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Relationship among Information Technology Investment, Firm Performance, Innovation and Firm Growth, Case Study: Largest Iranian Manufacturers

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ABSTRACT

Information technology is the main item for improve the firm performance for organizations. On the basis of the resource-based view, this paper investigates relationship between Information Technology (IT) investments and firm performance. The research assesses whether innovation is moderated by firm growth and this study investigated the mediation effects of innovation on IT's impact on firm performance. A set of hypotheses rooted in the resource-based view theories of the firm was created and empirically tested. Survey email invitation approach was employed to send a letter of invitation to 1,100 potential participants at 300 firms to participate in the study. To analyze the data, both mediated regression and hierarchical linear regression models were utilized; and following controlling for firm growth. The results of this study indicate that IT increases the innovation of the firm. Innovation improves firm performance in terms of financial and operational. Results also indicate that IT's impact on innovation is significantly moderated by firm growth. Finally, the results indicate that IT's impact on firm performance is through innovation. This suggests that firms should consider IT investments that improve the firm's capabilities in order to achieve a significant impact on firm performance. The main purpose of this paper is to offer the new perspectives in illumination how IT can create a sustained competitive advantage for the firm.

Key words: Information Technology (IT), Firm Performance, Firm Growth, Innovation, largest Iranian manufacturers

INTRODUCTION

There are plethora of studies that have sought to identify the complicated relationship between IT investments, productivity, and performance which resulted in a number of various definitions and conceptualizations of the variable of IT investment. The definition, and thus the conceptualization of IT investments, differs based on whether the study data are driven from a survey or are obtained from archival sources. Broadly speaking, IT investments encompass all the expenditures and spending made by the firm on computers and telecommunications resources, for example, hardware, software, and related services (J. Dedrick, Gurbaxani, V., & Kraemer, K. L, 2003). In another survey- based study, (P. Weill, & Broadbent. M., 1998) conceptualized IT investments as "… dollars invested in all computers, hardware, software, communications, phone, fax, data, and the people dedicated to providing IT services." Nevertheless, most researchers have defined IT investments in a different way. In fact, in most studies, IT investment is only limited to hardware expenditures. In reality, firms have continued to invest greatly in software, although it is not easy to expound on these investments, partly because there is no metrics for quantifying and measuring units of "common" as well as custom software, contrasting with the case with packaged

software. Economists and management scholars concur on the role of innovations in creating economic rents at the levels of firm, industry, or economy (Brynjolfsson, 2009; Porter, 1990; Schumpeter, 1942/87; Scott, 2008; A. H. Van de Ven, 1986). Firms that are determined and persistent innovators have been illustrated to appropriate superior economics rents in comparison with their competitors (Scott, 2008). Alternatively, IT has permeated many phases of organizations and is being used, for example, to internally control, coordinate, and facilitate organizational processes and management for decision-making. To contribute to and facilitate interactions with consumers, suppliers, and other stakeholders as shown in the use of consumer relationship management as well as supply chain management systems respectively ,firms have externally made IT investments (Li, 2006).

IT INVESTMENT AND FIRM PERFORMANCE

Firms are making considerable amounts of investments in IT resources presuming that these investments result in payoff (Liu & Ravichandran, 2008; Radhakrishnan, Zu, & Grover, 2008; Xue, Liang, & Boulton, 2008). In many firms, IT expenditures and spending are approximately 3% of the total sales (Kobelsky, 2008) and roughly 40% of the firm's total capital expenditures (Ranganathan & Brown, 2006). According to literature related to IT, there are many researches that have sought to illustrate the returns from these investments at the levels of firm, industry, or economy (J. Dedrick, Gurbaxani, V., & Kraemer, K. L., 2003; Melville, Kraemer, & Gurbaxani, 2004). Most of these researches have been either conceptual or empirical. Researchers who investigated IT investments under the IT strategy rubric have examined the IT deployments, for example, Supply Chain Management (SCM), Enterprise Resource Planning (ERP), and Customer Relationship Management (CRM) and their relationships with firm performance (Hayes, 2001; Poston & Grabski, 2001; Subramani, 2004; Subramani & Walden, 2001) or new IT-enabled strategies that result in improved business processes (D. Chatterjee, Pacini, C., & Sambamurthy, V., 2002).

