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The Investigation of the Impact of Information Technology on Profitability, Productivity and Customer Satisfaction in Manufacturing Firms

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ABSTRACT

Profitability, Productivity and customer satisfaction are important economic factor which has a key roles in evaluating the economic growth. It is identified as the foundation for economic prosperity, a prerequisite for national development and also an important indicator of organizational competitiveness. Use of Information technologies (IT's) is increasing day by day in manufacturing firms all over the world. Investment in IT is helping the top level management in achieving their objectives and anticipated targets. This empirical study reveals the contribution and role of IT on the efficiency of firms and also explores the existence of relationship between the investment in IT and firms efficiency measures. The result shows that investment in information system is contributing towards increase market share, reducing operating cost, improved customer services and assisting the firms in introducing new products and services. These are the major benefits of investment in IT which are propelling many firms to invest in IT. That is the reason that most of the organizations in Iran are using the IT as competitive tool.

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INTRODUCTION

Today, information technology (IT) is advancing rapidly and studies at an extensive level try to establish a better perception of attributes of productivity growth especially multi-attribute growth of productivity. Machines with high quality (more advanced) create more capital services (in the efficiency unit) than older equipments. One of the conducted studies in this regard illustrates that there is a direct relationship between investment in advanced technology and applying human force with high skills. In addition, such studies reveal that there are strong relationships among various actions of the organization and information technology attributes. They show that information technology, organizational actions and interaction of these two have positive impacts on productivity.

To improve their customer satisfaction, firms are making greater use of IT tools in their internal and customer facing business processes. Managers consistently rank "improvement in customer satisfaction" as one of the prime motivations for making IT investments. Significant investments in IT applications in recent years indicate the industry belief that IT applications can streamline both internal and customer-interfacing business processes (Chopra and Meindl 2003)

Profitability, Productivity and customer satisfaction are important economic factor which has a key roles in evaluating the economic growth. It is identified as the foundation for economic prosperity, a prerequisite for national development and also an important indicator of organizational competitiveness (Dedrick *et al.*, 2003).

The role of information technology in revitalization of economic growth experienced in many developed industrial companies became more important by both academicians and policy-makers groups in the second half of the 1990's. Such technologies directly impact in advancement of economic growth. Information technology is important economically for two reasons according to the European Association Committee (2001). First, it makes acceptance of innovation and organizational

changes very easily in factories. Second, they change competition status and structure of the market especially added competition arising from lower obstacles and creating new policies to deliver productions and services. In viewpoint of information technology economists have performed the highest search and

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examination during the two recent decades regarding the economic reaction of investment from this kind of technology (Badescu & Garcés-Ayerbe, 2009).

Customer relationships have emerged as a critical asset for firms, because the locus of power across industries and businesses is increasingly shifting towards customers. Firms are moving from a product-centric model to a customer-centric model to sense and meet customer demands for changes in the features of products and services, distribution channels, and pricing structure (Prahalad and Ramaswamy 2004). Customer satisfaction and customer retention have emerged as key metrics for measuring the effectiveness of IT systems and the competitive success of firms (Agarwal and Venkatesh 2002).

Much of the empirical research in business value of information systems focuses on the effect of IT expenditures on tangible measures of firm performance such as productivity or market value (Bharadwaj and Konsynski 1999)

The revolution in information technology (IT) and information system (IS) is bringing a drastic change in manufacturing, trading and service industry all over the world. It opens the new horizons for business enterprises and enables them to carry out their commercial activities by using advance technologies. Even in large commercial projects, IT is used to identify, measure, monitor and control the potential risk, to meet its strategies & objectives and it has also positive impact on time. (Teymouri and Ashoori, 2011).

The objectives of our empirical study are to explore the results about the type of technologies which is being used by mostly firms in Iran having impact on firms efficiency and performance. Different firms are using different type of technologies and how these technologies are contributing towards organizational goals.

1. Methodology:

1.1. Previous Research:

Lin and Chiang (2011) studied the impacts of country characteristics on information technology as measured by productive efficiency. They investigated information technology (IT) contribution at a country level by linking it to the complementarity/substitutability phenomena created by the presence of IT and the five national characteristics. The results indicated that the IT productivity paradox happens in not only developing countries but also developed countries. Based on their results, Eastern European countries could gain more productive efficiency than the G7 countries when IT was considered as a production factor.

