The Adoption of E-commerce in SMEs
A case study on a sample of Iraqi enterprises

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Abstract— This paper describes the factors that Influence SMEs in Adopting of E-commerce, and the cost/benefits of using e-commerce in Iraqi SMEs.
Fuzzy logic system has been used to analyze a set of questionnaires distributed among owners / managers of Iraqi SMEs.
The researchers find many results in this paper , one of the most important result is that the adoption of e-commerce by SMEs in Iraq is affected by several factors which are perceived benefits, technology readiness, owners' innovativeness, owners' IT experience and owners' IT ability.
Keywords— E-commerce , SME , Fuzzy logic , Iraqi enterprises

I. INTRODUCTION

Small and Medium Enterprises (SMEs) are enterprises which act a very important role in the economy of many countries, and SMEs are essential components of the economy of Iraq.
In order to succeed, it is very important that Iraqi SMEs be open to new techniques due to that the new technologies are the key to enabling enterprises to establish contacts with enterprises over the world, which enable them participating in the global economics[1].

Over the last few years, after 2003, some Iraqi enterprises have adopted ecommerce and are already benefiting from it. Many Iraqi SMEs have been inadequate to resolve such problems by themselves, which is why government authorities, financial institutions and large enterprises have conducted to assist and encourage them with their policies and their assistance programs. With a few rare exceptions, Iraqi enterprises, like most enterprises in developing countries, have not yet selected much technological innovations, often due to a lack of resources, but also because of the work habits and culture of those who arrange these SMEs. Many cannot, or will not, accept the risk inherent in changing the way they do business and their decision-making processes.
In this paper, the researchers will analyze the Factors that Influence SMEs in Adopting of E-commerce.

II. LITERATURE REVIEW

A. E-commerce :

Electronic commerce means the conducting business transactions over the Internet, which includes exchange of information of value in the form of products and services as payments, using web-based technologies[2] , Zwass , 1998 defined it as a distribution of business information; upholding business relationships; and performing business transactions by means of telecommunications networks. More significantly, e-commerce transactions were the exchanging of goods and services using the internet and other digital media[3] , However, Kalakota and Whinston, defined e-commerce based on the following[4] :

- From a communications perspective: E-commerce was the delivery of information; products/services or payments via telephone landlines, mobiles, computer networks, internet, or any other means.
- From a business process perspective: E-commerce was the application of technology towards the mechanization of business transactions and workflow.
- From a service perspective: E-commerce was a tool which directed the desire of firms; consumers; and

management to cut service costs, while making the quality of goods better and increasing the speed of the providing service.

- From an online perspective: E-commerce provided the competence of buying and selling products and information on the Internet and other online services. Therefore, it could be said that e-commerce was an action of a trust action, between buyers and sellers, in buying and selling goods or services and paying by many types of digital payments.

B. The differences between traditional and electronic commerce :
1)   Traditional Commerce :
This part of trade was characterized by having many channel which the product/services went through before it arrived at the final customer. As shown in Figure 1, the product/services moved from manufacturer or supplier to the distributer who sold it to the wholesaler or retailer and, then, they sold it to the final customer. During these processes every broker added the cost and profit margin to the price of the product/services and, by the end, the price was higher than the original price identified by the manufacturer/supplier. Also, it took a long time due to transportation and distribution from one channel to another[5].
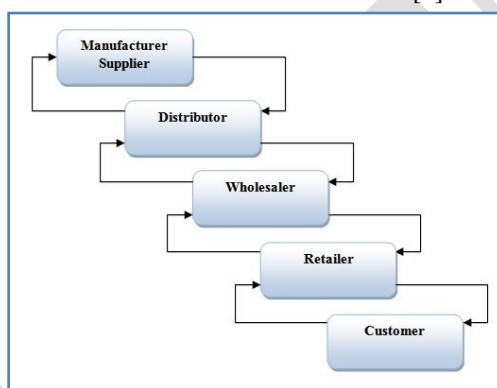

Fig. 1.   The channels of traditional trading

2)   Electronic Commerce :
E-commerce evolved the direct marketing sale since it reduced the transmitted channels which the product/services passed through from manufacturer/supplier to the final customer as shown in Figure 2 .

