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THE EFFECTS OF INFORMATION TECHNOLOGY IN SUCCESS OF KNOWLEDGE MANAGEMENT PROCESSES

***Farzad Afrooz¹ and Fereshteh Shiri²**

¹*Department of Information Technology, E-commerce*

²*Department of Information Technology, Qazvin Islamic Azad University*

**Author for Correspondence*

ABSTRACT

Many enterprises have applied IT in order to cut production costs, introduce innovations in products and services, promote growth, develop alliances, lock in customers and suppliers, and create switching costs and raise barriers to entry. In other words, IT can help a firm aiming to gain a competitive advantage. In addition, many studies have argued that business value comes mainly from intangible assets, such as knowledge. This paper examines the impact of information technology on knowledge management processes. The sample was drawn from 20 Firms in Iran. A factor analysis using varimax rotation with principal components and linear regression were applied to test the research hypotheses. Knowledge management was analyzed with IT applications. The results show that information technology has significant effects on Success of knowledge management processes. This paper concludes with a discussion of the implications and limitations of the research.

Keywords: *Information Technology, Knowledge Management, Development, Competition, Globalization*

INTRODUCTION

In recent years, the rapid advancement of technology has been accelerating a global transformation of the competitive environment. This technological revolution signals the dawn of a new era. Thus, traditional organizational management is no longer considered an appropriate strategy in current competitive markets. Consequently, businesses must compete for their survival through continuous improvement and innovation. Today, the competitiveness of the firm relies less on traditional factors (capital, land, and labor) than was true in the past. Knowledge now appears to be replacing these traditional factors. Moreover, knowledge will become not just a source of competitive advantage but the only source of it (Drucker, 1993). Within the wide discussion on the approaches for managing knowledge in organizations, information technology (IT) is often mentioned as one of the anchors for knowledge management activities (Alavi and Leidner, 2001; Nonaka and Takeuchi, 1995). As the product development process is a knowledge intensive work, IT may be considered as an advanced tool that enhances the volume of data, information and knowledge that can be processed throughout the product development process (Nambisan, 2003). The application of information technology (IT) is an important driving force behind many socioeconomic changes. In trade and industry, the application of IT stimulates innovation in all possible fields. Companies can thus offer their customers a faster, more individual and reliable product or service on a more regular basis. Often the entire internal labor and organizational structure of a company has to be transformed into a flatter and more flexible organization in order to realize such innovations. A conceptual framework is developed that assists in analyzing the relationship between technology, innovation, and firm performance. It is argued that the performance implications of new technologies, such as information and communication technologies, are mediated by innovative activities that result from the adoption of these technologies. Furthermore, the performance implications can vary across different types of innovation, depending on firm-internal and market-specific factors.

IT plays a critical role in product development, as its allowance ranges from the transaction, storing, and processing of explicit knowledge to the facilitation of people networks, coordinated interfaces, and collaboration for the flowing of tacit knowledge (Van Den Brink, 2003). Following Van Den Brink (2003), this study defines two main IT dimensions in term of intentionality or purpose of technology use: the divergent dimension -focused on having information and explicit knowledge components online,

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indexed and mapped, with easy access to be retrieved – and the convergent dimension- focused on enhancing analysis and discourse while supporting a virtual network that is not constrained by barriers of time and place. The technology element of knowledge infrastructure comprises the information technology (IT) systems that enable the integration of information and knowledge in the organization as well as the creation, transfer, storage and safe-keeping of the firm's knowledge resource. Although an appropriate technology infrastructure is essential for effective knowledge management, studies that examine the link between information technologies and measures of organizational performance are often inconclusive, and fail to demonstrate whether IT is directly related to performance (Powell and Dent-Micallef, 1997; Webb and Schlemmer, 2006). This information leads to several assumptions. First, the information is critical to the operation of the business. Any loss or damage will prove fatal to the business continuity. For example, lost of sales information can cause the loss of customers and revenue. Another assumption involves the companies desire to keep only important information. Retaining obsolete or miscellaneous information will reduce efficiency and effectiveness of the KM. Lastly, there must be senior management commitment to the implementations and use of KM. Without this support, any KM project is doomed from the start. Employees need to see that the company and senior management see this as a major project and needed. A way of accomplishing this is by including knowledge management as a company objective or goal. Thus, employees will provide greater support and help make the KM project a big success.

