

Study of the Effects of Investment in IT on Firm's Non-Financial Performance

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ABSTRACT

During the last decades the use of information technology/systems (IT/IS) has been increased significantly. The increasing use of IT has resulted in a need for evaluating the productivity impacts of IT. In this paper we study the effects of investment in information technology on non-financial performance of the firms. Non-financial performance was measured using three factors of productivity, coordination and information ability. The results showed that investment in information technology has positive effect on all sub-variables of productivity, coordination, and information ability except customer service in the productivity section and human resource in the coordination section.

Keywords— IT Evaluation, IT investment, non-financial performance, PLS

1. INTRODUCTION

The increasing development of Internet applications and the rapid development of new aspect of IT have formed a digital economy. In the digital economy age, knowledge has become key success factors for an enterprise, with the role of intangible assets in an enterprise. With aim of IT, business enterprise knowledge can be accumulated with more extensive and flexible manners. IT indeed increases opportunities of an enterprise to create the maximum value by using knowledge. Furthermore, Information technology (IT) has become a key enabler of business process reengineering if an organization is to survive and continue to prosper in a rapidly changing business environment whereas facing competition in a global marketplace. Generally, Information Technology (IT) has changed the ways of business enterprise operation and management.

Investment in information technology (IT) has grown continuously over the past years. Many organizations invested a considerable amount of money in various types of information systems in order to improve their organizational performance and competitiveness. Although businesses invest huge amount of intellectual and financial capital in a range of communication and information technologies and services, the results of some surveys revealed that some companies have started to freeze IT budgets because there are insufficient evidence of a return from the investments and IT applications seem to be simply a black hole [1]. The reason behind is that it is difficult for managers to demonstrate tangible returns on the resources expended to plan, develop, implement and operate computer-based information system (IS). Some frequently asked questions by the organizations are whether the investment in IT/IS is really worthwhile, whether the implemented IT application is a success, and whether the IT department functions productively. It is therefore necessary for an enterprise to evaluate its benefit of such investment. A reasonable and objective evaluation method is an

important issue to assist managers who manage their information resources, and make right IT investment decisions.

Over the years many methods and techniques have been suggested to evaluate the investments in IT/IS. However, well-known financial measures such as return on investment (ROI), internal rate of return (IRR), net present value (NPV) and payback period have demonstrated to be inadequate [2]. In the assessment of IT/IS investments, it is critical to understand how IT/IS contribute to the organizational and strategic goals, and evaluation methods that rely on financial measures alone are not suitable for IT applications.

Studies of evaluating the effects of IT investments may vary based on the period, the sample, and the industry [3]. Here we seek to investigate and study the effects of IT investments on non-financial performance among Irankhodro part-makers. The issue of the relationship between IT investment and organizational performance in a specific industry has been proposed by Huang and colleagues (2006) [4] as an opportunity to research. Now, we evaluate non-financial performance by using three variables such as productivity, coordination, and information ability. The main purpose of this study is to determine the relationship between IT investments and organizational performance. The main objective is not only to explore the effects of IT investments on what criteria of non-financial performance, but also the magnitude of those effects can be considered.

In section 2, we will mention the articles and done research in this field, and in the third section we illustrate the research model along with the research hypotheses. The next section would talk about the research methodology and how to collect the information, and in the fifth section, the data analysis and results and PLS software output may be considered. The last section we will present the conclusion.

2. LITERATURE REVIEW

For most of the past half-century, organizations have been increasing their investments in information technology (IT) [5], primarily because of the belief that IT has a significant positive impact on organizational performance. Many managers and researchers have been interested in determining the validity of this belief, and have conducted various studies. Some previous ones have attempted to examine the contribution of IT to output but in spite of the increased IT investment they have failed to show any evidence of IT's impact on productivity. Accordingly, the "IT productivity paradox" has been an issue debated by IS researchers for the past decade. In general, research on the relationship between IT investment and firm performance can be classified into three categories.

First, several researchers have asserted that there is no relationship between IT investment and organizational performance [6, 7, 8, 9]. Rather, they argue that IT investment could have a negative impact [10] on the productivity of an organization because of inefficient allocation of management resources. The elasticity of other management activities (e.g., marketing, research and development, advertising) and similar capital targeting on improving firm performance are greater than that of IT capital [11, 12]. In the worst case, as firms invest more in IT, there is a greater need for coordination between different activities and information systems across all functional areas of the organization [13].

The second research group has asserted that there is a significant positive relationship between IT investment and organizational performance. If firms invest more in IT, their performances correspondingly increase [14, 15, 16, 17, 18, 19]. Suggesting that further discussions are needed on the limitations of the studies, they have used various techniques and data to explain a positive relationship between IT investment and organizational performance.

The third research group has reported partial or mixed results, and explained possible reasons for the results [20, 21, 22, 23, 24, 25, 26]. They report that there is a positive relationship between IT investment and a range of firm performance variables whereas in some performance variables there is a negative relationship or effect.

3. RESEARCH MODEL AND HYPOTHESES

Fig. 1 shows the research model. As it can be seen in this model, we seek find out a relationship between investment in IT and firm's non-financial performance. Non-financial performance was measured by using three parameters such as productivity, coordination, and information ability.