In studying the influence IT investments, based on e-commerce, on the market value of the firm, there is an event study methodology to inspect the reactions of market to announcements of 251 e-commerce initiatives by firms in 1998 (Subramani & Walden, 2001). In their study, IT investment was defined as an announcement of a new initiative related to electronic commerce or the expansion or extension of an already existing initiative (p. 141) and reported that the market reacts positively (i.e. stock price increases) to firms that invested in e-commerce. Lastly, IT management/capability researches are established on the differences between firms' laying stress on the employment of IT or IT ability levels in the firm. Therefore, firms that emphasize the employment of IT are categorized as successful customers of IT and levels of ability is rooted in the accessibility of top IT officials including Chief Information Officers plus the roles they play in top management teams (Bharadwaj, 2000; D. Chatterjee, Richardson, V., & Zmud, R., 2001; Dehning, 2002; Richardson, 2001b; Strassman, 1990). IT investments account for almost 3% of many firms' total sales (Henderson, 2007) and roughly 40% of many firms' capital expenditures (Karanja, 2011; Ranganathan & Brown, 2006). Another study (P. Weill, 1992) suggested that IT investments results in great triumph and pay-off when the firm enjoys a quality management team committed to IT initiatives, whereas attributed the superior firm performance to the superior number of information workers.

INNOVATION AND FIRM PERFORMANCE

There is a suggestion that innovation is an essential to get competitive advantage and organizational sustainability (Porter, 1990). Organizations in the fast evolving knowledge-intensive service industries must pay close attention to innovation (Howells, 2004; Miles, 2004). Innovation is "new ideas that are developed and implemented to achieve desired outcome by people who engage in relationships with others" (A. Van de Ven, Polley, D.E., Garud, R., and Venkatamaran, S., 1999). In addition, the concept of innovation has been defined as a process that encompasses three overlapping stages, such as, invention, innovation, and diffusion (Dosi, 1988; Enos, 1962; Mansfield, 1968). The first stage, invention is the instigation of a new idea, process, or product that is not necessarily economically valuable (Granted patents), whilst the second stage, innovation, is the medium that drives inventions to usability. Usability is the ability and capability of the innovation to create economic rents for the investing body by meeting the consumers' or users' needs. Lastly, the third stage, diffusion, is the process whereby the innovation travels from the industry to the customer market and is welcomed by the users (Patent citations); also called the adoption of an innovation (Rogers, 1995).

Since then, a concurrence has been reaching on the role of innovation in greater firm performance, growth, and survival (Christensen, 1996; G. Hamel, & Prahalad, C. K., 1994; O'Reilly, 2004; Teece, Pisano, & Shuen, 1999; Zahra & Covin, 1995). Nevertheless, maintaining a competitive benefit through innovation is not as easy as it may look; and firms that are determined and persistent innovators invest a lot in relation to time, equipment, and personnel in studying innovation. This is even more intimidating in environments featured by resource immobility, in which the resource-based view does argument for innovation as a key driver of firm productivity, profitability, and survival (Barney, 1991b; G. Hamel, 2000). Lack of or sluggishness in persistent innovativeness has been demonstrated to result in shifts in market dominance and supremacy from one generation to another. For example, in the personal computer (PC) industry, market domination has changed from Altair to Tandy, to Apple, to IBM, to Compaq, to Dell, to HP (Tellis, 2001). The shift has been followed by superior and greater firm performance of the leader firm.

FIRM GROWTH AND INNOVATION

Flourishing and growth in the economy is generally the outcome of the interaction between savings and upgrading and improvement in production efficiency (Foster, 2008; Heshmati, 2003). Literature which explores firm growth dates back to the influential work of Edith Penrose, "The theory of

the growth of the firm" (1959), where she outlined the principles which guide the growth of the firm and the tempo at which firms can efficiently and effectively grow. Penrose also outlined the drivers of the tempo and direction of the growth of the firm, including current knowledge bases, the availability of top managerial and technical expertise, and other related firm resources. Firm growth is a global strategic plan; and when a firm shows positive growth, it signals that the firm's strategies are working (Grant, 2001). There are compelling arguments on the tie between firm growth and innovation grounded on broad theoretical and descriptive assumption of the role of innovation in expanding and extending the firm market share. For example, another author demonstrates the results of the Mckinsey Global Survey of Business Executives, who maintains that "innovation is what their firms need most for growth" (Carden, 2005). From an economic point of view, researches have also demonstrated the role of firm growth in boosting innovation (Geroski, 2005). A number of researchers have recently empirically illustrated the role that innovation plays in booming the growth of the firm and vice-versa.

