Studying the impact of environmental, organizational and technological factors on adoption of e-commerce in Kerman Maftul Cheshmeh Company

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With respect to increasing importance of development of information and communication technology and application of e-commerce as a way of doing business by companies around the world, the current study is done to identify effective environmental, organizational and technological factors on adoption of e-commerce in Kerman Maftul Cheshmeh Company. In this study, electronic commerce (EC) model is used to analyze effective factors on adoption of e-commerce in the company. The study is done using a questionnaire and seven factors including government facilities, technological infrastructures, management support, cultural factors, human resources, financial resources and market elements. In addition, technology acceptance model (TAM) is used to analyze the approach and social perceptions of managers and experts toward e-commerce. This model is used in the form of a second questionnaire with two important factors including perception from benefits and ease of application of technology. The two questionnaires were distributed among 30 managers and experts of Kerman Maftul Cheshmeh Company. Results of the gap analysis between current and ideal states showed that, from cultural factors and management support dimensions, the company is in good condition but should devote more budgets for technological infrastructures and train human resources. Government support should be increased and via adoption of e-commerce, the company must improve its competitive advantage. Using Spearman coefficient of correlation and TAM model, a significant relationship was found between government facilities and market factors. The research hypotheses were approved by Wilcoxon test. Using Friedman test, the factors were ranked based on their importance as follows: technological infrastructures; management support; government facilities; human resources; financial resources; cultural factors; and market factors. On the other hand, based on the current conditions, the factors were ranked as follows: management support; cultural factors; financial resources; technological infrastructures; market factors; human resources; and government facilities.

Key words: E-commerce, information technology, electronic data interchange.

INTRODUCTION

E-commerce is a powerful concept which has significantly affected on the life of human. It is one of the objective symptoms of information and communication technology revolution in economy. Statistics provided about the volume of e-commerce transactions in recent years show that, from development of e-commerce point of view, there is a huge gap between developing and developed countries. So, to fill the gap, effective factors on adoption and application of e-commerce should be identified. By removing barriers and problems and reaching a global level, the technology can be effectively used by
companies. Of course, the cultural dimensions of acceptance of technology are also important. So, the research studies effective factors on adoption of e-commerce based on the model of Scupola (2003) and technology acceptance model of Davis (1989). Via distribution of some questionnaires among managers and experts of Kerman Maftul Cheshmeh Company, the study is treated as a case study.

**Defining the problem and necessity of research**

Information and communication technology is one of the phenomena which has revolutionized most organizations and companies. Application of internet and e-commerce is considered as a way to do business by many companies worldwide (Chong et al., 2001). Advanced computer science and ICT enabled companies to use new strategies to earn a competitive advantage. So, Iranian companies should use e-commerce approaches to reach global standards. Adoption of e-commerce includes a series of effective factors in different levels in various companies. So, in Kerman Maftul Cheshmeh Company, the effective factors and their significance are some of the unknown facets of the research. This study tried to analyze the impact and effectiveness or ineffectiveness of each of the aforementioned factors on small and medium-sized companies using three main variables including external environment (government facilities, technological infrastructures and market factors), organizational contexts (management support, approach and knowledge of workers toward e-commerce and human and financial resources) and technological context (limitations and benefits of e-commerce and technologies related to e-commerce). Then, competitive situation of the company were analyzed and some strengths and weaknesses were identified.

**LITERATURE REVIEW**

E-commerce is the process of transaction of goods and services and transfer of information via computer networks (that is, internet). This business is based on electronic process and transfer of data. E-commerce and the related models were provided for the first time during 1970s. In the period, application of the e-commerce models was very expensive and their main users were big financial institutions (for example, banks) and industrial companies (Robbins, 2004).

Electronic transfer of financial resources was one of the first examples of e-commerce models used to connect financial institutions. In the period, application of e-commerce required huge amounts of investments to prepare the infrastructures. In the next step, some standards for electronic data interchange (EDI) were defined which was a continuation of financial banking transactions with new information tools. Modern EDI has an important advantage because it could also be utilized in other commercial transactions (Sarrafizadeh, 2008).