Literature Review and hypotheses

Knowledge Management Capability

Knowledge is one of the most strategically important resources that firms can acquire (Quinn, 1992). Choi and Shepherd (2004) suggest that managerial capability can refer to a firm's skills, knowledge, and experiences, which are used to handle difficult and complex tasks in management and production. Knowledge management capacity has been recognized as a key factor for gaining and sustaining a competitive advantage (Corsoa *et al.*, 2006; Rezgui, 2007). Knowledge integration within the organization is the process of translating the raw knowledge into actionable knowledge by means of an acute understanding of the business context. Knowledge integration is defined as creating, transferring, sharing and maintaining information and knowledge. Knowledge integration is the task of identifying how new and prior knowledge interacts while incorporating new information into a knowledge base (Wijnhoven, 1999). Knowledge acquisition, as a fundamental and essential process of individual and organizational learning (Nonaka, 1994), refers to the process of acquiring knowledge from external sources and making it suitable for subsequent use (Holsapple and Singh, 2001). Karim and Mitchell (2000) examined acquisitions activity as a mechanism by which firms change their mix of resources. It has been shown that a firm should find some middle ground that allows their employees to remain creative (Holsapple and Joshi, 2002).

KM practices are defined here as “observable organizational activities that are related to knowledge management”. Four key dimensions of KM practice were identified from the literatures that appear to relate to performance:

1. The ability to locate and share existing knowledge;
2. the ability to experiment and create new knowledge;
3. A culture that encourages knowledge creation and sharing; and
4. A regard for the strategic value of knowledge and learning.

Information Technology

IT, in its nascent business world form, was generally considered a support tool. But as time passed and technological sophistication grew, IT's usage and impact increased dramatically. This pattern of progress may be due to advancement of technology. But a technological diffusion or infusion may be attributable to the fact that IT's introduction into an organization creates further technological needs and encourages product and policy innovation meet such needs. In prior years, IT had been viewed only as a supporting player within the overall strategy of the firm. Automation was, for example, limited to existing organizational functions. But opinions have changed with the emergence and successful implementation

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of IT innovations. IT also acts as a facilitator because the design of a new operation may necessitate the creation of a new product. The availability of IT in this case serves as a facilitator. In other words, IT can be viewed as a part of the product itself by virtue of increasing the electronization of products and is frequently used to do things that could not be done before. In recent years, the rapid development of information technology has made it easier for employees, customers, suppliers, and partners to interact while carrying out each of their business functions; moreover, cross-function collaborations become feasible in product development, marketing, distribution, and customer service. That is, IT does not merely support efficient business operations, workgroup task and collaborations, and effective business decision-making; but they also change the way businesses compete (Ruiz-Mercader *et al.*, 2006). IT concepts are pervasive in the current business environment, yet its definition also contains certain intangible aspects.

Information Technology for Knowledge Management and Innovation

There is an ongoing lively debate about the role that information technology can play for knowledge management. On the one hand, information technology is used pervasively in organizations, and thus qualifies as a natural medium for the flow of knowledge. A recent study from the American Productivity and Quality Center shows that organizations embarking in knowledge management efforts generally rely, for accomplishing their goals, on the setting up of a suitable IT infrastructure (AP&QC 1997). At the other end of the spectrum, leading knowledge management theorists have warned about the attitude that drives management towards strong investments in IT, possibly at the expense of investments in human capital; see for instance (Sveiby, 1997). While realizing the capability that IT provides for creating networks, with respect to tacit versus explicit knowledge, historically, information technology has had the net effect of making knowledge more explicit. This is done in order to facilitate more rapid transmission (e.g. by the use of email and Web pages) Standardized decision-making procedures (e.g. through the use of decision support systems), or codify knowledge (e.g. through the use of expert systems). Indeed, accounting systems where information technology was first widely applied involved extremely explicit rules and procedures (McKinney *et al.*, 1997). The analysis of the role of information technology in the design and development of knowledge management initiatives especially came from practitioners – first of all consultant companies. Researchers looked at the contribution of those systems to organizational memory (Anand *et al.*, 1998; Stein and Zwass, 1995), defining information technology as the technical view of organizational learning (Huber, 1991): information technology “can contribute to sustain competitive. IT plays an important role in determining the success or failure of the implementation of KMS (Johannessen *et al.*, 2001). Technological innovation in a company or in a branch of industry depends on the interaction between a numbers of factors. One of these is the standardization of products and processes. This may lead to an increase in scale and mechanization. Moreover, standardization leads to time saving since the wheel does not need to be invented again and again. Based on these standards, individual companies will therefore have increased opportunities for further shifting competition through differentiation and specialization. Building on the understanding of the innovation process as a collaborative process, ICT technologies to facilitate communication between individual actors and their tools have been proposed and implemented, principally for the engineering design phase (Christensen *et al.*, 2003; Sethi *et al.*, 2003). An effective IT infrastructure, KM can maximize the return on organizational knowledge through continuously creating, accumulating, and sharing it.

Types of IT Application

We determined whether the following 17 types of IT application were in place or not: employee competence databases (Model 1), groupware for discussion (Model 2), expert networks (Model 3), case-based experience databases (Model 4), e-mail (Model 5), document management (Model 6), on-line knowledge search (Model 7), data warehousing (Model 8), on-line learning (Model 9), workflow (Model 10), decision support systems (Model 11), enterprise portal sites (Model 12), teleconferencing (Model 13), exogenous professional databases (Model 14), enterprise resource planning (Model 15), supply chain management (Model 16), and customer relationship management (Model 17) (Shera and Leea, 2004).