FIRM PERFORMANCE

Yet while researchers have addressed the concept of performance as well as the role it plays in organizational effectiveness and efficacy for a long time (Campbell, 1977; Kirchoff, 1997; Steers, 1977), it still remains one of the controversial issues to both academics and business practitioners (Ravichandran, Liu, Han, & Hasan, 2009; Venkatraman, 1986). It is argued that researchers' findings lack consistency in terms of the definition and operationalization of business performance. Although the literature on studies addressing this issue is increasing, they are concurrently becoming divergent, consequently diminishing the chances of agreement in basic terminology and definitions (Richard, 2009). Nevertheless, there is concurrence that firm performance is influenced by the strategies and operations in the market as well as non-market environments (Orlitzky, 2003) and the present study measures the firm performance with two dimensions including financial performance and operational performance.

HYPOTHESES

The hypotheses proposed in our research model consist of:

H_1: IT Investments will be positively related to innovation.

H_2: Innovation will be positively related to firm performance.

H_3: The impact of IT on innovation is moderated by firm growth factor.

H_4: IT impacts firm performance through the mediator innovation.

CONCEPTUAL FRAMEWORK

The purpose of this study was to determine the extent to which information technology (IT) improves innovation and its impact on firm performance. The research model shows in figure 1.

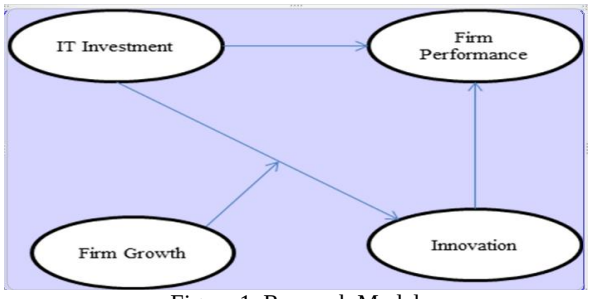

Figure 1, Research Model

As shown in Figure 1, the conceptual model developed for this study is based on the extent to which IT improves innovation and its impact on firm performance. This figure is the operational definition for the constructs in this study. The model also tested the impact of firm growth factors on the effectiveness of IT in improving innovation and performance. It explored the effects of increased innovation on financial and operating performance and the mediating effects of innovation on IT's impact on firm performance.

METHODOLOGY

Sample

The section of analysis for this study was a sample of the largest Iranian manufacturers from various industries. A total of 1500 managerial personal of Iranian manufacturing firms from various industries participate in this survey. These firms located in four provinces including: Tehran, Markazi, Esfahan and Yazd. A total of 1500 participant's submitted responses, resulting in a total of 1500 responses (n = 1500) in 300 companies that were included in this study's data analysis. The respondents were asked three questions relevant to their position to better understand the role of the participant in the companies. Table 1 provides further demographic information about this research.

Table 1. Sample demographics

Type of industry	Frequency	n	Percent
Automotive	40	200	0.13
Electronics and ICT	50	250	0. 17
Chemical	40	200	0.13
Food	40	200	0.13
Plastic	30	150	0.10
Pharmaceutical	30	150	0.10
Textile	20	100	0.07
Mechanical	20	100	0.07
Others	30	150	0.10
Total	300	1500	1.00

RESEARCH DESIGN

The research design for this study was quantitative method and data collected from an online survey. Quantitative data were collected for the majority of the questions using forced-choice rating and a rating scale.

SURVEY INSTRUMENT

The survey questions were developed by the researchers based on a review of the literature as presented in literature review section. The survey was completed by respondents.