EDI developed domain of application of e-commerce models. In the period, e-commerce merged with IOSs and led to applied models such as stock transactions, reserving airline tickets, etc but meanwhile, execution of EDI-based E-commerce was expensive and required a lot of investment for training of personnel and preparing infrastructures. In the early years of 1990s, internet technology developed and its users increased. Development of World Wide Web (WWW) and related standards and protocols attracted more users and generalized IT tools. So, it enabled easy and inexpensive application of IT for companies (David, 2008). During the last years of the decade, new dimensions of the newly emerging economy appeared, which coincided with digital technology and communication networks and enabled growth of a borderless economy in some key sectors. Considerable decrease in price of information technology tools, for example, computer chips, semi-conductors, micro-processors, communication equipment, software and personal computers decreased investment requirements in capital-intensive sectors, which in turn, led to development of investment in infrastructures and production of related goods (Sarrafizadeh, 2008). From experts' point of view, the evolution process of information technology has passed two 20-year periods and is now entered into its third phase (Hanafizadeh, 2006) as follows:

1965 to 1974 - Electronic data processing era
1975 to 1994 - Management information systems era
1995 to 2014 - Internet era

**THEORETICAL FRAMEWORK AND RESEARCH HISTORY**

This study is done using two questionnaires and is based on analytical and technology acceptance models of Davis in Kerman Maftul Cheshmeh Company. The analytical model examines three main variables including external environment and organizational and technological contexts. These variables were developed by Fleishcher and Tornatzky in 1990. Then, the variables were tested by Scupola and were converted into a general model for application of e-commerce in small and medium-sized companies. The main variables of external environment model include government facilities, supportive technological infrastructures and market factors. The main variables of organizational context include viewpoints and supports of top management, knowledge of employees about e-commerce, having trained workers and financial resources. The main variable of technological context includes its limitations, advantages and related technologies with E-commerce. In addition,
other variables such as competitive advantage of companies and economical conditions were also tested. Moreover, two main factors including perceptions of people about benefits of technology and ease of its application were used to examine approaches and social perceptions of experts and managers toward adoption of E-commerce in the company. To do that, technology acceptance model (TAM) of Davis is applied (Davis, 1989).

Some studies are done both in Iran and other countries. For example, a study is done in Tehran University titled “studying the effective factors on trend of application of e-commerce in Iran”. In this study, telecommunication factors and the relevant rules and regulations are reported as the main effective factors in application of e-commerce. In Tarbiat Modarres University, a study is done titled “Appraising the adoption rate of e-commerce in Iranian Companies” to determine the main factors in adoption of e-commerce (technical, organizational and ultra-organizational factors). The results showed that the main factors were organizational, technical and ultra-organizational ones, respectively. Another study was done in Allameh University titled “studying limitations and challenges of applying e-commerce in top Iranian exporting companies from viewpoints of managers of Iranian development and trade organization”. It examined micro and macro environmental factors. As a result, all micro factors (for example, organization and customers) and macro factors (for example, political and social factors) were verified. In most international studies, factors such as security, advantages of e-commerce and consistency and adoption of e-commerce technology have been considered as the main factors.

Objectives of the study

This study aims to identify effective environmental, organizational and technological factors and their relative importance in adoption of e-commerce in Kerman Maftul Cheshmeh Company. The study also wants to examine approaches and social perceptions of employees, managers and experts in the company.

Questions of the study

i. If external environmental factors (government facilities, technological infrastructures and market factors) are effective on adoption of e-commerce in Kerman Maftul Cheshmeh Company, which ones are more important?

ii. If organizational context factors (approaches and supports of top management, viewpoints and knowledge of employees toward adoption of e-commerce, trained employees and financial resources) are effective on adoption of e-commerce in Kerman Maftul Cheshmeh Company, which ones are more important?

iii. If technological context factors (limitations and advantages of e-commerce and related technologies) are effective on adoption of e-commerce in Kerman Maftul Cheshmeh Company, which ones are more important?

Study hypotheses

H₃: There is a significant relationship among factors related to supportive governmental facilities and adoption of e-commerce in Kerman Maftul Cheshmeh Company.

H₄: There is a significant relationship among factors related to supportive technological infrastructures and adoption of e-commerce in Kerman Maftul Cheshmeh Company.

H₅: There is a significant relationship among cultural factors and adoption of e-commerce in Kerman Maftul Cheshmeh Company.

H₆: There is a significant relationship among capabilities of human resources and adoption of e-commerce in Kerman Maftul Cheshmeh Company.

H₇: There is a significant relationship among environmental and market conditions (customers, distributors and competitors) and adoption of e-commerce in Kerman Maftul Cheshmeh Company.

Analytical model of the study

Analytical model of the study (Figure 1) examines three main variables including external environment and organizational and technology contexts. These variables are developed by two researchers (Fleischer and Tornatzky, 1990) and were tested by Scupola in 2003 and were defined as a general model for adoption of e-commerce in small and medium-sized companies. This model is currently considered as the most complete model. The main variables of external environment including government facilities, supportive technological infrastructures and market factors were tested and verified by the researchers.

