

The relationship between knowledge-based systems and supply chain management in competitive advantage

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ABSTRACT

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The study aimed to examine the relationship between knowledge-based systems, E-Systems, and Supply chain management (SCM) in competitive advantage. In order to achieve the objectives of the study, the researchers developed a questionnaire to collect the required data, where (120) questionnaires were left valid for analysis. SPSS Version 16 was used to analyze the study data. The most important results of this study were as follows: The perceptions of the respondents for knowledge-based systems (E-Systems) were at a high level. Also, the perceptions of the respondents for SCM were with a high degree. Furthermore, the perceptions of the respondents for competitive advantage were with a high degree. There is an effect for knowledge-based systems (E-Systems) and SCM in competitive advantage, and the dimensions of the dependent variable explained about 53% of variance in the variable of competitive advantage.

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1. Introduction

Competitive advantage particularly deals with what the organization has in stock in order to achieve edge, over others, in the competitive market. Based on the relevant literature, constructs such as, competitive intelligence, strategic planning, corporate social responsibility, creativity, and innovation among others, are used interchangeably with competitive advantage, and their respective measuring constructs (Epetimehin, 2017; Basheer & Sahedd, 2019; Heinz-Theo & Heinz-Theo, 2015; Krell & Matook, 2015; Sigalas, Georgopoulos and Economou, 2018). However, competitive advantage is also defined as a performance construct that demonstrates a phenomenon relating to organizational progress. In this context, constructs, such as operational efficiency, financial performance, organizational performance, and financial sustainability, among others, are used (Sadia, 2015; Agha et al., 2016; Vahid et al., 2015; Heinz-Theo & Tim, 2016). With this, varying, but valid, factors have been identified as antecedents to competitive advantage. One of the prominent concepts of information and communication technology (ICT) strategy is to actualize competitive advantage.

Moreover, the use of tele-presence systems, resource management of data, e-commerce systems, enterprise resource management system (ERP), and systems of decision support have been rated as strategies that influenced the competitive advantage of organizations (O'Brien & Marakas, 2015; Bogdan & Marinela, 2017; Petter, 2016; Kasasbeh et al., 2021).

2. Problem Statement

Despite the high use of internet-based technologies, the application of e-business strategies in adopting banking software (for Intelligent system), in the form of enterprise resource planning (Derakhshandeh, 2012; Bodgan, & Emina, 2017), knowledge-based systems (Ray, 2017), and their effects on banking competitive advantage has not been investigated empirically. This confirms the necessity of investigating E-Systems with Enterprise Resource Planning ERP, Intelligent system, electronic data analysis, data auditing and reporting sub-variables.

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3. Intelligent-system Strategy

Organizations are, currently, using many software systems with various capabilities and capacities. The leading systems that have been used in the banking sector are based on (ERP) (Massa & Testa, 2017; Tat Huei, Boon-Liat, Yet Mee & Teck Heang, 2016). Biometric systems are considered as a good example of intelligent systems. The current study addressed all the software systems that are based on intelligence and employed as knowledge-based systems for banking activities. Therefore, E-system strategy can be defined as processes, techniques and methods through which organizations use E-Systems for optimal performance (Euripidis & Fotini, 2015; Huei, Yet, Boon, & Teck, 2016; Massa & Testa, 2017).

3.1 *The Relationship between knowledge-based systems (E-Systems) and Competitive Advantage*

Adopting the systems that are based on knowledge (E-Systems) in organizations has been mainly attributed to one of the elements affecting organizational competitive advantage (Hana, 2016; Shadi & Mazir, 2018; Del Giudice & Della Peruta, 2016; Reyes & Raisinghani, 2019; Euripidis & Fotini, 2015; Massa & Testa, 2017). This construct encompasses all the organizations that employed intelligent and enterprise resource planning systems (ERP). They are operationalized as an E-system strategy, and one of the sub-components strategies under e-business strategy.