The survey consists of four constructs: (1) Firm growth factor. (2) IT investment. (3) Innovation factor and (4) firm performance. All constructs contained quantitative questions with two optional open-ended questions at the end of the survey that obtained qualitative data. The first construct consisted of survey questions that collected data on firm growth. This item was selected in order to determine if it moderated the impact of IT on innovation. The second construct consisted of survey questions that collected data on the firm's use of IT in achieving innovation. This section was comprised of three questions that were rated using a 5-point Likert scale ranging from 1 (not at all) to 5 (very large extent). A 5-point Likert scale was used in the survey to achieve higher statistical variability among responses (Saraph, 1989). One of the three questions contained three sub questions to be answered using the same 5-point Likert scale. The third construct consisted of survey questions that collected data on the extent that IT budget improves innovation. This section was comprised of three questions, each with three to four sub questions that were also rated using the 5-point Likert scale. The fourth construct consisted of survey questions that collected data on the impact of innovation on firm performance. This section consists of one question with five sub questions. This question was rated using a 5-point Likert scale ranging from 1 (very negative) to 5 (very positive).

DATA COLLECTION

Survey Monkey's email invitation method was used to send a letter of invitation to participate in the study to 1500 potential participants at 300 firms. The letter of invitation explained the purpose of the research study, why they were chosen to participate, assured confidentiality of their responses, and advised them of their access to real-time survey results. The letter of invitation requested their voluntary participation in the study and provided the survey hyperlink to consent to participate and begin the survey. This link directed the participant to the informed consent. Upon consent, the participant was taken to the survey.

DATA ANALYSIS

Confirmatory factor analysis

A survey method approach was used to analyze the data collected. The quantitative data analysis consisted of reliability and validity analysis, descriptive statistical analysis, and inferential statistical analysis. Quantitative data analysis was conducted using SPSS software packages. The survey instrument was tested for reliability and validity on the three constructs: IT investment and Firm Performance (2 items). First, Confirmatory Factor Analysis (CFA) loadings were used to determine the content and construct validity of the IT investment, innovation and Firm Performance constructs. Construct validity, also referred to as content validity, determines how accurately the survey items measure the three constructs. Second, Cronbach's alpha test was used for internal consistency reliability of the IT investment, innovation and Firm Performance constructs. Cronbach's alpha test determines the relation of the items in the construct. If the individual survey items are sufficiently interrelated, their combination in comprising a single construct is justified for use in the study.

IT investment constructs. Table 2 presents the means, standard deviations (SD), Cronbach's alpha (α), and factor loadings for the IT Use construct. The IT investment construct had a Cronbach's alpha of 0.848, which represents good reliability. Validity of the IT investment construct was determined by measuring the construct/content validity. Researchers use factor loadings to evaluate the model fit of a construct. Researchers consider factor loadings below 0.4 as low and above 0.6 as high. The factor loadings of the IT investment showed high construct/content validity (IT2 = 0.775). In combination, the results of reliability and validity testing indicate that the IT Use construct has both high reliability and high content/construct validity in measuring the use of IT in firms to innovation.

Innovation constructs. Table 2 presents the means, standard deviations (SD), Cronbach's alpha (α), and factor loadings for the innovation construct. The innovation (INO) construct had a Cronbach's alpha of 0.936, which represents excellent reliability. Validity of the innovation construct was determined by measuring the construct/content validity of the construct. The factor loadings showed high construct/content validity ($INO = 0.8092$). The factor loading was significant at the 95% level ($p < 0.05$). In combination, the results of reliability and validity testing indicate that the innovation construct has extremely high reliability and extremely high content/construct validity in measuring the innovation of the firms.

Firm Performance constructs. Table 2 presents the means, standard deviations (SD), Cronbach's alpha (α), and factor loadings for the Firm Performance construct. The Firm Performance (FP1) construct had a Cronbach's alpha of 0.872, which represents good reliability. The Firm Performance construct has two sub constructs of financial measures (FP_{1a}) and operational measures (FP_{1b}). Both of these sub constructs also had good reliability with Cronbach's alpha of 0.827 and 0.676, respectively. Validity of the Firm Performance construct was determined by measuring the construct/content validity of the five items comprising the construct. The factor loadings of the sub constructs showed high construct/content validity (FP2 = 0.880 and FP6 =1.080). Additionally, the five individual Firm Performance items showed high construct/content validity ranging from 0.668 to 0.807. All factor loadings were significant at the 95% level ($p<0.05$). In combination, the results of reliability and validity testing indicate that the Firm Performance construct has both high reliability and high content/construct validity in measuring the performance of the firm.

