process by which exterior thoughts and knowledge about complex information technology are appropriated alongside localized, particular context of the organizational knowledge, so as to develop particular solutions of the organization. Appropriation refers to the unloading of supplied innovations and their reconfiguration to correspond the particular context and requests of the adopting organization [32]. In fact, IT-based innovations are not seen as technological artifacts' implementation (i.e. hardware or software), yet as thoughts and knowledge integration which supporting such technology [31]. Coombs et al. [33] have discussed that knowledge in IT-based innovations context is supposed to be socially built, as in explanations and meaning around complex information technology emerge and influence the development and interplay with it.

In this study, Database Management System (DBMS) is considered as a system food processing firms use to facilitate innovation within them due to the most such firms, if not all, utilize one of the DBMS types [19]. DBMS is a type of knowledge management system which provides active storage and retrieval of data. Therefore, DBMS can be defined as an IT application that allows interaction with the user, the database itself, and other applications to acquire, analyze, store, and retrieve information. So, DBMS is designed to define, create, query, update, and manage organization databases [28], and it can exist in several types such as IBM DB2, Microsoft SQL Server, PostgreSQL, Microsoft Access, MySQL, Oracle, Sybase, and MemSQL.

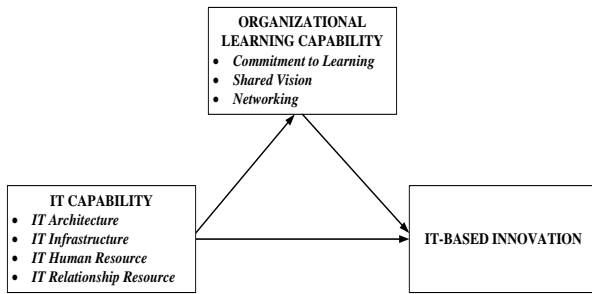


Figure 1: Theoretical Model

2.5. Development of Hypotheses

Based on the theoretical framework and previous reviews on the literature of the study, research hypotheses are developed in this section.

2.5.1. IT Capability and IT-Based Innovation

Researchers have highlighted the influence of the resource-based view of a firm on the capabilities of an organization [4]. The proponents of this view contend that superior performance and innovation are influenced by the bundles of costly-to-imitate resources possessed by firms [20]. While it is easy for the resources of a firm to be copied by rivals, it is more difficult for the capabilities to be copied because they are closely connected with a firm's culture, history, and experience. Recently, researchers in the area of IS have focused on the role which IT plays in facilitating a superior IT-based innovation and business performance [22]. Due to the increased emphasis on the strategic role of IT in contemporary organizations, it is important to have an in-depth understanding of the factors that influence the IT capability of a firm. However, the constituents of a firm's IT capability are yet to be fully understood, and how they can be measured [7].

According to Zhang [8], the adoption and application of IT in organizational processes can facilitate the attainment of a process-based innovation. Similarly, Choe [34] noted that the competitive applications of knowledge management are influenced by IT infrastructure that is also supported by the strategic alignment of IS. More so, recent research in the area of IS has changed focus to the role of IT capability in enhancing greater IT-based innovation and business performance. Therefore, for the purpose of facilitation, IT capabilities might be incorporated into organizational processes. This will be qualified as incremental or accumulative interference that does not promote great developments, though in different cases it might be introduced as a thorough or radical interference that facilitates structural change in organizational processes. By and large, there is no united theory that explains the adoption of IT-based innovation. The majority of researchers have argued that the adoption and diffusion of innovation must be considered within the context of its presentation [35].

In addition, IT capability is particularly relevant in the context of SMEs, regardless of the fact that the majority of existing SMEs do not employ the strategic use of IT resources because of limited resources in terms of IT infrastructure, funding, and human IT skills [6]. Nevertheless, in an event that such firms are able to effectively use IT resources, it will enhance cost reduction, improvement of customer service, creation of links with suppliers, and development of unique products and IT-based innovations [21]. Thus, it can be argued that:

H1.a: IT architecture has a significant effect on IT-based innovation.

H1.b: IT infrastructure has a significant effect on IT-based innovation.

H1.c: IT human resource has a significant effect on IT-based innovation.

H1.d: IT relationship resource has a significant effect on IT-based innovation.

