

The role of Social Capital and Collaborative Knowledge Creation in Achieving E-business Innovation: An Empirical Study

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Abstract—The present study aims to examine empirically the interrelationship and impact of social capital and collaborative knowledge creation on e-business innovation. A questionnaire was developed to collect data from manufacturing firms with a sample of 112 respondents. The results reveal a significant impact of social capital on collaborative knowledge creation and achieving e-business innovation. The findings also reveal a direct impact of collaborative knowledge creation on e-business innovations. The present empirical study contributes to a better understanding of the influencing factors of e-business innovations in today's business organizations. This study also provides insights into the interrelationship among social capital, collaborative knowledge creation, and e-business adoption and use.

Keywords-social capital; collaborative knowledge creation; e-business innovation

I. INTRODUCTION

More than ever before, innovation is considered as a necessity for all firms in the new economy due to the ever-growing and fiercely competitive environment [1][2]. With the advent of the knowledge economy, intangible assets have become the main source of competitive advantage. At the same time, advances in e-business technologies are presenting new opportunities to business organizations and entrepreneurs to innovatively rethink and reshape their business strategy. The intangible assets represent the main origin of knowledge, which comes from workforce and firm's relationship with stakeholders [3].

A major part of intangible assets is embodied in the intellectual capital. Prior research conceptualizes intellectual capital as the sum of all knowledge and knowing capabilities that can be utilized to give a company competitive advantage [3]-[5]. The scholars have increasingly focused on the importance of social capital as a major dimension of intellectual capital and an important topic in knowledge management [6]. Social capital, as an approach to understand how people interact with their environment, is increasingly regarded as a vital predictor of innovation. Many previous

studies [7]-[12] confirmed the association between social capital and e-business applications.

Social capital is considered as the new approach, which explains the success of innovation [13]. The previous research [14]-[17] emphasized that the organizations are not an isolated entity, but is embedded in a social context, where organizations consistently use their social environment networks to get ideas and gather information and learn to support the process of recognition and develop new entrepreneurial innovations. The previous studies confirmed that social capital plays a pivotal role in the way in which e-business models are perceived, implemented and evaluated. Social capital has been defined as resources embedded in social relationships and networks among individuals, communities, or society, which can be mobilized when an actor wishes to increase likelihood of success in a purposive action [3].

Business attained the perception in which, intangible assets have been recognized as the most important sources of innovation and entrepreneurship [10][14]. The intangible assets are the main origin of knowledge which comes from workforce and firm's relationship with stakeholders [18]. Whilst social capital and collaborative knowledge creation are accepted as significant contributors to sustain competitive advantage, there is limited empirical evidence, investigating the interactive relationship between these constructs and e-business innovation. Furthermore, while the strategic values of knowledge creation practices are clear, most firms are not able to comprehend how these elements can be integrated to enhance their e-business innovation [5]. These social and collaborative capabilities are interesting concepts to perceive how they are related and contribute to establishing e-business innovation. Therefore, the present study aims to examine empirically the interrelationship and impact of social capital and collaborative knowledge creation on e-business innovation.

The rest of this paper is organized as follows. Section II reviews related literature. Then, we propose the research model and hypotheses in Section III. Section IV reports instrument development and data collection and presents the results followed by a discussion of these results, conclusion, limitations and future work of research in section V.

II. LITERATURE REVIEW

Social capital can be defined as resources embedded in social relationships and networks among individuals, communities, or society, which can be mobilized when an actor wishes to increase likelihood of success in a purposive action [8]. Another definition of social capital introduces it as the combined value of the relationship with customers, suppliers, industry association and other business partners, representing the potential an organization possesses as a result of external intangibles [12]. Léger [9] confirmed that social capital represents the portion of a company's market value that is attributable to its portfolios of business relationships.

Ghane and Akhavan [11] showed how certain values collectively held in a society can be a kind of social capital that benefits the society as a whole, even in the absence of specific links between individual members of that society. Common values and a shared vision, the major manifestations of the cognitive dimension of social capital, may also encourage the development of trusting relationships [8]. A trusting relationship between two parties implies that common goals and values have brought and kept them together [11].