The main variable of organizational context including approach and support of top management (Jeyarjy, 2006), viewpoints and knowledge of employers toward e-commerce (Sabherwal, 2006) and trained employees and financial resources (Jacovou et al., 2003) were tested and verified. Results of the study show that management support is the most important variable. Positive approaches and awareness of employees from advantages of e-commerce decrease their resistance against changes in technology. In addition, having sufficient financial resources to provide the requirements
Organizational context: Viewpoints and supports of top management Viewpoints and knowledge of workers toward EC Trained workers and sufficient financial resources

External environment: Government facilities Supportive technological infrastructures Market factors

Adoption of E-commerce

Technological context: Advantages and limitations of E-commerce relevant technologies to E-commerce

Figure 1. EC model by Scupola (2003).

METHOD OF STUDY

The current study is done with the aim of application in business. It is based on the model of adoption of e-commerce in small and medium-sized companies (Scupola, 2003) and examines environmental, organizational and technological factors to use e-commerce in Kerman Maftul Cheshmeh Company. This study aims to measure importance of each of the aforementioned factors. Based on the TAM model (Davis, 1989), two questionnaires were used to examine approaches and social perceptions of managers, experts and employees toward adoption of e-commerce.

The first questionnaire includes 30 questions in the form of seven factors designed based on all aforementioned factors in e-commerce adoption model (Scupola, 2003). There are two columns for each question, showing importance of the factor and current situation which is designed based on five-point Likert scales from very low to very high.

For preparation of questions of the second questionnaire, TAM model of Davis (1989) is used. In the model, a lot of variables affect on behavior and acceptance of users. So, because of importance of perception of "usefulness of technology" and "ease of application of technology", questions are prepared based on the two factors.

Questions 1 to 3 and 4 to 6 relate to "usefulness" and "ease of application" of technology, respectively. They are designed based on five-point Likert scale. Also, survey and descriptive methods are used for gathering data.

Place of the study

The current study is done as a case study in Kerman Maftul Chesmeh Company which is one of the affiliate companies of Kerman Sarchesmeh Copper Company.
Time domain of the study

The current study started from March 2009 and finished on August 2010. Moreover, in this study, information up to July 2010 is used to examine the company’s readiness for adoption of e-commerce.

Sampling method

Because of limited statistical population, the questionnaires were distributed among all top managers, experts and employees. So, an all-inclusive sampling method was used.

Data gathering method

The required data were gathered by studying some books, previous researches, websites and internal and external scientific articles. Then by guidance of professors, two questionnaires were prepared to gather and analyze related information based on a five-point Likert scale to be distributed among managers and experts.

Data analysis

All descriptive statistical analyses (frequency, average, central tendency and deviation measures), gap analysis diagrams (for example, spider chart) and inferential statistical analysis of variance (ANOVA), correlations and Friedman ranking tests are done using SPSS software.

FINDINGS

Gap analysis between current and ideal situations

The gap analysis between current and ideal situations was done for the following variables: government facilities, market factors, financial resources, human resources, cultural factors, management support and technological infrastructures. Results of the gap analysis between current and ideal situations show that for management’s approach toward capabilities and usefulness of e-commerce, top management’s financial support for knowledge sharing culture among employees and managers, and customer-oriented culture for adoption of e-commerce, the company is in good condition.

The company should make more investments to buy enough hardware and software and prepare suitable telecommunication facilities (for example, high capacity internet) to use a complete electronic banking for adoption of e-commerce. In addition, the current website should be updated.

Moreover, some training courses should be held to familiarize employees with advantages of e-commerce to improve the current situation of human resources. With respect to moderate role of government facilities in adoption of e-commerce in the company, more financial support and cooperation of some related governmental institutions (banks and telecommunication companies) are required. In addition, by adoption of e-commerce, the company can reach a favorable situation by development of market strategies, attracting customers, 24 hours services and decreasing inventory and distribution costs. With respect to moderate competitive situation than other rivals, by adoption of e-commerce, the company can reach a competitive advantage and improve its position than competitors.

Results of radar diagram for factors

In Figure 3, number 1 represents government facilities and shows the highest gap of 1.97 between average importance (4.67) and current situation (2.70). Regarding high importance of the factor from respondents’ point of view, this indicates that the company is in a moderate level for government facilities and should be accurately monitored to reach to an ideal state.

Number 2 represents technological infrastructure with a gap of 1.6 between average importance (4.7) and current situation (3.1). So, to reach an ideal state, the company should invest in technological infrastructures including software, telecommunication and internet banking.
Table 1. Ranking based on importance of factors.