2.5.2. Mediating Role of Organizational Learning Capability

With accordance to Robey et al. [36], the dual and mutual feature of the link between information technology and organizational learning that information technology's usage, on the one hand, promotes the learning processes and expands the organizational learning capability. However, on the other hand, organizational learning supports the new IT's adoption and implementation in the organization. Whilst, other studies have stated that the effect of IT on performance is intervened through the learning capability [11], [13] and such IT does not create a competitive advantage in itself, however through utilizing other complementary resources [14].

Researchers also have found that the correlation between the learning environment and company innovation is strong, and as a result of this finding, researchers have become more interested in investigating the relationship [2]. Innovation is considered by many researchers as a learning process [36]. Thus, innovation can be regarded as an individual and a collective learning process that facilitates the identification of new problem-solving techniques. Furthermore, there is a relationship between the innovation and learning capability of an organization, which is supportive of the creation, distribution, and use of knowledge by an organization. Also, findings of previous studies on IT-based innovations have revealed that most of the knowledge required for the integration of new IT is determined by a human being, rather than systematized in a disembodied manner [32]. Scarbrough [37] also indicated that professionals working in organizations or the so-called "knowledge workers" have discussed the importance of human beings in knowledge maintenance.

Innovation, on the other hand, depends on the knowledge platform that is owned and created through organizational learning [28]. Therefore, organizational learning is a crucial factor that must be considered by firms that aim at developing new products or markets in terms of the need to keep innovating so as to survive extreme rivalry [38]. In this light, Fichman et al. [35] highlighted the importance of encouraging the evolution of elements that empower and add value to innovation, with the aim of empowering for the introduction of new ideas, products, systems, and services in the midst of competition. Through organizational learning, innovativeness is facilitated, new knowledge is acquired, ideas are conceived, while the possibility of understanding and apply them is augmented. Also, organizational learning is supportive of organizational knowledge that is combined with culture with the aim of shaping the foundation for innovation orientation [12].

Due to this fact, researchers have argued that a higher level of innovative orientation and activities can be obtained with high levels of commitment to learning [7]. Similarly, it has been argued by Ma'atoofti and Tajeddini [39] that commitment to innovation and the ability to use

IT innovations can be driven by a commitment to learning. Findings of a study carried out by Lopez et al. [40] have also shown that new knowledge and intuitions can be generated when human resources are developed.

Likewise, the formal process of planning in an organization supports the process of sharing in the vision of the firm, thereby driving people towards a common goal. It has been argued by Senge [29] that the benefits of planning surpass just the strategies and objectives that can be derived from formal planning, but also includes the learning which occurs in the whole process of planning. More so, by means of formal planning, an organization is able to acquire and share the knowledge that is capable of increasing the innovation and strategic applications in the organization [8].

The importance of IT-based knowledge management systems has been highlighted by researchers,, who consider them as an effective way of sharing knowledge among staff [35]. Similarly, IT-based innovations are influenced by internal networks because the sharing of intra-organizational knowledge goes beyond the acquisition of information from different sources, rather it also involves systematic reconsideration and construction of information. So, lessons and experience should be shared among the divisions of an organization, and also stored in the memory of the organization [37]. More so, through the sharing of organizational knowledge, social interaction is promoted, thereby resulting in trust and reciprocity that are enabling factors of knowledge sharing. Thus, it is argued that:

H2: Commitment to learning positively has a significant effect on the mediating relationship between IT capability dimensions (IT architecture, IT infrastructure, IT human resource, and IT relationship resource) and IT-based innovation.

H3: Shared vision has a significant effect on the mediating relationship between IT capability dimensions (IT architecture, IT infrastructure, IT human resource and IT relationship resource) and IT-based innovation.

H4: Networking has a significant effect on the mediating relationship between IT capability dimensions (IT architecture, IT infrastructure, IT human resource, and IT relationship resource) and IT-based innovation.