Although individual causal relationships are relatively easier to understand, studies indicate that humans have considerable difficulty in deducing the collective impact of multiple interrelated causal relationships [10]. Nahapiet and Ghoshal [18] use the term intellectual capital to refer to the knowledge and knowing capability of a social collective, such as an organization. It is reflected by the collective abilities of the firm in producing a better solution based on the knowledge possessed by the employees [19]. Social capital ensures that all the collaborating firms trust each other and their collective commitment toward customer satisfaction [20]; therefore, individual firms devote their resources toward their specific competence and expertise in the order fulfillment process. Among the individuals and the formalized organizational structure of a firm, social capital can be defined as the knowledge embedded within, available through, and utilized by interactions among individuals, working groups, and their networks of relationships in a collective way, but without the formality and rigidity of organizational capital [18]. In fact, innovation has also been defined as the most knowledge-intensive organizational process that depends on a firm's individual members and collective knowledge [21].

In general, innovation refers to the generation, acceptance and implementation of new ideas, processes, products or services [2]. According to Rogers [15], innovation is an idea, practice, or object that is perceived as new by the unit of adoption. In the context of business, Scheepers et al. [2] describe innovativeness as the creation of new products, services and technologies. Advances in e-business applications are presenting new opportunities to business organizations to innovatively rethink and reshape their business strategy [1][21]. E-business innovation capabilities

can be described as a firm's ability to enhance its technological innovativeness and create new business value propositions by acquiring, utilizing, and using new valuable e-business applications [1].

The literature [9]-[12] has widely investigated the association between social capital and e-business applications. For example, Liu et al. [12] concluded that social capital is a critical driver of substantive performance improvement in the context of e-business. Sambamurthy et al. [22] advocate that, in contemporary firms, e-business innovation results from the collaborative and collective actions of IS and business executives. In the context of social capital, Ghane and Akhavan [11] also suggest that e-business requires a strong intimacy and collaboration among business partners. A considerable stream of research [16][17][23] affirmed that e-business adoption is subject to the values, standards, and expectations shared among business partners and other members of social networks, such as professional and trade associations and accreditation agencies, to attain effective coordination and collaboration and to meet the requirements of professionalization.

A primary factor of productivity and competitiveness in the current economic paradigm includes the capacity of individuals and organizations to create, process and transform knowledge into economic assets [24]. Many previous studies [3][10][12] advocate that, social capital represents the knowledge embedded within, available through, and utilized by interactions among individuals, working groups, and their networks of relationships. Social networks have long been described as effective mechanisms for the transfer and exchange explicit and tacit knowledge [8][10]. They are used not only for information and knowledge exchange, but as a mechanism for identifying who knows what within the network context. Such networks can promote collective and distributed cognition among organizational participants [25]. In this context, Borgatti and Cross [26] asserted that organizational social capital is realized through members' levels of collective goal orientation, which create new knowledge by facilitating successful collective actions. Faccin and Balestrin [27] claimed that one challenge facing today's organization is that knowledge increasingly extends beyond the boundaries of the organization, and the ability to build external collaboration is an important source of new ideas and information that leads to technology and innovations that promote business performance.

The previous studies [1][13][27] confirmed that the characteristics of the processes by which firms search for creating new knowledge strongly effect innovation and can shape the impact of the origins of knowledge on innovation outcomes. Recently, the focus has shifted from knowledge creation within a firm to inter-firm collaborations, towards networks and Communities of Practice (CoPs), and toward knowledge creation in human interactions [8]. The theory of inter-firm collaboration has explained why firms collaborate and how knowledge is created in these collaborative relationships of firms. Knowledge creation often occurs spontaneously as a result of communication and collaboration among individuals or task groups where

persons with a variety of specializations discover opportunities for practical innovation concealed within a project [14][28]. However, a considerable body of research [3][29][30] has investigated the impact of knowledge creation on different issues concerning e-business adoption and implementation.