According to Shao and Lin (2001) [27] investments in information technology have an efficient impact on a firm's production process, where, in contrast, Ko and Bryson (2002) [28] found out IT implementation has not improved a firm's productivity as it was designed and expected to do, but still a connection between IT impacts on firm's functions and costs and firm's performance existed. Moreover, Hitt and Brynjolfsson (1996) [29] found evidence that spending in information technology might lead a firm's productivity to a higher level. Furthermore, Kling et al. (2001) [30] stated that information technology investments improve a firm's performance directly by giving solutions to critical coordination problems as they become more complex and interdependent. Also, Gurbaxani and Shi (1992) [31] stated that information systems might simplify firm's functions and improve a firm's coordination ability. Additionally, Bruque-Camara, Moyano-Fuentes, Hernandez-Ortiz, and Vargas-Sanchez (2003) [32] argued that a firm's information ability improves by IT implementation and can lead the organization to higher levels of performance, as Poston & Grabski, (2001) [33] also pointed out [34].

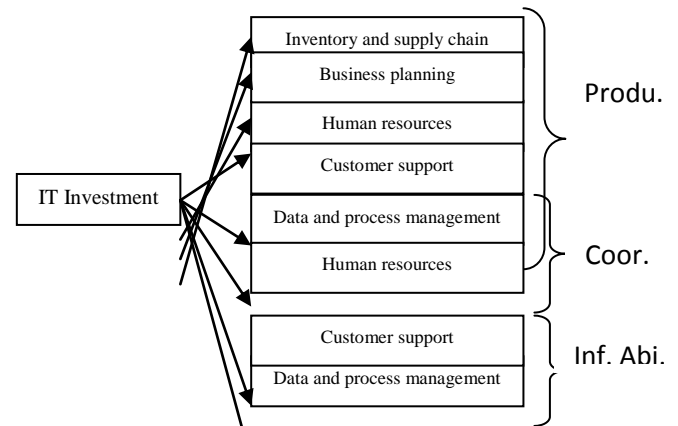


Figure 1. The conceptual model of research

By studying the relevant research, we could identify the subgroups of the three parameters of non-financial performance. They can be seen in table 1.

TABLE I. Variables Measuring Firm's Performance

Factor	Attribute	Variable
Productivity	Inventory and supply chain	Supply communication
		Delivery time
		Inventory
	Business planning	Manufacturing cost
		Labor cost
		Produced output
		Manufacturing ability
		Sales
		Intensity of rivalry
		Privileged information
Human resources	Bargaining power with suppliers	
	Bargaining power with buyer	
	ROI	
	Total output	
	Improved employees' computer skills	
	Increased staff needs	
	Employees' adoption of new technology	
	Employees' ability to solving problem	
	Team skills	
	Customer support	Product quality
Customer returns		
Defected rates		
Coordination	Data and process management	IS openness
		IS reliability
		IS scalability
		Data reusability
		Data portability
		Data updating
		Data management
		Security breaches
		Data availability
		On-line ordering
IT integration	IT integration	
	Data processing	

		Program processing
		Security costs
Human resources		Team scheduling
		Team support
		Employees' respect for the company
		Employees' trust for the company
		Employee needs satisfaction
		Employee opportunities enhancement
		Employee interest for their job
Information ability	Customer support	Question reply
		Complaints response
		Helpful information
	Data and process management	IT equipment reduction
		Data capturing time reduction
		Data flood reduction
		Data report submission
		Internet use
		Filtering data
		Capturing data
		Useful information
		New data flow
		New computerized production

Source: Chatzoglou and Diamantidis(2009)

Therefore, according to research model, we aim at studying the three following hypotheses:

H1: Investment in information technology has a positive effect on organizational productivity.

H2: Investment in information technology has a positive effect on organizational coordination.

H3: Investment in information technology has a positive effect on the information ability.

4. METHODOLOGY

The survey was carried out in Tehran's Iran Khodro part-makers. Totally, there are 160 Iran Khodro part-maker in Tehran and its suburbs. A questionnaire was used for collecting data. The questionnaire was designed based on the research literature and table 1 that included 5 sections. The first section was about the general questions related to the company such as company's name, name of product, the number of employees. Second section concerns investment firms in their information systems. The other three sections consist of several questions using 5-point Likert scales ranging from 1 (very low) to 5 (very high). The next section contains questions concerning firm's productivity, gathering data about firm's business planning, inventory and supply chain, product quality and employee skills and abilities. Section four examines firm's coordination as far as data and process management and employees are concerned. Further, section five deals with firm's information ability, measuring items such as Internet usage, data capturing and flow and the provision of customer information.

The questionnaire was sent to 100 part maker via mail, and then the necessary administration information was given to them over the phone or in person. Finally, we had received 34 useful questionnaires (34% rate of return.)