Bresnahan, Brynjolfsson and Hitt (2002) surveyed about 300 large firms to obtain information on organizational practices and worker characteristics and combine the survey data with a panel detailing ICT capital levels and mix over the 1987-1994 period. The major findings include: skilled labour is complementary with a cluster of three distinct changes at the firm level: ICT, new work organization, and new products and services; and interactions between ICT, new workplace practices and human capital positively predict firm productivity. Firms that adopt decentralized organizational structures do appear to have a higher contribution of ICT to productivity

Empirical evidence suggests that organizational changes may improve economic performance of firms through their mutually-reinforcing relationship with ICT. The OECD (2002) argues that ICT is key to facilitating new organisational approaches, from lean production, to teamwork, to customer relations. ICT enable firms to introduce significant organizational changes in the areas of re-engineering, decentralisation, flexible work arrangements and outsourcing. It allows firms to produce with greater flexibility and with shortened product cycles to satisfy shifting consumer preferences. In fact, organisational innovation and ICT may be regarded as complementary factors. To be successful, firms typically need to adopt

ICT as part of a "system" or "cluster" of mutually reinforcing organizational approaches (Milgrom and Roberts, 1990).

Jacks *et al* (2011) investigate information technology (IT) business value, IT capabilities, and competitive advantage for the companies. Researchers are calling for a more coherent understanding of the firm-level impacts of IT, and how those firm-level impacts can be measured. The purpose of his study is to investigate the multitude of organization-level studies of the impact of IT. His research findings are synthesized into an overarching framework of the impact of IT at the organization level. The framework categorizes measures of the impact of IT into productivity, profitability, and intangible benefits, while the antecedents of IT impact are categorized into IT resources, IT capabilities, IT/business alignment and external factors.

A recent study by Brynjolfsson and Hitt (1998) explores the relationship between computers and *productivity growth*. The study uses data that included more than 600 large U.S. firms over the period 1987 to 1994. The findings show that computers make a positive contribution to output growth. More interestingly, the study concludes that, "as a general purpose technology, the pattern of growth contribution appears to suggest that computers are a part of a larger system of technological and organizational changes that increased productivity over time."

Gikandi *et al*. (2009) investigate the factors that influence the adoption and effectiveness of IS and IT in retail banking sector in Kenya. Two surveys were carried out (Initial and follow-up) in the years 2005 and 2009, respectively, which involved banks controlling approximately 90% of formal retail banking in Kenya. The

purpose of the follow-up surveys is to monitor the trends in 4 years (2005 – 2009). The result of his research shows that there was a drastic shift in the importance attached to some emerging information technologies between years 2005 and 2009. From the study the researcher concludes that application of IT infrastructure has matured in developed countries, it would be expected that banks in developing countries would learn some lessons the developed countries and be spared some of the uncertainties undergone by their counterparts in technological development.

Davis *et al.*, (1989) investigated that perceived usefulness and perceived ease of use are the fundamental elements of perception introducing new technologies. He clarify the meanings of Perceived usefulness is defined as the extent to which a person believes that using a particular technology would enhance her/his job performance while perceived ease of use is the degree to which using IT is free of effort for the user.

Sohn and Moon (2003) used structural equation model for predicting technology commercialization success index (TCSI). They implemented a structural equation model (SEM) to predict the TCSI associated with technology developer and receiver, technology transfer center, and environmental factors. The proposed SEM was fitted based on partial least square (PLS) estimation procedure and independent TCSI was used for American customer satisfaction index (ACSI) for different combinations of characteristics of the mentioned items. They expected that the proposed approach for TCSI could be implemented as guidance for an ideal match of technology with technology developer and technology receiver.

Lee *et al.* (2011) investigated the impact of service R&D on the performance of Korean information communication technology small and medium enterprises. Lin (2009) investigated the business value of information technology as measured by technical efficiency. Their results indicated that IT spending had not been able to increase technical efficiencies of individual countries and that given technological changes, the so-called productivity paradox could exist in a country, no matter whether it is a developed or developing nation.

1.2 Hypotheses :

Regarding the research elements, research hypotheses are presented as follows:

H1: Information technology increases firms profitability.

H2: Information technology increases firms productivity.