Unlike traditional selling, the use of e-commerce, in selling, meant that the product/services could move directly from the manufacturer/supplier to final customer without passing through other brokers. E-commerce saved the time between the production and the consumption of product/services. Also, there was a cost saving because it reduced transportation / distribution processes between brokers. Consequently, e-commerce reduced the price of the product/service and improved its diffusion by communicating directly with the final customer[6]
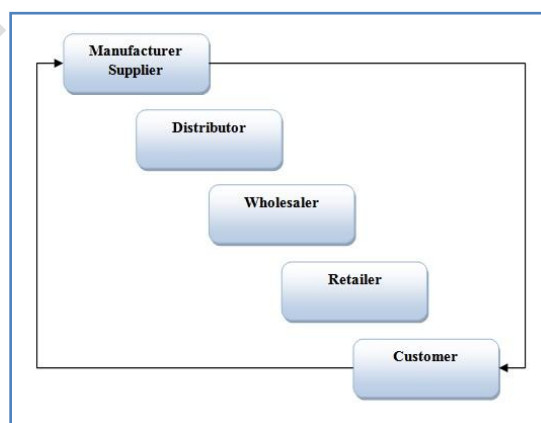

Fig. 2.The channels of electronic commerce

C.   The types of E-Commerce :

E-commerce be can categorized into various type of application and the usage. Many scholars categorized various model of e-Commerce into[7] :

- (C2C) Customer to Customer where consumers directly transact with other consumers in the cyberspace. It can be identified C2C interaction as important model in Internet based transactions and pointed the companies' need to take it into consideration in their market planning effort. Their assertion is exemplified by the growth of social network site in recent times.
- (B2C) Business to Customer is where customers learn about products or services through electronic publishing, and buy them using electronic cash and secure payment systems, and have them delivered electronically or through physical channel.
- (B2B) Business to Business is e-market transaction in which businesses, governments, and other organizations depend on computer-to-computer communications as a fast, an economical, and a dependable way to conduct business transactions.
- (C2B) Customer to Business is type of online transactions where consumers initiate trading with companies.
- (C2G) Customer to Government is type of online interaction where feedback is given to government through pressure group or individual sites.
- (B2G) Business to Government is type of online interaction where feedback from businesses is given to government and non-government organizations
- (G2C) Government to Citizen is type of online interaction through which government offer national transactions such as local government services, national government information, and tax information.

III.   CONCEPTUAL FRAMEWORK

A. Adoption of E-Commerce :

        E-commerce is defined as the purchase and sale of products and services by electronic means such as Internet, e-mail and exchange of electronic data. E-commerce forms an important component of "electronic activities", a broader term which refers to the automation of any commercial process by electronic means[1] .

        The adoption of e-commerce is a reflection of the strategic orientation of an enterprise, and can be characterized by the extent of interactions such as exchanges of information, communication, distribution, transactions and/or collaboration in the business process[8] .

        An enterprise can be using e-commerce currently, or plan to use it in the future. The extent of adoption of e-commerce can be measured by whether or not the enterprise currently uses or will soon use at least one form of the technology associated with an electronic network (for example, the exchange of computerized data (EDI: Electronic Data Interchange), the Internet, Intranet and Extranet, etc.), and by whether or not it currently uses or will use such interconnectivity for business interactions[9].

        The extent of adoption of each electronic network can be measured according to the criteria proposed by many scholars and researchers and, taking into account the current context in Iraq, the researchers in this paper can classify the adopters of e-commerce in SMEs in Iraq in three categories:

- Users (or first adopters): currently use a form of e-commerce technology
- Declared prospectors: plan to use it within three years
- Declared late-comers: plan to use it in more than three years time, or not use it at all.

B. Factors that Influence SMEs in Adopting of E-commerce :

        Based on the discussion above, in this paper those factors that influence SMEs in their adoption of e-commerce are classified in four main groups[10] :

1)   Technological Context (H1)

        The technological context refers to those aspects such as perceived benefit, compatibility, and cost, that influence the adoption of e-commerce technology. The perceived benefit refers to the degree of acceptance of the possible advantages that ecommerce technology can provide for the organization.