<table>
<thead>
<tr>
<th>Importance of factor</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological infrastructure</td>
<td>5.05</td>
</tr>
<tr>
<td>Management support</td>
<td>4.93</td>
</tr>
<tr>
<td>Government facilities</td>
<td>4.55</td>
</tr>
<tr>
<td>Human resources</td>
<td>4.48</td>
</tr>
<tr>
<td>Financial resources</td>
<td>3.53</td>
</tr>
<tr>
<td>Cultural factors</td>
<td>2.73</td>
</tr>
<tr>
<td>Market factors</td>
<td>2.72</td>
</tr>
</tbody>
</table>

Number 3 indicates management support with a gap of 1 between average importance (4.8) and current situation (3.8) and shows that for awareness and belief of top management toward benefits of e-commerce and financial support, the company is near an ideal state.

Number 4 represents cultural factor with the lowest gap of 0.8 between average importance (4.3) and current situation (3.5). This indicates that for knowledge sharing culture among managers and experts and customer-orientation viewpoints, it is near an ideal state.

Number 5 indicates human resources with a gap of 1.73 between average importance (4.63) and current situation (2.9). Regarding to high importance of the factor from respondents' point of view, this indicates that the company is in a moderate level for familiarity of employees with English language, their awareness from benefits of e-commerce and relative number of skilled workers in the company. So, to fill the gap, the company should plan some training programs to upgrade the employees' capabilities or hire its required experts.

Number 6 represents financial resources with a gap of 1.2 between average importance (4.5) and current situation (3.3). The company should increase its investments in technological infrastructures to reach to an ideal state.

Number 7 indicates market factors with a gap of 1.4 between average importance (4.4) and current situation (3). The company is in a moderate situation for customers, services and competitive factors. So, it should use e-commerce and decrease its distribution costs to reach to an ideal state.

**Kolmogorov-Smirnov test**

In the test, significance indices of the data were mainly less than 5%. So, normality assumption would not be accepted. In other words, data of the study are non-normal.

**Spearman coefficient of correlation**

By the test, all factors of the first questionnaire were examined based on their importance and current situations and the results were separately compared with the second questionnaire (TAM model). As a result, there was only one correlation among current situation of government facilities and market factors. Correlation between government facilities and employees' approaches toward usefulness and ease of application of technology shows that government support (both financial and providing infrastructures) and market conditions can have a relatively high impact on approaches of employees.

**Wilcoxon test**

By using the test, research hypotheses were tested and significant relationships were found among all factors. Moreover, level of importance of each factor in adoption of E-commerce in the company is determined as follows: Management support, government facilities, supportive technological infrastructure, human resources, financial resources, market factors and cultural factors.

**Friedman test**

By using the test, all factors were ranked based on their importance and current conditions. The results are shown in Tables 1 and 2.
Table 2. Ranking based on current situation of factors.

<table>
<thead>
<tr>
<th>Current situation of factor</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management support</td>
<td>6.3</td>
</tr>
<tr>
<td>Cultural factors</td>
<td>5.57</td>
</tr>
<tr>
<td>Technological infrastructure</td>
<td>4.07</td>
</tr>
<tr>
<td>Market factors</td>
<td>2.98</td>
</tr>
<tr>
<td>Human resources</td>
<td>2.45</td>
</tr>
<tr>
<td>Financial resources</td>
<td>2.43</td>
</tr>
<tr>
<td>Government facilities</td>
<td>2.2</td>
</tr>
</tbody>
</table>

CONCLUSIONS AND SUGGESTIONS

Based on findings of the research, all factors (government facilities, supportive technological infrastructures, management support, cultural factors, human resources and market conditions) have high importance in adoption of e-commerce in Kerman Maftul Cheshmeh Company. Results of the gap analysis between current and ideal states show that, the company is in good conditions for cultural factors and management support viewpoints but should devote more budgets for development of technological infrastructures and training employees. In addition, government's financial support should be increased and the company should improve its competitive power by adoption of e-commerce. Correlation between government facilities and market factors with approaches toward usefulness and ease of application of the technology indicates that these two factors should be highly considered in company. The more is the importance of a factor in adoption of e-commerce, the more investment should be done in it. In this study, management factor is the most and market factor is the least important one. By using a factors' ranking based on importance of the current situation, planning for successful adoption of e-commerce would be easier. So, suggestions of the researcher are as follows:

1. The researcher suggests using technology acceptance model for similar studies.
2. The researcher suggests using the same study for other affiliated companies to Sarcheshmeh Copper Industries or food ones.
3. The researcher suggests doing a study to promote the culture of application of e-commerce among all managers of commercial companies in Iran.
4. The researcher suggests planning necessary workshops for employees to adopt e-commerce in commercial companies.
5. The researcher suggests a conceptual model of the research for examining adoption of e-commerce in small, medium and big companies.
6. The researcher suggests doing a study to examine strengths and weakness of current rules and regulations in adoption of e-commerce and its users.
7. The researcher suggests some future studies to examine effective factors on the level of governmental supportive facilities for adoption of e-commerce in commercial companies in Iran.

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REFERENCES