Reyes and Raisinghani (2019) conducted a study which aimed at investigating the integration of knowledge-based system and information technologies for enhancing the production and inventory control, as a competitive advantage measure. The results revealed that economies that are based on knowledge and intellectual capital are yet to be fully explored as organizational tools for driving growth and enhancing performance. They have been considered as vital assets that are not common and have not been skillfully managed. Intangible value and knowledge that are exchanged through integrating knowledge management and procurement inventory control (PIC) contribute to providing a solid basis for the emerging-networked economy. In the same vein, Massa and Testa (2017) explored the impact of e-procurement adoption on the management of organizational knowledge by using a case study of an electronic company. E-procurement is a knowledge-based system used for investigating an EP project in progress and to enhance the parties involved in that. Therefore, it shows the way through which the project affects the organizations and promotes the conventional procurement performance.

Del Giudice and Della Peruta (2016), Hana (2017), Del Giudice and Della Peruta (2016) and Lipitakis (2009) are experimental studies that explored the impact of using an E-system on firm performance. Euripidis and Fotini (2014) conducted a study which explored ERP and e-business system development, business performance and innovation. The study revealed that there has been extended theoretical work concerning the potential of (ICT) to come up with important innovations that can dramatically promote firms' performance. Therefore, the study empirically investigates and compares the impact of the two most widely-used types of information systems, ERP and e-business. It addressed their impact on business performance that is mediated by innovation by using the data collected from interviews with decision makers of companies in (29) countries. The study revealed that both e-business and ERP have a positive effect on innovation; however, ERP has a stronger effect on innovation drivers as compared to e-business IS. It is worth noting that most of their positive effect on the performance of business is attributed to automation and existing process support, while only a small portion of it is related to innovation.

On the other hand, Lipitakis and Lipitakis (2011) conducted a study which aimed at evaluating certain e-business strategies on firm performance, where the study used the adaptive algorithm modeling as a strategy that is alternative to the managerial approach. The approach of innovative adaptive algorithmic modeling is mainly used for solving a lot of problems related to e-business and strategic management under conditions of uncertainty. The proposed approach is based on a basic idea as well as four interrelated sciences: computing science, applied mathematics, management sciences, and economic science. E-business performance measurement, under certain organizational constraints and environmental pressures, is used to describe the relationships between innovation, technology, and firm performance, where these constructs are regarded as vital applications for the proposed adaptive algorithmic-modeling approach. This model is a theoretical time-dependent one for evaluating the e-business performance of firms. Euripidis and Fotini (2018) and Del Giudice and Della Peruta (2016) suggested that only few studies investigated the effects of intelligent systems and ERP on organizational performance and none of them addressed financial organizations. Based on the few reviewed studies, we may conclude that E-Systems adoption has an impact on organizational competitive advantage.

3.2 *The Relationship between supply chain management and Competitive Advantage*

With the advancement of internet-based technologies, researchers have increasingly shown an interest in supporting supply chain management with such technologies. However, practitioners had no obvious way to implement e-business strategies in the supply chain of high-tech and software-oriented products (Cao, Ye & Yuan, 2016). In spite of the progression of technology and the capabilities e-business, which have proved to yield generous benefits to organizations such as influencing efficiency of Small and Medium Enterprises (SMEs) and contributing to the strategic development e-business and supply chain management (SCM), they have not been utilized enough and extended to the financial sector (Yuen, 2017). For instance, the majority of the conducted studies that investigated e-operations, as a sub-variable of e-business strategy, mainly addressed (SCM). These studies are almost applicable in production sectors, while their measuring dimensions cannot be applied to

banking sectors which include various e-operations, such as data auditing, electronic data analysis, and reporting, as suggested by Derakhshandeh (2012) and Koo et al. (2016).

This confirms the necessity of establishing e-operations that are based on banking industries to be investigated as supply chain management sub-variable and explore its effect on the competitive advantage of the banking industry.

3. Research Framework

The researcher proposed the conceptual research model, where it was performed based on the gaps that were observed from the existing literature; accordingly, the scope was delineated for the current study.