Greater managerial understanding of the relative advantages of e- commerce adoption raises the probability of that company allocating some resources, such as managerial resources, financial resources and technological resources, to adopting e-commerce technology. Then, compatibility refers to what extent e-commerce is appropriate with technology infrastructure, culture, value, and work practices that already exist in the firm. An innovation will be easily accepted in an organization if it is tune in with the prevailing values of that organization, can meet the needs of organization and accords with organization culture. Compatibility between organization policies and technology innovation will make the innovation easier to be pictured in a more familiar context. In this paper, cost is also considered as a factor that influences Iraqi SMEs in their adopting e-commerce. Usually, the less expensive the cost of a certain technology, the more likely it will be quickly adopted and implemented in an organization.

2) Organizational Context (H2)

The organizational context refers to the characteristics of the firm that might influence the adoption of e-commerce technology. Technology readiness is one of the organizational contexts proposed in this paper as a determinant factor that influences SMEs in adopting e-commerce. Technology readiness refers to what extent the technology infrastructure, relevant systems and technical skills in business can support e-commerce adoption. Technology readiness consists of both technology infrastructure and IT human resources and both are really needed if the company wants to make e-business an integral part of the value chain. Hence, the greater the technology readiness of an organization the more likely the organization adopts IT technology, and vice versa. Another factor in organizational context that is identified as a determinant factor of e-commerce adoption by SMEs is firm size. This is because firm size is related to the ability of business to provide certain resources, both financial and human resources. The larger the size of business means the greater its ability to provide certain resources, and the more likely the adoption of e-commerce technology.

3) Environmental Context (H3)

The environmental factor refers to external influences such as pressure from customers / suppliers, pressure from a competitor(s) and external support that influence e-commerce adoption. In this paper, the customer / supplier pressure relates to the degree of pressure from customers / suppliers perceived by SMEs. In many cases, the customer / supplier has the power to pressure an SME to adopt a particular kind of technology. For example, multinational corporations often pushed their branches and suppliers to adopt e-commerce technology to link into their global production network. Therefore, the greater the pressure from trading partners perceived by the SME, the more likely they are to adopt certain technology innovation(s) in order to maintain their own competitive position. The competitor pressure refers to the extent of pressure from competitors within the industry as felt by the firm. When competitors start to use e-commerce technology, firms will be shoved into adopting e-commerce technology more widely to obtain competitive advantages. Thus, the higher the level of competition within the industry, the more likely it is that greater e-commerce use will be achieved. Besides pressures from customer / suppliers and competitors, support from external parties such as government and IT vendors is also considered in this study as one of determinant factors of e-commerce adoption by SMEs. As commonly known, SMEs have limited resources; financial resources; and IT skills resources, and so support from the government through policies or rules that can protect the parties involved in the business transaction; regulation of the use of the internet to make it as a secure medium for transactions; provision of incentives for companies to use e-procurement; or a support from IT vendor are all believed to drive business, especially SMEs, to adopt IT technology.

4) Individual Context (H4)

In addition to the three contexts explained above, in this paper individual contexts are also considered as determinant factors of e-commerce adoption by SMEs in developing countries. This is because mostly in SMEs a strategic decision is highly dependent on the manager / owner. Some researchers revealed that the e-commerce adoption by SMEs extensively depends on the acceptance of e-commerce technology by the owner of business. This is reasonable, because structurally SMEs tend to centralize, hence the owner / manager have an important role in any business decision making.

In this paper, three individual contexts: owner innovativeness, owner IT experience and owner IT ability are identified as determinant factors that influence SMEs in adopting e-commerce. In this paper, innovativeness refers to the degree to which a person adopts innovation more quickly than others in the same social context. A manager who tends to seek a solution by changing the structure where the problem is located is usually considered an innovative manager (Thong & Yap, 1995). It implies that the innovative manager prefers to search for a solution that has never been tried before and therefore is more risky. As a technology innovation, e-commerce also has risk, especially if it is applied in small business and even more in developing countries. Hence, the more innovative the SMEs owner, the more likely they have an intention to adopt an e-commerce application.