3. METHODOLOGY

For the sake of this research, this study is based on quantitative paradigms and survey-based methodology was considered by using a simple random sample method. The population of the study is SMEs of the food processing sector in Yemen where the concentration was on firms that are presently members of the federation of Yemen chambers of commerce and industry which amounting to 1826 firms [19]. The sample size of this study was 318 according to Krejcie and Morgan's formula

for determining the needed sample size. The unit of analysis in this study is the organization. Thus, a closed-ended survey was distributed in order to acquire the information required for empirical purposes and to achieve the objective of the study. The 5-point Likert scale was used in the questionnaire to examine how strongly a respondent agrees or disagrees with a statement. 620 responses were collected. 16 questionnaires were excluded for the inefficiency of statistical analysis and 27 cases of outliers and 16 were eliminated from the data set leaving a final 577 cases.

The outer model is affirmed and afterward, the examination structural model of the study is tried. For this progression, a few tests are carried out to assess preparatory presumption to operate SEM. These tests comprise normality testing, outlier, and Multicollinearity problem. Also, the Average Variance Extracted (AVE), Cronbach's Alpha, and Composite Reliability (CR) for the measures are additionally calculated to examine to what extent the suggested measurement model is reliable. Moreover, AVE and factor loadings are employed to test the convergent and discriminant validity of the measurement model as AVE shows the general amount of variation caught via the construct. In general, factor loadings are acceptable at a value greater than 0.5. In the same way, to test the convergent validity for a construct, the value of AVE has to exceed 0.5 [41]. To test the discriminant validity, the assessment criterion of Fornell and Larcker is utilized as well and consequently, for any two constructs, the squared root of the AVE for each latent construct ought to be greater than the correlations amidst the two related constructs. Structural equation modeling (SEM) was used by SmartPLS V-3.0 in data analysis via a dual-phase method. SEM is known as casual modeling on the grounds that it tests the proposed casual relations. It assists to define the acceptability of the suggested model by testing the study's hypotheses.

4. RESULTS

4.1. Measurement Model Assessment

The measurement model specifies how each construct is measured, the measures that will be assessed by performing a goodness of fit test [42], and also problems of reliability and validity for all constructs used. To validate the study model, the goodness of fit test was conducted by using SmartPLS 3 and the results show that SRMR was 0.07, whereby values less than 0.08 are considered a good fit. For all items of the study constructs, the outer loading and cross-loadings were examined to notice any problem before conducting convergent validity. As referred by Hair et al. [42], factor loadings greater than 0.50 are considered to be very significant (See Table 1).

Table 1: Constructs Reliability and Validity

Construct	Item	Loading	($\alpha > 0.7$)	(CR > 0.7)	AVE
IT Architecture	ARC1	0.764	0.736	0.835	0.559
	ARC2	0.728			
	ARC4	0.804			
	ARC5	0.690			
IT Infrastructure	INF2	0.739	0.716	0.818	0.530
	INF3	0.665			
	INF5	0.743			
	INF6	0.761			
IT Human Resource	HR2	0.683	0.748	0.800	0.500
	HR3	0.699			
	HR4	0.728			
	HR5	0.719			
IT Relationship Resource	RR1	0.846	0.772	0.890	0.668
	RR2	0.822			
	RR3	0.741			
	RR5	0.857			
Commitment to Learning	CL1	0.841	0.756	0.870	0.573
	CL2	0.718			
	CL3	0.758			
	CL4	0.647			
	CL5	0.808			
Shared Vision	SV1	0.656	0.715	0.803	0.506
	SV2	0.727			
	SV3	0.785			
	SV4	0.671			
Networking	NET1	0.692	0.718	0.810	0.515
	NET2	0.753			
	NET3	0.739			
	NET4	0.687			
IT-based Innovation	ITI_C1	0.730	0.701	0.894	0.516
	ITI_C2	0.714			
	ITI_C3	0.612			
	ITI_X2	0.775			
	ITI_X4	0.668			
	ITI_R1	0.749			
	ITI_R3	0.797			
	ITI_R4	0.681			

On the other hand, discriminant validity is achieved by conducting the Fornell-Larcker criterion. In Table 2, the bolded values explain the AVEs' square root, for each construct, which has higher values than the correlations between constructs (corresponding column and row values). With these, the constructs are strongly linked to their respective items compared to other constructs of the model, then proposing satisfactory discriminant validity [42]. More so, Awang [43] has stated that the correlations between exogenous constructs have to be less than 0.85. The findings of the assessment of the measurement model have revealed that the model has achieved acceptable levels of constructs reliability and validity, which permit

1.1. Structural Model Assessment

After the measurement model assessment, the second phase of SEM analysis is the structural model assessment. In this way, with accordance to Hair et al [42], the structural model should be assessed through considering the values of each of the beta (β), the effect sizes (f^2), the predictive relevance (Q^2), the coefficient of determination

the researcher to move to the subsequent phase and evaluate the structural model.