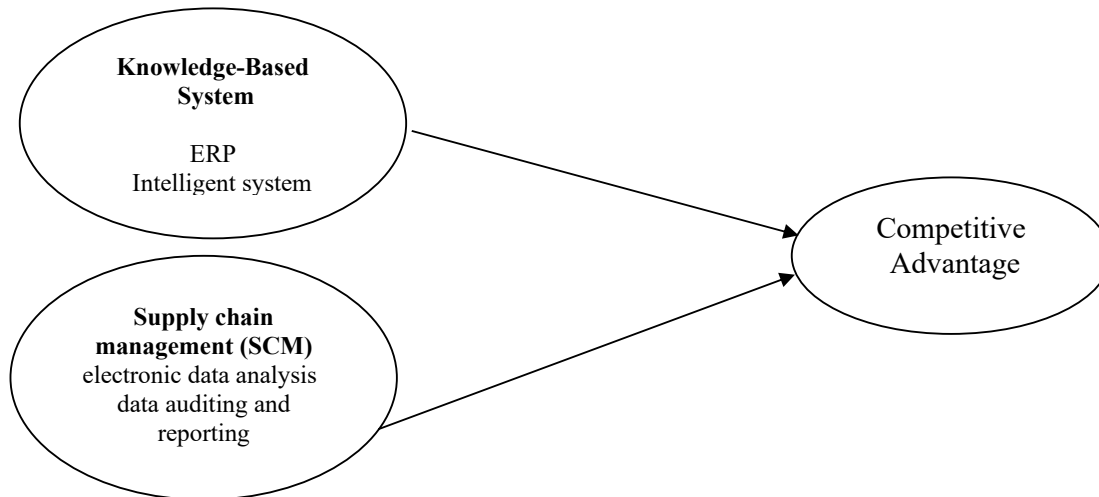


Fig. 1. Research Framework

Hypothesis:

H₁: Enterprise resource planning (ERP) positively affects competitive advantage.

H₂: Intelligent system positively affects competitive advantage.

H₃: Electronic data analysis positively affects competitive advantage.

H₄: Data auditing and reporting positively affect competitive advantage.

4. Research Methodology

In order to conduct effective research, it is important to choose an appropriate research methodology. The appropriate design of a research is important for determining the type of the needed data, the method of data collection, and the type of the applied sampling technique. Accordingly, the research design is too crucial for actualizing the objectives of the research. The current study used the quantitative research approach, where this design enables the researcher to examine the relationship between the study variables. Also, this approach enables the researcher to determine whether a certain concept or idea is preferred to the others. This design can also answer questions about the relationships between the measured variables in order to elucidate, control and envisage phenomena (Sekaran, 2006).

Therefore, the quantitative research design is considered as an appropriate method for the current study, since it allows for testing the relationships between the study variables by using the suitable statistical methods (Sekaran & Bougie, 2010). Indeed, this corresponds with the main purpose of the current study. Therefore, the quantitative research design is suitable for this study, where it allows for examining the relationship between variables using the appropriate statistical approaches (Sekaran, 2006).

This agrees with the study's main objective, which aimed at examining the relationship between knowledge-based systems (E-Systems) and Supply chain management (SCM) in Competitive Advantage, based on an applied study on managers and assistant managers in the Jordanian commercial banks. Accordingly, the specific questions related to the quantitative research design also allows us to implement the analysis by using a larger sample in order to generalize the study results among a wide range of population.

4.1 Population and Sampling

Sekaran (2006) defined the research population as all the groups of individuals, things, or events of interest that the researcher examines. In this study, the population consisted of 140 managers, assistant managers, and heads of departments in the Jordanian commercial banks. The unit of analysis is considered as the most basic element in the research study (Zikmund et al., 2013). Sekaran and Bougie (2010) defined the unit of analysis as “the aggregation level of the data collected during the subsequent stage of data analysis”. Thus, the analysis unit is individual based, which means that the data that were collected from (managers, assistant managers, and heads of departments) in commercial banks represent the study's unit of analysis.

The current study employed the method of probability simple random sampling, which is based on both probability and non-probability sampling. This method was used in order to represent each domain of the study population in the sample (Zikmund et al., 2013). Krejcie and Morgan (1970) and Sekaran and Bougie (2009) suggested that the suitable sample size for a population of (140) is about (113) individuals. In order to reduce the sample size error and take into account the existence of non-response by some respondents, the researcher increased the sample size. Accordingly, the size of the study sample had become (113+10 = 123). Consequently, the researcher distributed (123) questionnaires to the sample individuals; out of them, three questionnaires were excluded, since they were not filled as required, and thus, (120) questionnaires were valid for analysis.