H3: Information technology increases firms customer satisfaction

1.3. Research Method:

This research has a measuring, descriptive and applied methodology. All questions were close-ended. Moreover 5-point Likert Scale is used in some questions and all were quite relevant to the study. Our respondents were neither the

end users of technology nor the customers instead we have selected the ISM (Information System Manager) or CIO (Chief Information Officers) as our respondent as they are more relevant having suitable exposure, knowledge and understanding about the system. The questions in the questionnaire covered all the aspects about technology including technology profile, usage, perception etc. The T tests were employed to reject or confirm the hypotheses.

1.4. Research Variables:

Typically three variables were selected to prove the hypothesis. They are profitability, productivity and customer

Satisfaction As They Are Also Used In Hypothesis:

1.5. Validity and reliability of measurement tools:

We have used Cronbach's alpha test to verify the reliability of the survey questionnaire and to test its validity using confirmatory factor analysis. Cronbach alpha for IT, profitability, productivity and customer Satisfaction were 0.96, 0.841, 0.88 and 0.91, respectively and an overall Cronbach alpha was 0.906. As we see, Cronbach's alpha values of all variables are greater than 0.7, which validates our results. On the other hand, all load IT, profitability, productivity and customer Satisfaction relationship factors were greater than 0.5 and based on the results we can conclude that the questionnaire has good reliability and validity

1.6 .Sample and Scope of the research:

So in the sample of our population efforts were made to know whether the management of the firms feels that their

investment in IS and IT is advantageous to their institution in financial and non-financial terms. Statistical population of this research included 100 firms working in manufacturing firms. The sample size of the survey has been calculated as follows,

$$n = \frac{N \times z_{\alpha/2}^2 \times p \times q}{\varepsilon^2 \times (N - 1) + z_{\alpha/2}^2 \times p \times q}$$

where N is the population size, $p = 1 - q$ represents the yes/no categories, $z_{\alpha/2}^2$ is normal distribution and finally ε is the error term. Since we have $p=0.5$, $z_{\alpha/2}^2=1.96$ and $N=100$. the number of sample size is calculated as $n=60$

2. The Results Analysis:

Table 1: T-Test results of the first hypothesis.

Test value=3					
T	Freedom degree	Significance degree	Average difference	Reliability difference %95	
				Low degree	High degree
14/66	58	/000	1/560	1/483	1/782

The first hypothesis is associated with the impact information technology on increases firms Profitability and as we can observe t-student is meaningful when the level of significance is 0.01. Based on the result, we can conclude that as an increase on IT efforts will lead us to have the same increase on profitability. T-Test has been used to examine this hypothesis and the test statistic has been calculated as; $T=14/66$ which, comparing with the critical amount, is at critical point. So the reliability level of %95 has been rejected and the research hypothesis confirmed.

Table 2: T-Test results of the second hypothesis.

Test value=3					
T	Freedom degree	Significance degree	Average difference	Reliability difference %95	
				Low degree	High degree
13/80	58	/000	1/440	1/385	1/586

The second hypothesis is associated with the impact information technology on increases firms Productivity and as we can observe t-student is meaningful when the level of significance is 0.01. Based on the result, we can conclude that as an increase on IT efforts will lead us to have the same increase on profitability. T-Test has been used to examine this hypothesis and the test statistic has been calculated as; $T=13/80$ which, comparing with the critical amount, is at critical point. So the reliability level of %95 has been rejected and the research hypothesis confirmed.

Table 3: T-Test results of the third hypothesis.

Test value=3					
T	Freedom degree	Significance degree	Average difference	Reliability difference %95	
				Low degree	High degree
12/66	58	/000	1/112	1/051	1/292

The Third hypothesis is associated with the impact information technology on increases firms Customer Satisfaction and as we can observe t-student is meaningful when the level of significance is 0.01. Based on the result, we can conclude that as an increase on IT efforts will lead us to have the same increase on profitability. T-Test has been used to examine this hypothesis and the test statistic has been calculated as; $T=12/66$ which, comparing with the critical amount, is at critical point. So the reliability level of %95 has been rejected and the research hypothesis confirmed.

Conclusion:

In this paper, we to asses the impact information technology on three variables on in Iranian manufacturing firms. the hypothesis was constructed that IT increases firms profitability, productivity, and customer satisfaction. respondents are agreed that IT puts a positive impact on profitability, productivity and customer satisfaction respectively. The proposed study of this paper used a standard questionnaire and using structural equation modeling selected a sample of study from the groups of manufacturing firms in Iran On the basis of these results we will accept null hypothesis and which was contrary to that. firms are using IT in order to introduce innovative products, increased market share, increased profitability and productivity and better customer services.

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