Based on the literature review and research objectives, the following hypothesis was derived:

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H1. Information technology is positively related to knowledge management processes.

MATERIALS AND METHODS

Research Methodology

Sample

The questionnaire was designed with the independent and dependent variables in mind. All measurements of the questionnaire are designed according to relevant literature and verified by a panel discussion of a group of five experts. A seven-point Likert scale was used to measure research variables. Data was collected through a structured mailing. The sample was drawn from 20 Firms in Iran. Each company received seven questionnaires to answer.

Assessing Reliability

The reliability of the measurements in the survey was tested using Cronbach’s α . Cronbach’s α for the 12 measurements of KM was 0.82, demonstrating a high reliability for the measurements, taking a reliability value of 0.7 as the minimal standard (Hair *et al.*, 1998).

RESULTS AND DISCUSSION

Analysis and Results

A factor analysis using varimax rotation with principal components was applied to reduce the 12 measurements of knowledge management (see Table 1). Linear regression was then applied to test the research hypotheses. Knowledge management was analyzed with IT applications, (see Table 2). All of the regression models suggest that there is a significant influence of knowledge management. Thus, hypotheses H1 were strongly supported by our empirical results. These findings are consistent with conventional wisdom on the importance of KM for business excellence and strategic advantage.

Table 1: Factor analysis of the application of IT in knowledge management

Measurements of knowledge management	Knowledge management
IT reduces uncertainties of knowledge loss	0.625
IT reduces dependence on specific personnel	0.712
IT is comprehensively utilized by members in organization	0.456
IT is comprehensively constructed in organization	0.542
Top management is capable of applying IT	0.706
Members in organization apply IT to search and use current organizational knowledge	0.651
Members in organization apply IT to create new knowledge	0.492
IT facilitates acquisition of supply chain knowledge	0.547
IT facilitates acquisition of marketing knowledge	0.714
IT facilitates processing of supply chain knowledge	0.643
IT facilitates processing of marketing knowledge	0.517
IT infrastructure is congruent with corporate strategy	0.627
Eigenvalue	5.40
Variance	31.5%
Cumulative variance	56.7%

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Table 2: Linear regression models

Model	Constant	KM	F	R ²
1	-0.255	3.32**	14.36***	0.303
2	-0.248	2.25**	16.58***	0.351
3	0.324	3.53**	14.46***	0.305
4	0.210	3.25**	14.58***	0.312
5	0.312	3.63**	15.21***	0.334
6	0.154	2.14**	14.22***	0.301
7	-0.242	3.64**	16.16***	0.345
8	-0.242	2.46**	14.62***	0.314
9	-0.162	4.83**	15.66***	0.339
10	-0.214	3.36**	15.38***	0.336
11	-0.146	2.73**	14.76***	0.327
12	0.412	3.62**	16.56***	0.348
13	-0.365	2.25**	14.86***	0.337
14	0.112	4.73**	14.46***	0.305
15	-0.254	2.35**	16.26***	0.344
16	0.142	3.73**	14.51***	0.309
17	-0.214	3.45**	15.86***	0.340

Note: *t*-values with significance levels are presented in parentheses along with knowledge management coefficients. * $P < 0.1$. ** $P < 0.05$. *** $P < 0.01$.

Discussion and Conclusion

The implication is that knowledge can never be effectively shared through IT that involves a static repository-such as an intranet – because as static information, such knowledge can never convey the richness of the context in which it was applied. This paper examines the impact of information technology on knowledge management processes.

The results show that information technology has significant effects on Success of knowledge management processes. This paper concludes with a discussion of the implications and limitations of the research. In the Iranian case, implementation of an IT application reduced the inventory lead-time from seven days to less than one day. Accuracy of information also improved as well as the marketing support to the firm’s offices worldwide. Many enterprises have applied IT in order to cut production costs, introduce innovations in products and services, promote growth, develop alliances, lock in customers and suppliers, and create switching costs and raise barriers to entry. In other words, IT can help a firm aiming to gain a competitive advantage. In addition, many studies have argued that business value comes mainly from intangible assets, such as knowledge.

The limitations of this study constraint the interpretation of the results. First, regional sampling does limit the generality of the results. It may be instructive for future research to extend to other regions or other transitional economies. Future research could explore the possibility that classes of firms in high technology industry develop differing knowledge structures and strategies and how they affect the evolution of high technology industry. Future research should examine other contingency factors such as organization structure, environmental factors, and knowledge management strategy. Including these factors could result in another issue of interest in exploring the effectiveness of knowledge management process. Furthermore, our research design focused primarily on KM infrastructures in terms of IT applications. Despite this narrower scope, the research design in no way denies nor undermines the potential significance of other organizational factors of KM.

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