4.2 Normality Test

The test of normality for the scales is based on the skewness and kurtosis of the variables under study. Skewness is used to measure symmetry, or asymmetry. The distribution, or data set, is considered as symmetric in case it has the same distance from the right and the left of the center. Kurtosis is designed to measure whether the data are light -tailed or heavy-tailed in relation to normal distribution. That is, the data sets with high kurtosis values have heavy tails. On the contrary, the data sets with low kurtosis values have light tails. Indeed, the uniform distribution represents the extreme case. To consider that the data are normally distributed, the values of asymmetry (skewness) and kurtosis should range between -2 and +2 in order to be considered as acceptable values and prove the normal univariate distribution. Table 1 shows the characteristics of the study data, in terms of means, skewness, and kurtosis for each business intelligence system and supply chain management as well as competitive advantage variables.

Table 1
Normality of the scale

Variable	Description	Value
Knowledge-based system	Mean	3.62
	Skewness	-1.01
	Kurtosis	2.46
Supply chain management	Mean	38.49
	Skewness	-0.84
	Kurtosis	0.86
Competitive advantage	Mean	39.08
	Skewness	-0.29
	Kurtosis	1.66

According to the previous table, the skewness and kurtosis of all the variables indicate normal distribution of the scales. Accordingly, we can conclude that the data set under the study is normally distributed.

4.3 Correlation Matrix

The researcher performed a correlation test between the study variables in order to identify the multiple correlation between the independent variables of the study (Business Intelligence Systems and Supply chain management) and the dependent variable (Competitive Advantage), where a correlation matrix test was applied to avoid Multi-collinearity. The results revealed that each dimension is considered as independent from another in case it has correlation values less than (1). Table 2 below shows the results of the correlation matrix, which reveals that the highest correlation was (OLTP Systems) (0.673). The results revealed that all the correlation values between the independent variables are less than (1), which means there is no multi-collinearity. Based on the results of tests, the researcher can use the regression analyses to test the research hypotheses.

Table 2
Correlation matrix

	Supply chain management	Data warehouses	OLTP Systems	ERP
ERP	1.00	0.464**	0.176	0.417**
Intelligent system	0.464**	1.00	0.240*	0.375**
Electronic data analysis	0.176	0.240*	1.00	0.673**
Data auditing and reporting	0.299	0.263*	0.436	1.00

4.4 Testing Hypotheses

H01: E-system positively affects competitive advantage at ($\alpha \leq 0.05$).

To test this hypothesis, the researcher used multiple regression analysis to verify the effect of E-system according to (ERP, Intelligent Process Planning, Intelligent Design) on competitive advantages shown in Table 3.

Table 3
Stepwise Multiple Regression effect of the E-system strategy on competitive advantages

The entry order of independent elements in the equation	R ²	(F) Value	T Calculated	Sig
ERP	0.547	309.145	7.472	0.000
Intelligent system	0.575	272.824	8.863	0.000
Electronic data analysis	0.581	242.824	6.863	0.000
Data auditing and reporting	0.480	222.621	56.764	0.000

Table 3 reveals the entry order of independent variables in the regression equation. The results showed that the variable of (OLTP Systems) was in the first place with (0.581), followed by the effect of Data warehouses with (0.575), then the effect of Intelligent system with (0.547), and finally the supply chain management and ERP with (0.480). This explains the cause of rejecting the Null Hypotheses and accepting the Alternative Hypotheses .

5. Conclusions

Research and innovation contribute to promoting the competitive advantage, especially in this fast-growing world. Digitizing business strategies, which is exemplified by using technological tools in implementing the hitherto traditional business strategies is a leading element in this regard. However, the banking sector didn't receive sufficient research attention concerning the relationship between knowledge-based systems (E-Systems) and Supply chain management (SCM) in competitive advantage. The problem statement of the current study presented the background that motivated the planning of this research, intelligent systems, knowledge-based systems, as practical problems that demanded conducting this work. Lastly, out of the five main hypotheses tested by this study, four hypotheses were accepted. This showed that ERP, Intelligent system, electronic data analysis, data auditing and reporting positively influence competitive advantage.

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