In this paper, owners' IT ability and experience are also identified as determinant factors of e-commerce adoption by SMEs in developing countries. As commonly known, insufficient IT skills is one common SME problem. If the SME owner has greater ability and greater experience with IT, they will be confident in adopting IT and it will reduce the uncertainty and risk in that technology adoption. In addition to this, it is also believed that user skill and knowledge can assist and increase the speed of technology adoption. More importantly, it assumes that if manager/owner comprehends the function and advantages of e-commerce adoption, they may be more pleased to adopt such technology.

Hypotheses : The adoption of e-commerce in SMEs in Iraq differs depending on four factors (from H1 to H4) .

IV. RESEARCH METHODOLOGY :

A survey method using an on-line questionnaire was employed. This was chosen in due to its advantages, namely: cheaper, better, faster, and easier than other methods. The questionnaire was developed by reference to previous studies.

A. Sampling Method

Target respondents for this study were owners / managers of Iraqi SMEs. In this paper, SMEs refers to a business which has less than 100 employees, assets less that 1 million US dollar and total sales per year below 5 million US dollar. In Iraq, there is no centralized database that stores information about all Iraqi SMEs. Most of data sources available in Iraq come from the data which collected and stored by several parties. Based on various data sources, 960 SMEs were chosen as sampling frame for this study and 20 SMEs participated in this study.

B. Measurement

1) Independent Variables:

The adopted indicators to measure the independent variables were 55 indicators , classified to 11 indepeted variables. Table 1 shows the types of independent variables, the numbers of their indicators, and their references. All of the measures in this paper employed 5 point Likert Scales, passed a reliability test requirement, with Cronbach's Coefficient Alpha value greater than 0.83, and analyzed by Fuzzy logic tools .

TABLE I.   THE TYPES OF INDEPENDENT VARIABLES

Variables	No. of Indicators	References
Perceived Benefits	10	[10], [11], [12], [13]
Compatibility	7	[10], [11], [12], [13], [14]
Cost	4	[10], [11], [12]
Technology Readiness	6	[10], [15]
Firm Size	3	[10], [11], [15]
Customers/Suppliers Pressure	4	[10], [11], [12], [16]

Competitor Pressure	3	[10], [11], [12], [16]
External Support	5	[10], [11]
Innovativeness	4	[10], [11], [12], [17]
IT Ability	5	[10], [11], [12], [17]
IT Experience	4	[10], [11], [12], [17]

2) Dependent Variable:

The dependent variable is e-commerce adoption which is proxied by the scope of e-commerce use by SMEs. The scope of e-commerce use refers to "the extent of e-commerce use for a number of different activities in the value chain, from advertising and marketing to sales, procurement, service and support, data exchange with customers and suppliers, and integration of business process". In this paper, respondents were asked about whether they used or did not use e-commerce technology in such activities. The scores (yes =1, no =0) were accumulated and this measure is adopted from the Gibbs and Kraemer, 2004 study[18].

V. PRACTICAL PART

For the purpose of this paper, 50 questionnaires were prepared by the researchers and distributed to a sample of random managers and owners in 20 SMEs in Iraq .

The questionnaire consists of 11 perspectives with multi indictors for each one of them.

The researchers processed the data of the 50 questionnaires and analyzed them by Fuzzy logic tools and using MatLab 10.

A. The method of Fuzzy logic :

To analyze the results of the questionnaires by Fuzzy Logic tools. The results are processed by fuzzy logic function, built in Matlab ver. 10 according to the following steps[19] :

1. Determining the required ratios of the results.
2. Determining the weights of ratios and questions
3. Calculating all the ratios, based on the data of the questionnaires.
4. Calculating all the ratios according to their weights which resulted from step 3.
5. Calculating the rate of the linguistic variables by assuming a rated value to each linguistic variable by dividing the weight of each ratio into the number of linguistic variables.
6. Calculating the rate of triangular fuzzy numbers by using the function of fuzzy logic in MatLab ver.6.5.
7. Computing the weighted rates of triangular fuzzy numbers.
8. Determining the fuzzy Distance of each ratio by using the equation (1) and (2) [19].

