E-commerce Propagation in The Middle East Economies: an Application of a Revised Technology Acceptance Model

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ABSTRACT: E-commerce is the technology of conducting commercial transactions via electronic media. The Internet has provided this media to the extent that commerce is being increasingly made through it. However, another side of commerce, which included the (heavy lifting) of physical goods are still traversing the distribution channels and employing the traditional transportation infrastructure with varying efficiency and cost. This paper examines the employment and adoption of this technology within the Middle East businesses, and what are the barriers that hinder this adoption. The famous Technology Acceptance Model, TAM is implemented with some variations to identify the difficulties associated with implementing e-business models through a survey of key stakeholders in this industry, namely procurement professional and logistics managers. One hundred forty five participants filled the survey questionnaire aimed at measuring their responses to perceived usefulness (PU), perceived ease of use (PEOU), attitudes towards usage (ATU) and behavioral intention to use (BIU) the e-business system The results shows that the main factors holding the propagation of e-commerce in these countries, and in spite of growing interests and belief in implementing e-commerce, are related to the inertia of the legacy operating systems, the lack of compatible infrastructure, the security of information, and the level of business ethics. A conceptual mathematical probability model is developed to estimate a new TAM as an MTAM where the acceptance is computed as an average probability of six interaction factors. Several conclusions were arrived at including the need for the development and installation of a legal framework for safeguarding against abuse and illegal schemes of defrauding consumers.

KEYWORDS: E-commerce, Technology Acceptance, logistics, distribution channel.

1 INTRODUCTION

The main difficulty in assuring success of introduction of any technological innovation is the ability to accept the technology and willingness to integrate it in the common day-to-day work. However, an implementation of new technology will bring with it challenges of understanding and difficulty of application. This is true if the application involves a number of people working in different entities. This issue of introducing a new technology has been researched extensively. It is estimated that more than Two thousand papers were published on this subject. Most of them are extensions of the technology Acceptance Model, TAM that was published by [1].

Essentially it is a set of questions about the ease of use and acceptance of different technologies. The questionnaires were validated through their use by different researchers and arriving at similar conclusions in a process called replications.

This research is attempting to examine the difficulty of accepting the e-commerce collection of technologies within the business community in the Middle East countries. The research question that is being investigated is that the difficulty arises from the elements of technology acceptance, namely the perceived usefulness and the perceived ease of use only or the existence of favourable infrastructure that supports the implementation? The e-commerce is assumed to be composed of two distinct categories the transactional information based, and the physical, that is the trade and movement of goods and services.

Background and Theoretical framework

It is important to define the main characteristics of the e-commerce and the purpose and functionality of any e-commerce application. The term e-commerce is a generic name to indicate that transaction is no longer executed using pencil and paper, but conducted through the electronic media.

The employment of Internet to this purpose is ever increasing globally and many businesses started to use it for the procurement process. It may include exhibiting the product or service, registering a request and customer information databases, to processing sales, to issuing picking orders, to the entire logistics of delivering the product to the customer door step. It may involve the reverse logistics, and after sale customer care. Thus e-commerce contains all the facets of information technology and all the factors related to acceptance of this technology as modeled by the TAM and its extensions.

As Internet usage keeps expanding, many businesses keeps acquiring internet based applications. In addition, they would bring in their own applications to promote their businesses. The home grown e-business applications are been challenged by specialized applications. This is true to the point that e-business applications are becoming standard and it is the least of concern when engaging in e-business. The research will show that the main concern of participants was on the existence of reliable infrastructure to support the logistics of material. In the Middle East countries, e-business is struggling against the inertia of an age old trade practices. The entire supply chain must accommodate the e-business schemes. This does not exist in few of the countries, like Iraq, Syria and Saudi Arabia. The gulf countries and judging from the responses enjoy a better status and does accommodate smoother material movement. However in the entire area the legal system does not provide cover against illegal or customer rights [2,3].