III. RESEARCH MODEL AND HYPOTHESES

The research model proposes that social capital has a direct impact on e-business innovation. It also proposes that collaborative knowledge creation has a direct impact on e-business innovation. Finally, the research model proposes that collaborative knowledge creation moderates the impact of social capital on e-business innovation.

Below each dimension of the research model is discussed in more details, followed by the related hypotheses.

A. *The impact of social capital*

Many previous studies [10][14][31] affirmed that social capital can contribute to the development of innovation capability in organizations. The innovation diffusion theory [15] has described the process by which an innovation is transferred through certain channels between the members of a social system. Organizational social networks have been identified as being significant resources that can lead to innovation [10]). They serve as a conduit where fragments of information and knowledge can be rapidly transmitted and assimilated [10][26]. Subramaniam and Youndt [32] examined how social capital influences incremental and radical innovative capabilities in companies. According to Petti and Zhang [31], the literature of social capital focuses on internal and external network characteristics that might be more conducive to business's innovation capabilities. Many previous studies [9]-[12] confirmed the impact of social capital influence, directly or indirectly, on the way in which e-business models are perceived, developed, implemented and evaluated.

B. *The impact of collaborative knowledge creation*

Knowledge creation can be seen as the starting point of both KM and innovation [14]. Knowledge management involves a range of strategies, processes and practices utilized by a firm to identify, capture, structure, share and apply an individual or organizational knowledge to attain competitive advantage and create sources for new innovations [27]. New knowledge is frequently engendered by innovative concepts or urgent needs, either arising within the company itself or emanating from external market pressures. The previous studies [1][14][27]) emphasized that to strengthen their innovation potential, organizations need to increase the efforts of collaborative knowledge creation and innovation, so they can build new products, services, or procedures. Significant research has been conducted in this context, emphasizing the connection between knowledge creation and accumulation on one hand, and novel business ideas and practices on the other.

The previous studies [3][29][30] confirmed the existence of a positive impact of organizational learning and creating

new knowledge on successful e-business innovation. Cegarra-Navarro et al. [29] investigated how knowledge creation contributes to the employees' productivity and the development of the necessary capabilities for success in the new e-business environment. According to Khamis et al. [5], the ability of e-business companies to be flexible and correspond to the continuously changing electronic environment depends largely on creating new knowledge. Cegarra-Navarro et al. [29] explained how an organization that enhances organizational knowledge application is more likely to implement e-business successfully. Knowledge creation is claimed to produce intelligence and innovation and, thus, positively affects the trading success of e-businesses [22]. Maditinos et al. [30] confirmed that interaction and knowledge sharing among e-business partners is a very important asset for every firm. Drawing upon the previous discussion, the present study hypothesizes the following:

H3: Collaborative knowledge creation has a direct positive impact on e-business innovation.

C. *The mediating role of collaborative knowledge creation*

Social networks have long been described as effective mechanisms for the transfer and exchange the explicit and tacit knowledge [8]. Previous studies [9][10][32] advocate that organizations with high levels of social capital have more knowledge-management capabilities than other organizations with low levels of social capital. At the same time, the literature [1][22][27] has widely examined the impact of knowledge creation on the firms' innovation capability.

According to Nonaka and Takeuchi [28], the innovative capability of a certain firm depends very closely on the intellectual assets and the knowledge that it possesses, as well as on its ability to deploy them, viewing the innovation process as an intensive knowledge management process. Social capital, as a major element in these assets allows an organization to obtain new knowledge, which is the most important source of innovation [33]. Borgatti and Cross [26] also investigated the importance of social relationships for longer term innovation, since they contribute to enrich knowledge and information exchange. This capital is interrelated with knowledge management practice, as the collaborative learning through social networks is required for the firm to possess new knowledge and develop new technological innovations.