Table 2. Reliability and Validity of IT Investment (IT), Innovation (INO), and Firm Performance (FP) Constructs

Construct	Sub Construct	Mean	SD	α	Factor
IT Investment (IT)		2.763	0.782	0.848	0.775
Innovation (INO)		2.968	0.826	0.936	0.809
Firm Performance (FP1)		3.660	0.589	0.872	-
	FP1a	3.648	0.618	0.827	0.880
	FP1b	3.680	0.660	0.676	1.080

Notes: Mean/SD of constructs measured along a 5-point Likert scale (1=low, 5=high). N = 1500. α = Cronbach's alpha test of internal consistency.

HYPOTHESES TESTING RESULTS

This section presents the results of testing the hypotheses. Hypothesis 1 and 2 were tested using regression analysis. Hypothesis 3 was tested using hierarchical regression analysis to determine if a moderating relationship existed between firm growth factor and IT impact on innovation. Hypothesis 4 was tested using causal steps strategy, product of coefficients, and bootstrapping. Regression analysis was conducted on (Baron, 1986): (1) dependent variable Firm Performance on the independent variable IT, (2) the mediating variable innovation on the independent variable IT, and (3) the dependent variable Firm Performance on the independent variable IT and mediating variable innovation. Significance was determined by Type I error rates less than p = 0.05 (two-tailed tests). Figure 2 presents the model of the hypotheses tested.

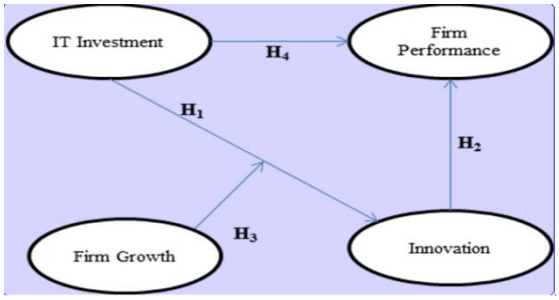

Figure 2 Hypotheses Model

Hypothesis 1: IT increases innovation.

To test this hypothesis regression analysis was conducted. Table 3 presents the regression analyses of innovation on IT investment. The regression analysis tested the relationship between the firm's use of IT and innovation to determine if IT increases innovation. The results of testing H1 infer that IT is a significant predictor of increasing innovation (Adjusted R Square = 0.485, t = 13.33, β = 0.722, p < 0.01). IT explains 48.0 percent of change in innovation Based on these results, the alternative hypothesis H_1 was accepted. In summary, the results of testing the hypothesis 1 suggest that IT is an important predictor of increasing innovation. The tests of this hypothesis provide strong support that IT increases innovation.

Table 3. Analysis of Hypothesis H1 as Tested Using Regression Analysis

Hypotheses	DV	IV	β	SE	*t*	*p**	R^2*(adj)*
H1	INO	IT	0.725	0.054	13.34	0.000	48.0%

Note. *Regression coefficient at $p < 0.01$ level.

Hypothesis 2: Innovation improves firm performance.

The following null sub hypotheses were tested:

H_2a: innovation improves firm performance in terms of financial measures.

H_2b: innovation improves firm performance in terms of operational measures.