Table 2: Fornell-Larcker Criterion

	1	2	3	4	5	6	7	8
1ARC	0.75							
2HR	0.55	0.71						
3INF	0.69	0.55	0.73					
4ITI	0.62	0.48	0.57	0.72				
5RR	0.67	0.62	0.67	0.62	0.82			
6CL	0.65	0.59	0.60	0.64	0.68	0.76		
7NET	0.63	0.46	0.59	0.59	0.62	0.61	0.72	
8SV	0.58	0.51	0.56	0.61	0.65	0.68	0.63	0.71

(R^2) and the corresponding t-values by a bootstrapping tool. Therefore, to assess the structural model hypothesis testing, all the conditions mentioned above were tested.

1.1.1. Direct Hypotheses Testing

As shown in Table 3, with regards to ITI, it was found that ARC and RR are significantly predicting ITI. Therefore, H1.a and H1.d are accepted. However, the remaining two hypotheses (H1.b & H1.c) are rejected.

Table 3: Structural Path Analysis Results

	Path	β	SD	T-Value	P-Value	Decision
H1.a	ARC → ITI	0.174	0.052	3.365	0.001	Supported
H1.b	INF → ITI	0.063	0.053	1.198	0.231	Not Supported
H1.c	HR → ITI	-0.004	0.045	0.083	0.934	Not Supported
H1.d	RR → ITI	0.132	0.058	2.283	0.023	Supported

1.1.2. Mediation Assessment

By using the bootstrapping analysis, Table 4 provides the mediation results and indicating that CL and SV mediate the relationship between (ARC, INF, HR & RR) and ITI. Hence, H2.a, H2.b, H2.c, H2.d, H3.a, H3.b, H3.c & H3.d are accepted. Likewise, the findings indicate that NET also mediates the relationship between (ARC, INF & RR) and ITI except for HR in which NET does not mediate the relationship between HR and ITI. Hence, H4.a, H4.b & H4.d are accepted. However, the remaining hypothesis H4.c is rejected.

Table 4: Mediation Analysis Result

	Path	β	SD	T-Value	P-Value	Decision
H2.a	ARC→CL→ITI	0.051	0.017	3.006	0.003	Supported
H2.b	INF→CL→ITI	0.023	0.01	2.195	0.028	Supported
H2.c	HR→CL→ITI	0.039	0.013	3.04	0.002	Supported
H2.d	RR→CL→ITI	0.062	0.018	3.53	0.000	Supported
H3.a	ARC→SV→ITI	0.028	0.012	2.428	0.015	Supported
H3.b	INF→SV→ITI	0.021	0.009	2.313	0.021	Supported
H3.c	HR→SV→ITI	0.018	0.008	2.267	0.024	Supported
H3.d	RR→SV→ITI	0.059	0.016	3.628	0.000	Supported
H4.a	ARC→NET→ITI	0.046	0.016	2.915	0.004	Supported
H4.b	INF→NET→ITI	0.025	0.009	2.778	0.006	Supported
H4.c	HR→NET→ITI	0.001	0.007	0.151	0.880	Not Supported
H4.d	RR→NET→ITI	0.043	0.014	3.148	0.002	Supported

2. DISCUSSION AND CONCLUSION

The findings of this study revealed strong support for the proposed model. In this way, ARC and RR were found to impact ITI which were significantly confirmed. These impacts are supported by previous studies [8], [20]. Specifically, the study of Chen et al. [22] found that ARC greatly affects the innovation of a firm. Mauerhoefer et al. [38] also found that RR which called IT proactive stance (RR) significantly influenced knowledge management IT tools. With these, the more SMEs in Yemeni food processing sector think that ARC and RR contribute to a better consistency of IT policies throughout the enterprise, support IT and business managers to consult with each other in their decisions, restructure IT work processes to leverage opportunities, enhance the relationship between line management and IT groups in setting business and IT strategy, and maintain mutual respect and close relationship between IT department and line management, the more their ITI enables employees to accomplish tasks more quickly, and improve their performance and effectiveness at work, fits with all aspects of work and adapts well with their work style and the way they like to work, and facilitates in understanding how it works through the database system, as well as to make the database system easy to learn and use.