Tallon [34] asserted that social capital determines a firm's capacity for IT-based innovation as a result of its ability to create new knowledge and convert it into strategic applications. Social integration can lower the barriers to information sharing and increasing the absorptive capacity of the firm and, thus, enhancing the opportunity of creating new innovative knowledge. The literature confirms the direct impact of collaborative knowledge creation on e-business innovation. At the same time, the previous discussion suggests that social capital has a direct impact

on creating new knowledge that can leverage an organization's capability to adopt and use new IT-based innovations. Therefore, the present study proposes the following hypothesis:

H4: Collaborative knowledge creation has a mediating impact on the role of social capital in achieving e-business innovation.

IV. RESEARCH METHODOLOGY

This section provides the research methodology, which includes measures and instrument development, sampling and questionnaire distribution, data analysis and results and finally, assessing the structural model and testing the research hypotheses.

A. Measures and instrument development

The present study adopted the measures used to operationalize the constructs of the research model from related previous studies. The scale of social capital was used from Hayton [8] and Zheng [13]. Items for measuring collaborative knowledge creation were derived from the four dimensions of the knowledge creation process, focusing on the extent of collaboration in achieving these dimensions. These four dimensions are socialization, externalization, combination, and internalization [24], [27][28]. The measurements of e-business innovation were derived from Hull et al. [1] and Al Omoush et al. [21].

Empirical data for this study were gathered via a self administered questionnaire. As shown in Table I, the questionnaire includes 22 questions (see APPENDIX I) that represent the research model constructs. All items were measured using a five-point Likert-type scale, ranging from 1=strongly disagree to 5=strongly agree).

TABLE I. MEASURES OF RESEARCH CONSTRUCTS

Construct	Code	No. of Items	References
Social capital	SC	5	[8] [13]
Collaborative knowledge creation	CKC	12	[24] [27]
E-business innovation	INNOV	5	[1] [21]

B. Sampling and questionnaire distribution

The manufacturing sector is one of the most competitive and innovatively diverse industries with multidimensional and reciprocal relationships, comprising a wide range of business partners [21]. Therefore, this sector is highly attractive for empirical researchers interested in studying e-business adoption and use. The study was conducted on a sample drawn from Jordanian firms. Currently, there are four active industrial parks in Jordan that accommodate more than 400 local, regional and international manufacturing firms, in addition to other industrial clusters.

The targeted respondents were selected from top-level executives, including individuals in such roles as Chief

Executive Officer, Vice President, Chief Information Officer, Chief Financial Officer, and Chief Operating Officer. Furthermore, the sample included the directors of IT, sales and marketing, research and development, manufacturing, procurement/purchasing, supply chain directors, and customer service. However, a total of 178 paper questionnaires were distributed among the participants and a total of 120 questionnaires were collected. The researchers received 112 usable responses resulting in a 62.9% response rate.

C. Data analysis and results

Smart Partial Least Squares (PLS), version 2.0, was used for data analysis. According to Fornell and Larcker [36], PLS is robust in that it does not need a large sample or normally distributed multivariate data. Further, a PLS path model consists of two elements. These are measurement model (Inner model) to provide the results related to reliability and validity of the scales and the structural model (outer model) to represent the relationships (paths) between the research constructs.

The measurement model was examined for internal consistency and convergent and discriminant validity. As suggested by Hair et al. [37], the factor loadings, composite reliability and the average variance extracted were used to assess convergent validity. Factor loadings analysis was applied to purify scales with the goal of improving their measurement. The results indicate that the factor loadings of some items are less than 0.50 on their own constructs and must be removed from the scale. Specifically, two items were removed from the construct of collaborative knowledge creation (CKC3, CKC8), and one from the e-business innovation scale (INNOV4) due in all cases to low item loading at level ($\alpha = 0.05$). Internal consistency reliability was measured using Cronbach's alpha, rho_A, and Composite Reliability (CR). Tables II lists the measurement model results, including information about Cronbach's alpha, rho_A, and CR. As shown in Table II, all constructs exhibited acceptably high scores exceeding the 0.70 threshold. Furthermore, an Average Variance Extracted (AVE) value of 0.50 or higher indicates that the construct explains more than half of the variance of its indicators. Table II shows that all values of AVE are larger than 0.5, which suggest a convergent validity.