Table 4 presents the regression analyses of innovation comprising the firm performance construct including its sub constructs of financial measures and operational measures on the innovation construct. The regression analyses tested the relationship between innovation and firm performance to determine if innovation improves firm performance. Additionally, the analyses tested the relationship of innovation on improving firm performance in terms of financial measures and in terms of operational measures. The results of testing H_2 infer that innovation is a significant predictor of improving firm performance (Adjusted R Square = 0.291, t = 8.92, β = 0.392, p < 0.01). Innovation explains 29.1 percent of change in firm performance. Based on these results, the alternative hypothesis H_2 was accepted. Hypotheses testing on the financial measures of firm performance (H_2a) infer that innovation is a significant predictor of firm performance. (Adjusted R Square = 0.224, t = 7.52, β = 0.360, p < 0.01). As a result, the null hypothesis of $H0_2$c was accepted. Hypotheses testing on the operational measures of firm performance (H_2d) infer that innovation is a significant predictor of improving firm performance (Adjusted R Square = 0.289, t = 8.89, β = 0.440, p < 0.01). As a result, the null hypotheses of $H0_2$d, was accepted. In summary, the results of testing null hypothesis 2 and its sub null hypotheses suggest that innovation is an important predictor of improving firm performance. Tests of this hypothesis and the related sub hypotheses provide strong support that innovation improves firm performance with powerful and comprehensive impacts on all measured aspects of financial and operational performance.

Table 4. Analysis of Hypothesis H02 and its Sub Hypotheses as Tested Using Regression Analysis

Hypotheses	DV	IV	β	SE	t	p*	R2(adj)
H2	FP	INO	0.392	0.044	8.92	0.000	29.1%
H2a	FP1	INO	0.360	0.048	7.52	0.000	22.4%
H2b	FP2	INO	0.440	0.050	8.89	0.000	28.9%

Note. *Regression coefficient at $p<0.01$ level. INO = Innovation, FP = Firm Performance, FP1 = Financial Measures (Firm Performance sub construct), FP2= Operational Measures (Firm Performance sub construct).

Hypothesis 3: The impact of IT on innovation is moderated by firm growth factor.

H_3 investigated the impacts of moderating variable firm growth factors. Table 5 presents the results of testing the combined firm growth infer that the impact of IT on innovation is moderated by firm growth factors. Specifically, a significant relationship was found between the IT impact on the innovation with moderator by firm growth (t = 2.29, β = 0.128, p < 0.025). In summary, the results of testing the hypothesis 3 suggest that firm growth (FG) is an important for increasing innovation. The tests of this hypothesis provide strong support that firm growth (FG) increases innovation.

Table 5. Analysis of Hypotheses H3 as Tested Using Hierarchical Regression Analysis

Hypotheses	DV	IV	β	SE	*t*	*p*	*R2(adj*
H3	INO	FG	0.128	0.034	2.29	0.025	50.5%

*Note.**Regression coefficient at p<0.01 level. INO= (Innovation construct), FG= Firm Growth

Hypothesis 4: IT impacts firm performance through the mediator innovation.

The mediating role of innovation was investigated to determine if this intervening variable explains how IT affects firm performance. That is, does IT impact firm performance through innovation? This hypothesis was tested using causal steps strategy, product of coefficients, and bootstrapping.

Table 6 presents the regression analyses for all three steps. As shown, a significant relationship was found between IT and firm performance, between IT and innovation, and between IT, innovation and firm performance as all p values were less than 0.05 for all three regression equations. Further, the coefficient of regression was lower for IT in the third equation (β = 0.229), than in the first equation (β = 0.403). That is, the impact of IT on firm performance is less when the mediation variable innovation is introduced into the regression equation. This suggests that innovation is a mediator. However, while the significance of the mediation effect is strongly suggested, it is not statistically tested.

Table 6) Causal Steps Strategy of H_4

Hypotheses	Step	DV	IV	β	SE	t	p	R2(adj)
H_4	1	FP	IT	0.403	0.046	8.73	0.000	28.1%
	2	FG	IT	0.725	0.054	13.34	0.000	48.0%
	3	FP	IT	0.229	0.062	3.71	0.000	33.5%
			FG	0.240	0.059	4.06	0.000	

Note. *Regression coefficient at $p < 0.01$ level.
FG = firm growth, FP = Firm Performance.