5. DATA ANALYSIS AND RESULTS

A. PLS Path Modeling

After collecting data, we employed PLS Graph software to analyze data and verify the accuracy of our model. PLS is a structured equation modeling technique that can analyze structural equation models (SEMs) involving multiple-item constructs, with direct and indirect paths. PLS works by extracting successive linear combinations of the predictors and is effective in explaining both response and predictor variation. PLS is a powerful approach for analyzing models because of the minimal demands on measurement scales, sample size, and residual distributions. In addition, the component-based PLS avoids two serious problems, inadmissible solutions and factor indeterminacy. SEM approaches, such as LISREL and AMOS, are not able to deal with non-normal distributions, and they can yield non-unique or otherwise improper solutions in some cases. PLS is not as susceptible to these limitations. The emphasis of PLS is on predicting the responses as well as on understanding the underlying relationship between the variables. For example, PLS is very useful in screening out factors that have a negligible effect on the dependent variables.

B. Structural Model

Fig. 2 shows the research structural model that has been attained from the output of PLS graph software. In every direction, there are two numbers in which the first number indicates the path coefficient and the number in the parenthesis represents t value. In addition, RSq shows the effectiveness of the independent variable on the dependent variable. For instance, one unit change in investment variable will change the customer support variable in information ability section for 0.179. In this model, all the relations are confirmed except the investment effect on customer support in productivity section and human resources in coordination section. There is a negative relationship between investment in IT and human resources in coordination section. Also, investment in IT don't affect customer support in productivity section.

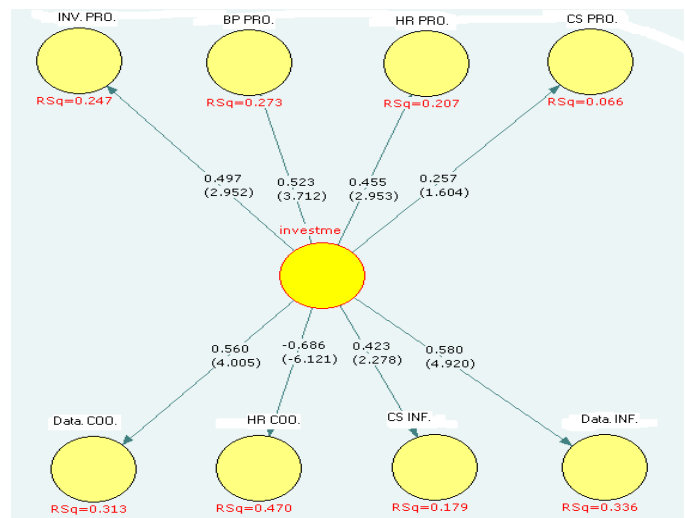


Figure 2. The structural model using PLS graph

6. CONCLUSION

In this study, we tried to find out the effects of investment in IT on non-financial firm's performance. From a managerial perspective, it would be meaningful to understand the way the information technology implementation affects a firm's performance variables. This study was performed in part-making companies that are located in Tehran and its suburbs. Fig. 2 shows the relationship between investment in IT and the variables of productivity, coordination and information ability.

As it can be seen in Fig. 2, a negative relationship exists between investment in IT and human resources in coordination section. Human resources have been measured using items such as creating job opportunities, increasing employee's respect and trust in the company. This shows that information technology has been lost in creating job opportunities and increasing employee's respect and trust for the company in the studied population. The reason could be explained by the removal of job opportunities because of automation and of limited number of employees as a result of using information technology in Iran-Khodro's part maker firms.

Fig. 2 also shows that investment in IT doesn't affect customer support in productivity section. The variable of customer support in the productivity section was measured using quality of the product, the rate of defective products and customer returns rate. Thatcher (2001) [37] demonstrate that investments in technologies that reduce the firm's fixed overhead costs do not affect the firm's product quality. This section of results confirmed the productivity paradox which has been reached by several other articles [6, 35, 36].

Despite the negative relationship between IT investments and human resources in coordination section and lack of relationship between IT investments and the customer support in productivity section, the overall relationship between IT investments and productivity, coordination and information ability is confirmed. Fig. 3 shows the structural model of these relationships and according to the path coefficients and *t* values it can be concluded that investment in IT resulted in improvement of productivity, coordination and information ability. To sum up, therefore we can assert that more investment in technology and information systems will improve the performance of non-financial companies.

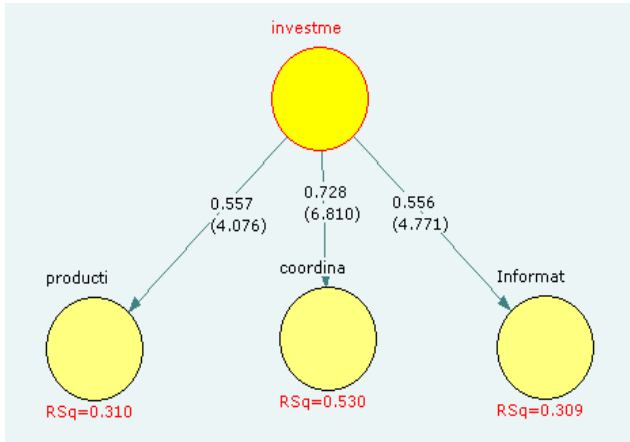


Figure 3. output PLS

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