Surprisingly, this study found that INF and HR do not influence directly ITI among SMEs of the Yemeni food processing sector. This finding contradicts the result of previous studies [8], [21], [38] which examined IT business spanning capability (HR) and found that it significantly affects knowledge management IT tools. This result may be due to Yemeni SMEs, in general, suffer several barriers in relating a lack of technology platform, staff training and the quality of vocational training, inconsiderable digital skills, and the difficulty of finding skilled employees, as well as deterioration in the skillset of graduates [44]. Such reasons may make Yemeni SMEs face an awkwardness to get a reliable infrastructure as well as skilled and trained staff.

In the present study, more so, OLC dimensions (CL, SV, and NET) are found to mediate the relationships between ITC dimensions and ITI by SMEs of the Yemeni food processing sector. Moreover, OLC dimensions are found to mediate the relationships between (ARC, INF, and RR) and ITI. These findings highlight the importance of ensuring the ARC, INF, and RR associated with the output of ITI. ARC, INF, and RR have indirect effects on ITI via OLC dimensions. In addition, OLC dimensions (CL and SV) are found to mediate the relationship between HR and ITI. This finding highlights the importance of ensuring HR associated with the output of ITI. HR has an indirect effect on ITI via CL and SV; however, NET does not mediate the relationship between HR and ITI. In sum, concerning ARC and RR, OLC dimensions (CL, SV, and NET) partially mediate the relationships between (ARC and RR) and ITI. In regards to INF, OLC dimensions (CL, SV, and NET) fully mediate the relationships between INF and ITI. Finally, in connection with HR, CL and SV fully mediate the relationships between HR and ITI.

2.1. Theoretical and Practical Implication and Further Direction

One of the aims of the present study is to examine and validate the proposed model of three distinct topics in strategic management and IS literature ITC, OLC, and ITI based on RBV. The deep explanations of the findings define the study contributions which are of interest to academics and practitioners alike. These ones have featured from the hypothesis testing. Providing a holistic view of the core elements that affect IT-based innovation, in light of IT-based innovation can be counted as one of the novelties of this study. The current study likewise contributes to the existent body of knowledge by testing the mediation effect of OLC dimensions (CL, SV, and NET) on the relationship between of ITC dimensions (ARC, INF, HR, and RR) on ITI among SMEs of Yemeni food processing sector. Further, the variance explained by the proposed model of the current study for the ITI (53%) and attained a suitable level of explanatory power for ITI according to Hair et al., [42].

Practically, the results of this study can be applied as a guide in the firms of the food processing industry for policymakers who want to increase the efficacy of their' performance. In the present study, the proof is provided about the critical role of ITC, OLC, and ITI. This study suggests that executives should avoid perceiving technology capabilities as a commodity, but rather be aggressively engaged in understanding the important role of OLC within SMEs among the food processing sector and how these resources can be developed and integrated

with each other to influence the higher-order learning outcomes. With the context of SMEs, the benefits of this study can be enjoyed by SMEs in the Yemeni food processing sector and the nation at large. When the use of new IT is employed as a complement for OLC, ITI and the development of new products can be positively influenced, and this influence will be reflected in the improved performance of SMEs of the food processing industry and other sectors in Yemen.

Lastly, in spite of the fact that the exact findings of this investigation are boosted greatly in the proposed model, three constraints should be taken into account. Firstly, the accuracy of the results of this study depends on the extent of the cooperation of the study sample. It is also recognized that relying on questionnaires may involve a degree of personal prejudice and the lack of credible response from some people involved in the study sample. Secondly, the research design was cross-sectional; therefore the assessment of all the inserted variables was at a single point in time. Thirdly, with regards to the generalizability of the findings, the targeted sampling of this study includes SMEs of the Yemeni food processing sector only.