To test the significance of the mediating effect of innovation (indirect effect) the product of coefficients test was used. This test is based on the product of the indirect effects at a 5% level. As shown in Table 7, the results of the product of coefficients test confirmed the significance of innovation's indirect effects (β = 0.174; p < 0.01). That is, IT impacts firm performance through the mediator innovation. However, the product of coefficients test assumes the products of the coefficients is normally distributed, which is unlikely. The final step in determining innovation as a mediator for IT impact on firm performance was conducted using the nonparametric bootstrapping test (Preacher & Hayes, 2008). Five thousand bootstrap samples were used in this re-sampling procedure to estimate the empirical distribution of indirect effects and to determine the significance of the indirect effect. Based on this distribution, the regression coefficients, standard errors, and the percentile confidence intervals (95% level) were calculated. As shown in Table 7, the confidence interval was 0.082 to 0.266. Since zero is not within the confidence interval, the indirect effect is statistically significant at the 95% level. That is, the bootstrapping test confirmed that IT impacts firm performance through the mediator, innovation. In summary, the mediating role of innovation on IT impact on firm performance was investigated using three testing methods. First, causal steps strategy tested the direct effects of IT on firm performance, IT on innovation, and IT and innovation on firm performance. The results suggested a mediation effect. Next, the product of coefficients statistically tested the indirect effects, assuming a normal distribution, and confirmed the mediation effect. Finally, bootstrapping statistically tested the indirect effects by creating a distribution of the product of coefficients that also confirmed the mediation effect. Confirmation of the mediation effect by all three tests, causal steps strategy, product-of-coefficients, and bootstrapping, provides a robust confirmation of the mediating relationship of innovation on IT impact on firm performance. Based on the results of all three tests, H_4 was accepted. As the mediation results show, IT improves firm performance by improving the firm's innovation. This finding is most important to IT professionals who are concerned with how IT adds value to the firm (Sambamurthy, Bharadwaj, & Grover, 2003). The insights gained from the mediation effects of innovation suggest that IT deployments focused on improving the innovation to strategies for improving firm performance.

Table7. Mediation of the Effect of IT on Firm Performance through Innovation Product of Coefficients Bootstrapping

	Point Estimate	SE	Z	P-Value	Lower	95% CI Upper
Direct Effects						
IT	0.229	0.059	3.887	0.000*	0.113	0.326
INO	0.240	0.063	3.818	0.000*	0.117	0.363
Indirect Effects						
INO	0.174	0.047	3.703	0.000*	0.082	0.266

Not: 5,000 bootstrap samples. CI = confidence Interval. FP = Firm Performance; IT = Information Technology; INO = Innovation. $* p < .05$; $Z > 1.96$., Direct effects: dependent variable = FP (firm performance), independent variables IT and INO (Innovation).

IMPLICATIONS AND CONCLUSION

A large scale study with a larger sample size might provide a greater confidence in relation to the generalizability of the findings from the current research, the analysis and diagnostics employed in the study did not disclose any reason for concern in terms of the quality of the data. In spite of the modest sample sizes, the results are consistent with the theoretical assumptions and expectations. Making use of patents as measures of innovation can cause some limitations too. However, there is a long-lasting debate on the application of raw-patents counts as a measure of innovation productivity at the levels of firm, industry or economy (Archibugi, 1992; Cohen, 1989; Dosi, 1988; Griliches, 1998). In this vein, some critic have made argument that; 1) there are patenting discrepancies both at the national, international, industry, or economy level; 2) there are patenting differences between large and small corporations; 3) patents should not be treated equally ,weight should be assigned in accordance with the economic value of the patent; 4) patents are the end products of a complex R&D process that might lead to no patents but still offer a firm other supplementary intangible benefits; and 5) some patents take quite a long time to be fully developed and applied-for and consequently might not be directly connected with the IT investments overlapping their application or grant years. The findings of this study imply that IT enhances the innovation to granted patents through improving information quality in regard with adequacy, accuracy, accessibility, and appropriateness. IT also augments the innovation to patent citations. The results of the present study recommends that innovation contributes to and improves firm performance in relation to sales, profitability, market share, speed to market, and customer satisfaction, although in varying degrees. The results have the implication that IT influence on firm performance is through innovation. This proposes that firms should give priority to investments in IT that enhance the granted patents and patent citations to achieve a significant influence and impact on firm performance. The current study has also provided evidence that all items which are measured in innovation are significant.

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