TABLE II. VALIDITY AND RELIABILITY OF RESEARCH CONSTRUCTS

Construct	alpha	rho_A	CR	AVE
Social capital	0.834	0.838	0.882	0.600
Collaborative knowledge creation	0.897	0.899	0.915	0.520
E-business innovation	0.841	0.841	0.894	0.678

One popular approach to assess the discriminant validity followed in the current research was through examining the cross-loading comparisons between constructs [36]. Specifically, the AVE of each latent construct should be higher than the construct's highest squared correlation with

any other latent construct. As shown in Table III, all constructs in the research model achieved this criterion because none of the off-diagonal elements exceeded the respective diagonal element. Thus, discriminant validity was demonstrated.

TABLE III. DISCRIMINANT VALIDITY

No.	Constructs	1	2	3
1	Social capital	0.774		
2	Collaborative knowledge creation	0.697	0.721	
3	E-business innovation	0.659	0.651	0.824

D. Assessing the structural model and testing the research hypotheses

The results of the structural modeling analysis are illustrated in Figure 1. Path analysis was conducted to provide a graphic of the links between the groups of factors. The path coefficient (β) analysis and the t-value test serve as the basis of evaluation of the hypotheses.

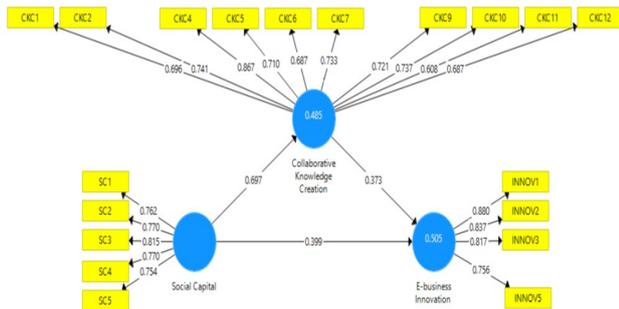


Figure1. Path coefficient analysis

It is recommended that the t-value should be larger than 2. The strength of the hypothesized paths and whether the path significant is evaluated by the standardized path coefficient. Standardized or (β) coefficients are the estimates resulting from an analysis performed on variables that have been standardized so that they have variances of 1. Table IV presents the results of testing research hypotheses.

TABLE IV. THE RESULTS OF TESTING RESEARCH HYPOTHESES.

H	β	T value	Sig.	The results
1	0.399	4.452	0.000	Supported
2	0.697	14.083	0.000	Supported
3	0.373	3.563	0.000	Supported

To evaluate the mediating role of collaborative knowledge creation in the impact of social capital on e-business innovation was analyzed using the Sobel Test [38].

TABLE V. THE RESULTS OF SOBEL TEST

H	z-value	P value	The results
4	3.481	0.001	Supported

The results in Table V reveal that the mediating role of organizational learning in the impact of top management support on e-business entrepreneurship (H4) is significant (z- value=18.413, (p< 0.000).

V. DISCUSSION AND CONCLUSION

The present study aimed to investigate empirically the interrelationship and impact of social capital and collaborative knowledge creation on e-business innovation. The results reveal that social capital plays an important role in achieving e-business innovation. These results are consistent with previous studies [7][9]-[12], which confirm the pivotal role of social capital in creating an innovative business environment to develop new ideas and initiatives concerning adoption and use of e-business innovations. The findings of the present study also indicate a significant positive impact of social capital on e-business innovation. The prior studies [4][5][8][33] clarified that collaborative knowledge creation is a direct outcome of social capital. Tallon [34] explained that social integration can help firms to lower the barriers to information sharing, increasing the absorptive capacity of the firm and, thus, enhancing the effectiveness and efficiency of knowledge creation.