In spite of the fact that e-business applications may offer robustness and ease of control, the underlying design models could be limited and rigid in terms of how to manage the flow and appearance of content. The employment of a web-based forms and presentation of goods and services is heavily utilizing built in forms and established workflows to facilitate the transactions. The main part is two directional flows of material and funds. The banks play a major role in facilitating this movement, but the rigid government rules controlling the flow of money hinders the expansion of the e-business transactions.

One of the challenges is to determine if an established e-business infrastructure can offer a favorable environment for companies to make effective exchange of information and processing of transactions. [5] showed that journals, for example, and reports can improve the users' learning curves. The only limitation is the time limitation that forces the users to by-pass the details, which is the heart of the e-business. This is ironic but the application developers can circumvent this drawback by providing user friendly interfaces and makes the user experience more pleasant and intuitive.

The technology acceptance model (TAM), developed by [2], states that the success of a system can be determined by user acceptance of the system, measured by three factors: perceived usefulness (PU), perceived ease of use (PEOU), and attitudes towards usage (ATU) of the system [2]. If a system is not easy to use then it will probably not be perceived as useful. According to the model, a user's perceptions about the system's usefulness and ease of use result in a behavioral intention to use (or not to use) the system ([2], [4]). Thus, the objective of this study is to examine the relationship of users' behavioral intention to use (BIU) in the e-business system with selected factors of perceived usefulness (PU), perceived ease of use (PEOU), and attitude towards usage (ATU), and develop a general model of e-business acceptance.

Application of the TAM model would seem to be favorably indicated for understanding conceptual issues related to e-business use. Use of the TAM is predicated on individuals having control over whether or not they use the system [3]. The factors in the model, namely perceived usefulness(PU), perceived ease of use (PEOU), and attitudes towards usage (ATU), represent attributes or characteristics of the system, such as the overall design and features of the system, the user's skills and capabilities, and the user's beliefs and attitude towards the system ([2], [3],[4]). The behavioral intention to use (BIU) is an important factor that determines whether users will actually utilize the system. For example, [4] found a direct and significant influence ($\beta = 0.19$; $p < 0.001$) between behavioral intention and actual usage of the web-based environment in their study. Use of the TAM model for understanding users' perceptions of the e-business system and potential future use is therefore based on the following assumptions:

1. When users think that the e-commerce as one that is useful and easy to use, then they may have a favorable inclination in adopting the system.

2. When users think that the e-commerce system as one that is easy to use in view of the availability of infra-structure supporting the system, then they may have an inclination towards the usefulness of the system.

3. When users have a positive attitude towards the system, they may use the system frequently and intensively and may have a favorable intention towards using the system [5].

And add to this:

4. When users have a positive attitude towards the system, from the view of knowing that it is applicable and implementable by the infrastructure that takes its demands into a higher level of reality, then they may have a favorable intention towards it and may use the system frequently and intensively.

Many models have been developed in the past three decades to investigate variables ([1],[2]). The technology acceptance model (TAM) proposed by [2] is the classical information systems model developed to explain computer-usage behavior and factors associated with acceptance of technology. According to this theory, information system usage behavior is predominately explained by behavioral intention that is formed as a result of conscious decision-making processes. Behavioral intention, in turn, is determined by two belief factors, namely, perceived usefulness (PU) and perceived ease of use (PEOU). By manipulating these two factors, system developers can have better control over users' beliefs about the system, and subsequently, their behavioral intention and usage of the system. Ref [7] defined technology acceptance as "the demonstrable willingness within a user group to employ information technology (IT) for the tasks it was designed to support". The dominant themes in research focus mainly on instrumental influences, which investigate acceptance decisions involving beliefs as to how using technology will result in objective improvements in performance

Aizen et al. [1] argued that this approach may have had a limiting effect on technology research and broadened their research to include concepts related to non-instrumental influences on technology acceptance. The TAM suggests that perceived usefulness (PU) and perceived ease of use (PEOU) determine an individual's behavioral intention to use (BIU) a system. [6] suggested that many factors influence initial acceptance of technology, but fundamental determinants (e.g. perceived ease of use and perceived usefulness) play a greater role in continued acceptance.