REFERENCES

- [1] Wong, K. and Lee, M., "Exploring the dimensions of IT-based Organizational Learning Ability," *Proceedings of the Association for Information Systems 1999 Americas Conference*, Milwaukee, Wisconsin, USA. 489-49(1999).
- [2] Rogers, E., "Diffusion of Innovations," 4th Ed. *Simon and Schuster*, (2010).
- [3] Attewell, P., "Technology Diffusion and Organizational Learning: The Case of Business Computing," *Organization Science*, **3**(1): 1-19(1992).
- [4] Real, J., Leal, A. and Roldán, J., "Information technology as a determinant of organizational learning and technological distinctive competencies," *Industrial Marketing Management*, **35**(4): 505-521(2006).
- [5] Jallad, A., "Business Innovation: The Importance of Benchmarking and Intellectual Capital Management in the Middle East," *Working Paper - the 6th International Benchmarking Conference*, Dubai - UAE. 96-109(2012).
- [6] Abdullah, A., Thomas B., Murphy L., and Plant E., "An investigation of the benefits and barriers of e-business adoption activities in Yemeni SME," *Strategic Change*, **27**(3): 195-208(2018).
- [7] Kiziloglu, M., "The Effect of Organizational Learning on Firm Innovation Capability: An Investigation in the Banking Sector," *Global Business and Management Research*, **7**(3): 17-33(2015).
- [8] Zhang, M., "Information Technology Capability, Organizational Culture, and Export Performance," *Doctoral Dissertation*, Washington State University. Pullman, WA, United States, (2005).
- [9] Canessa-Terrazas, E., Morales-Flores, F., and Maldifassi-Pohlhammer, J., "The impact of IT-enhanced organizational learning on performance: evidence from Chile," *Revista Facultad de Ingeniería Universidad de Antioquia*, **82**: 60-67(2017).
- [10] Iyengar, K., Sweeney, J. and Montealegre, R., "Information Technology Use as a Learning Mechanism: The Impact of IT Use on Knowledge Transfer Effectiveness, Absorptive Capacity, and Franchisee Performance," *MIS Quarterly*, **39**(3): 615-641(2015).
- [11] Hassan, N., Arshad, N., Mustapha, E., and Jaafar, J., "Understanding the ways organizational learning drives IT infrastructure," *International Conference on Computer and Information Sciences (ICCOINS)*, 1-5(2014).
- [12] Gomes, G. & Wojahn, R., "Organizational learning capability, innovation and performance: study in small and medium-sized enterprises (SMEs)," *Technology Management*, **52**: 163-175(2017).
- [13] Masa'deh, R., "The Impact of Information Technology Infrastructure Flexibility on Firm Performance: An Empirical Study of Jordanian Public Shareholding Firms," *Jordan Journal of Business Administration*, **9**(1): 204-223(2013).
- [14] Powell, T. and Dent-Micallef, A., "Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources," *Strategic Management Journal*, **18**(5): 375-405(1997).
- [15] Al-Sabbry, M., "Development of Manufacturing in Yemen, Background paper prepared for the Study," *World Bank Office in Sana'a, Yemen*, (2011).
- [16] Jandab, A., "The Effect of Innovative and Proactive Strategic Orientations on New Product Development and Marketing Performance: An Applied Study on Food Processing Firms in Yemen," *Master Thesis*, Middle East University, Jordan, (2013).
- [17] Aklan, M., "The Impact of New Products Development policy to Raise the Share of Marketing for Industrial Enterprises in Yemeni Private Sector: Empirical study on some companies in the period: 2003-2005," *Doctoral Thesis*, Al-Neelain University, Sudan, (2006).
- [18] YCSO, "The Industrial Survey 2016 Update," *Central Statistical Organization*, Yemen, (2017).
- [19] MITY, "Comprehensive Industrial Survey," *Ministry of Industry and Trade in Yemen, Internal Trade Sector*, Sana'a, Yemen, (2018).
- [20] Gomez, P., Lorente, J. and Cabrera, R., "Organizational Learning Capability: A Proposal of Measurement," *Journal of Business Research*, **58**(6): 715-725(2005).
- [21] Kyobe, M., "Investigating the strategic utilization of IT resources in the Small and Medium-sized firms of the Eastern free state province," *International Small Business Journal*, **22**(2): 131-58(2004).
- [22] Chen, Y., Wang, Y., Nevo, S., Jin, J., Wang, L. and Chow, W., "IT capability and organizational performance: the roles of business process agility and environmental factors," *European Journal of Information Systems*, **23**(3): 326-342(2013).
- [23] Byrd, T. and Turner, D., "Measuring the Flexibility of Information Technology Infrastructure: Exploratory Analysis of a Construct," *Journal of Management Information Systems*, **17**(1): 167-208(2000).
- [24] Uğurlu, Ö. Y., and Kurt, M., "The Impact of Organizational Learning Capability on Product Innovation Performance: Evidence from the Turkish Manufacturing Sector," *Emerging Markets Journal*, **6**(1): 70-84(2016).