The results reveal that collaborative knowledge creation has a direct positive impact on e-business innovation. These findings are in line with many previous studies [3][29][30] that confirmed the positive impact of organizational learning and creating new knowledge on successful e-business innovation. Maditinos et al. [30] affirmed that knowledge sharing among e-business partners is a very important asset for every firm. According to Cegarra-Navarro et al. [29], knowledge creation produces intelligence and innovation and, thus, positively affects the success of e-businesses. Finally, the results indicate that collaborative knowledge creation has a mediating impact on the role of social capital in achieving e-business innovation. These findings are also in agreement with previous studies [8][33][34] that have investigated the impact of social capital on creating new innovative knowledge. According to Nonaka and Takeuchi [28], the innovative capability of a certain firm depends very closely on the intellectual assets and the knowledge that it possesses, as well as on its ability to deploy them, viewing the innovation process as an intensive knowledge management process.

The results of the study highlight the pivotal role of social capital in preparing an organizational environment to support the efforts of knowledge creation and establish e-business innovation. The results also emphasize that to strengthen their e-business innovation potential, organizations need to increase the efforts of collaborative knowledge creation. The results reveal that the combination of social capital and collaborative knowledge creation is a crucial element to the success of e-business adoption and supports competitiveness and sustainability.

The findings of this study contribute to a better understanding of the impact of social capital on e-business innovation. This study also improves our understanding of the pivotal role of collaborative knowledge creation in

establishing e-business innovation. The findings are important for future research investigating the influencing role of social and collaborative capabilities as factors to consider when studying firms that conduct any e-business innovation activities. For executives, this study provides guidance for senior management in developing successful e-business initiatives. It also provides top managers with dimensions to be used for assessing the firm's attitudes toward e-business innovation. An understanding of the impact of social capital and collaborative knowledge creation will provide the managers with better knowledge on how to manage opportunities of e-business innovation. Organizations must scan and employ their social networks consistently to obtain ideas and gather information to support the process of recognition and develop new e-business innovations based on the continuing advances of e-business applications.

Despite its contributions, there are some limitations, which can serve as directions for future research. Although the design of the research model builds on the theoretical insights of intellectual capital, the study did not consider all of its theoretical dimensions, including human capital and organizational capital. In addition, the study did not reflect all of the theoretical factors that can impact on achieving e-business innovation, such as organization's characteristics, competitive pressures, and top-management support. Finally, knowledge creation often occurs as a result of individual and organizational learning. The present study did not investigate the impact of organizational learning on collaborative knowledge creation and e-business innovation and its interrelationship social capital.

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Collaborative knowledge creation

Socialization	CKC1	My firm stresses sharing experience with suppliers and customers and engaging in dialogue with competitors.
	CKC2	My firm stresses getting ideas for firm strategy from daily social life, interaction with external experts, and informal meeting with competitors.
	CKC3	My firm stresses creating a work environment that allows peers to understand the craftsmanship and expertise.
Externalization	CKC4	My firm stresses the use of deductive and inductive thinking.
	CKC5	My firm stresses creative and essential dialogues.
	CKC6	My firm stresses exchanging various ideas and dialogues.
Combination	CKC7	My firm stresses planning strategies by using published literature, computer simulation and forecasting
	CKC8	My firm stresses creating manuals and databases on products and services
	CKC9	My firm stresses transmitting newly created concept.
Internalization	CKC10	My firm stresses enactive liaising activities with functional department by cross-functional development teams
	CKC11	My firm stresses searching and sharing new values and thoughts.
	CKC12	My firm stresses sharing and trying to understand management visions through communications with fellows

APPENDIX I. Questionnair items

Construct	Code	Measurement Items			
Social capital	SC1	Membership and networking with industrial associations are very important for my firm to acquire innovative ideas.		INNOV1	My firm invests heavily on new e-business systems.
	SC2	My firm has adequate access to external sources for knowledge, technical, management, and business-related expertise.		INNOV2	Employees are encouraged to come up with new ideas concerning the adoption of new e-business applications.
	SC3	My firm encourages employees to share their knowledge, experience, ideas, and skills with colleagues from other departments.		INNOV3	The firm placed emphasis on introducing new e-business applications into business processes and activities.
	SC4	Our firm and its external stakeholders frequently collaborate to solve problems.		INNOV4	The firm emphasizes continuously on introducing unique e-business processes and activities.
	SC5	The social network of firm has a great impact on improving our products, services and processes.			

E-business innovation