$$D^2(\tilde{X}, M) = (b - M)^2 + \frac{1}{3}(b - M)[(c + a) - 2b] + \frac{1}{18}[(c - b)^2 + (b - a)^2] - \frac{1}{18}[(c - b)(b - a)] f(\alpha) \approx \alpha \dots (1)$$

$$D^2(\tilde{X}, M) = (b - M)^2 + \frac{1}{2}(b - M)[(c + a) - 2b] + \frac{1}{9}[(c - b)^2 + (b - a)^2] - \frac{1}{9}[(c - b)(b - a)] f(\alpha) \approx 1 \dots (2)$$

B. The Results :

The result of analyzing the answers of distributed questionnaires is shown in Table 2

TABLE II.   FUZZY LOGIC ANALYSIS RESULTS

Factors	*Relative Importance*	*Degree of Influence*
Technological Context	65%	87%
Organizational Context	52%	77%
Environmental Context	29%	22%
Individual Context	59%	51%

Figure 3 illustrates the results of analysis by bar chart to show the degree of influence for the main four factors in this paper .
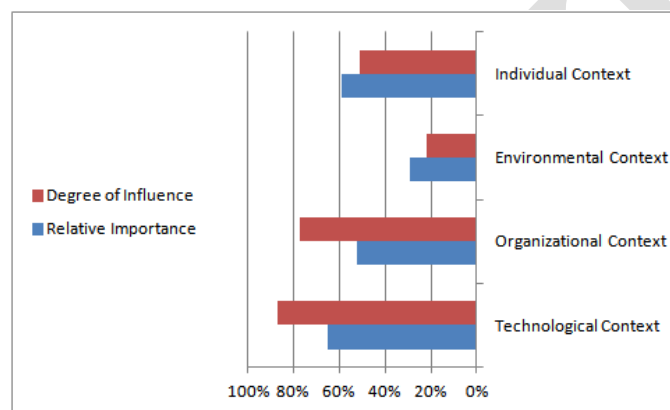

Fig. 3.   The bar chart for the results of analysis the questionnaire

C. Analysis and Discussion :

In this paper the eleven variables classified into four groups: technological contexts, organizational context, environmental contexts and individual contexts, are defined as determinant factors that influence Iraqi SMEs in adopting e-commerce technology.

1)   Technological contexts

There are three variables defined in technological contexts in this paper that influence Iraqi SMEs in adopting e-commerce, these are perceived benefits, perceived compatibility and cost. It was found in this paper that the perceived benefit has a positive and significant correlation with the adoption of e-commerce, which means that the perceived benefit is one of determinant factors of e-commerce adoption by SMEs in Iraq. Therefore, H1 in this study is fully supported.

2)   Organizational Context

Technology readiness and firm size which are classified as organizational context are defined in this paper as determinant factors of the adoption of e-commerce by SMEs in Iraq. However, based on the Fuzzy logic analysis, it is found that it is only technology readiness that has a positive and significant correlation with the adoption of e-commerce, while firm size does not. Hence in this paper, H2 is fully supported.

3)   Environmental contexts

Three variables which are customers / suppliers pressure, competitor pressure and external support are categorized as environmental contexts in this paper, and these variables are defined as the factors that influence SMEs in Iraq in adopting of e-commerce technology. However, based on the Fuzzy logic analysis, none of the variables have a positive and significant correlation with e-commerce adoption. This result indicates that three variables are not recognized by Iraqi SMEs as factors that influence them in adopting of e-commerce

technology. Hence in this paper, H3 is not supported.

4) Individual contexts

Owners' innovativeness, owners' IT experience and owners' IT knowledge, which are categorized as individual contexts, are defined in this paper as determinant factors that influence SMEs in Iraq in adopting of e-commerce. The Fuzzy logic analysis shows that all of these variables have a positive and significant correlation with the e-commerce adoption. Therefore, H4, is fully supported .

VI. CONCLUSION

According to the previous discussion , the adoption of e-commerce by SMEs in Iraq is affected by several factors which are perceived benefits, technology readiness, owners' innovativeness, owners' IT experience and owners' IT ability. The result also shows that the individual factors play a material role in adopting of e-commerce technology by SMEs in Iraq. Particular lessons can be drawn for both SMEs as distinct from large business and for SMEs in developing as opposed to developed countries.

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