Perceived usefulness (PU) is defined as "the degree to which a person believes that using a particular system would enhance his or her performance" [2]. Perceived ease of use (PEOU) refers to "the degree to which a person believes that using a particular system would be free of effort" [2]. TAM presumes that behavioral intention is a result of conscious decision making processes [6]. The model specifies three belief factors that are salient in the context of information technology usage and acceptance: perceived usefulness (PU), perceived ease of use (PEOU), and attitude towards usage (ATU) [1]. Perceived usefulness and perceived ease of use can be considered as cognitive factors. Attitude towards usage (ATU) refers to the "the degree to which an individual evaluates and associates the target system with his or her job" [2]. Attitude towards usage has been identified as a factor that guides future behavior or the cause of intention that ultimately leads to a particular behavior. However, none of the researchers touched on the availability of the infrastructure that support the use of the system especially when it is only a link between information processing and action that takes place in the field. Users would become cynical if a system cannot be propagated in a day to day usage if it is lacking the ability to execute decisions and orders,, in the field. This is exactly the case with the e-commerce. In TAM, attitude towards usage is referred to as the evaluative effect of positive or negative feeling of individuals in performing a particular behavior [1]. In order to ascertain that for the collected evidence from data must make sure that the questions are valid and predict the phenomenon we are trying to explore. A random sample of purchasing managers, employees and individuals involved in dealing with procurements were sent a questionnaire, there were about 45% response. The collection of data was achieved through a computerized system that allows the data to be compiled and listed. There were twelve presented questions asked that address the main points of the research inquiry.

Results of numerous researches [7]-[8] suggested that TAM is a solid theoretical model where its validity can extend to an e-commerce context.

It is empirically plausible that the larger the business entity, the more likely it would tend to adopt a new technology that provide a promise for better business, see Fig. 1.
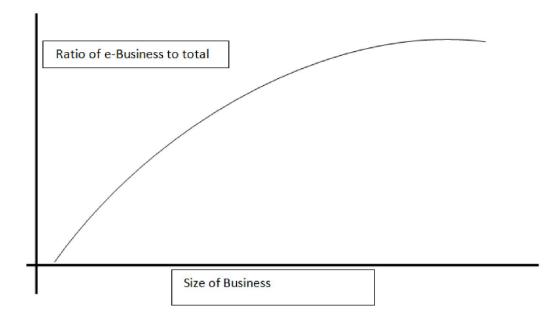
Fig. 1.   Relation of size of business and ration of e-business

The following research question seeks to examine users' usage of a system utilizing the technology acceptance model (TAM): what are individual user's perceptions of usefulness (PU), ease of use (PEOU) and attitude towards usage (ATU) of an e-business system that inform their behavioral intention to use (BIU) the system?

In order to understand how these factors support technology acceptance in the context of an e-business system. A thorough understanding of the TAM model may help us to analyze the reasons for resistance toward the technology and would further enable us to take efficient measures to improve user acceptance/usage of the technology. According to Davis (1989), practitioners evaluate systems for two purposes: 1) to predict acceptability; and 2) to diagnose the reasons resulting in lack of acceptance and to take proper measures to improve user acceptance. Overall, the technology acceptance model (TAM) has received empirical support for being robust in predicting technology adoption in various contexts and with a variety of technologies ([1],[2],[3],[4]). The relevance for this study is that an examination of users' usage of an e-business system could contribute to their acceptance of an emerging business technology that has been developed specifically to respond to current demands of the retail market.

In accordance with the research objective and consistent with the related literature, this study tested the following hypotheses:

H1: Perceived usefulness (PU) will have a significant influence on attitude towards usage (ATU).

H2: Perceived ease of use (PEOU) will have a significant influence on attitude towards usage (ATU).

H3: Perceived ease of use (PEOU) will have a significant influence on perceived usefulness (PU).