- [25] DiBella, A. & Nevis, E., "How Organizations Learn: An Integrated Strategy for Building Learning Capability," *California: Jossey-Bass Publishers*, (1998).
- [26] Yeung, A., Ulrich, D., Nason, S. and Glinow, M., "Organizational Learning Capability," *New York: Oxford University Press*, (1999).
- [27] Hsu, S., "Effects of Organization Culture, Organizational Learning and IT Strategy on Knowledge Management and Performance," *The Journal of International Management Studies*, **9**(1): 50-58(2014).
- [28] Watad, M., "The organizational dynamics of knowledge and IT-enabled innovations," *Journal of Technology Research*, **2**: 187-205(2011).
- [29] Senge, P., "The Fifth Discipline: The Art & Practice of the Learning Organization," *Random House Australia Pty Ltd, Australia*, (1990).
- [30] Harkema, S., "A complex adaptive perspective on learning within innovation projects," *The Learning Organization*, **10**(6): 340-346(2003).
- [31] Ravarini, A., "Information Technology Capability within Small-Medium Enterprises," *Doctoral Dissertation*, Edith Cowan University, Australia, (2010).
- [32] Tribiahn, J., "Managing Knowledge in IT-Based Innovation: The Case of Business-to-Business Electronic Commerce Implementation," *PhD Thesis*, University of Warwick, (2002).
- [33] Coombs, R., Knights, D., and Willmott, H., "Culture, Control and Competition: Towards a Conceptual Framework for the Study of Information Technology in Organizations," *Organization Studies*, **13**(1): 51-72(1992).
- [34] Choe, J., "The Construction of an IT Infrastructure for Knowledge Management," *Asian Academy of Management Journal*, **21**(1): 137-159(2016).
- [35] Fichman, R., Dos S. B. and Zheng, Z., "Digital innovation as a fundamental and powerful concept in the information Systems curriculum," *MIS quarterly*, **38**(2): 329-353(2014).
- [36] Robey, D., Boudreau, M. and Rose, G., "Information Technology and Organizational Learning: A review and Assessment of Research," *Accounting Management and Information Technologies*, **10**(1): 125-155(2000).
- [37] Scarbrough, H. "Linking Strategy and IT-based Innovation: The Importance of the Management of Expertise," In R. D. Galliers & W. R. J. Baets (eds.), *Information Technology and Organizational Transformation* (pp. 19-36). *Chichester: John Wiley & Sons*, (1999).
- [38] Mauerhoefer, T., Strese, S. and Brettel, M., "The Impact of Information Technology on New Product Development Performance," *Journal of Product Innovation Management*, **34**(6): 719-738(2017).
- [39] Ma'atoofi, A. and Tajeddini, K., "The Effect of Entrepreneurship Orientation on Learning Orientation and Innovation: A Study of Small-Sized Business Firms in Iran," *International Journal of Trade, Economics & Finance*, **1**(3): 254-260(2010).
- [40] Lopez, S., Peon, J. and Ordas, C., "Human Resource Practices, Organizational Learning and Business Performance," *Human Resource Development International*, **8**(2): 147-164(2005).
- [41] Hamid, M., Sami, W. and Sidek, M., "Discriminant Validity Assessment: Use of Fornell & Larcker criterion versus HTMT Criterion," *Journal of Physics: Conference Series* 890 012163, (2017).
- [42] Hair, J., Hult, G., Ringle, C. and Sarstedt, M., "A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)," 2nd Ed. *London: Thousand Oaks: SAGE*, (2017).
- [43] Awang, Z., "Structural Equation Modeling Using AMOS," Shah Alam, Malaysia: *University Teknologi MARA Publication Center*, (2014).
- [44] World Economic Forum, "The Global Competitiveness Report 2018," *Geneva*. (2018).