H4: Attitude towards usage (ATU) will have a significant influence on users' behavioral intention to use (BIU) the e-business system.

H5: Perceived level of infrastructure (PLI) will have an effect on usefulness.

These hypotheses give rise to the research model (Figure 1) represented as a causal relationship schema and used as a point of departure for this research. The boxes represent the constructs which were measured by a set of items, with arrows representing hypotheses 1 to 5.
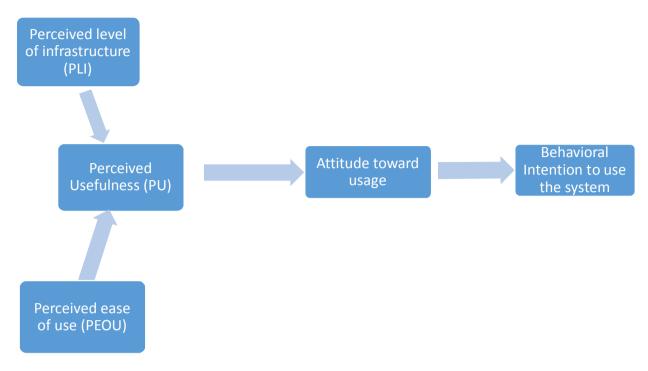
Fig. 2.   Modified Conceptual research model

2   A NON-LINEAR INTERACTIVE MODEL

Let us assume that three important elements determine the acceptance of the e-business model in the marketplace, namely, the Business user, the e-commerce system developer, and the transportation infrastructure usability. There are six interactions or interfaces. These are:

1. The Business feedback
2. The business usage
3. The developed system usability
4. The developed system mapping
5. The infrastructure network
6. The infrastructure data

Let us define the following variables:

1. P(BF) as the probability of the business user feedback, or the likelihood of a system user provides a feedback of the performance of the system to the developer.
2. P(BU) as the probability of a favorable perception of the business user of the infrastructure expressed as the perception of the adequacy of the infrastructure to the success of the e-business practice.
3. P(SU) as the likelihood of a favorable system usability measured as the number of system versions over the number of complaints received.
4. P(IM) as the percentage of the infrastructure mapping within the developed system as perceived by the system developer.
5. P(IN) as the percentage of the infrastructure network covering the business needs as perceived but e users.
6. P(ID) as the level of the data provided by the infrastructure to the system's developer .

Let us define the e-business acceptance indicator, MTAM as follows:

$$MTAM= \{P(BF)*P(SU)+P(BU)*P(IN)+P(ID)*P(IM\}/3$$

Figure 3 explains these relationships. The MTAM ranges from 0 to 1, where 0 indicate total failure while 1 indicate total success probability.
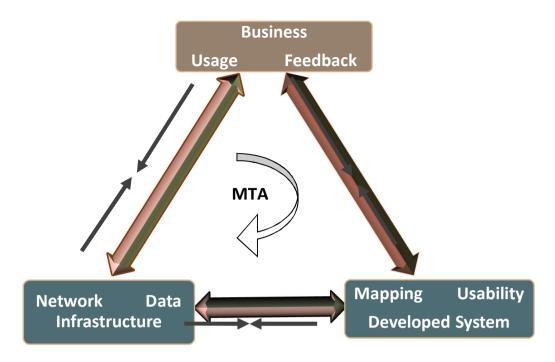
Fig. 3.   The conceptual MTAM

3   CONCLUSION

This research is a step toward understanding the reasons behind the sluggishness of adopting the e-business technology in the Middle Eastern economies. There was some significant to the hypothesis that the perceived level of infrastructure has an effect on the perceived usefulness. This will give rise to the assumption that e-business might not move forward unless there is a mature logistics systems in place. Further research is needed to explore the infrastructure deterioration influence in the implementation of e-business. The MTAM conceptual model can become a powerful indicator of the probability of success of an e-business model in any country or community. Further research is needed to validate this model and standardize its precepts.

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