

Adoption, Diffusion, Use and Impact of ICT In Developing Countries: A Case Study of Jordan

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ABSTRACT

The new and rapidly growing fields of Information and Communication Technology (ICT) have continuously changed the face of the world. ICTs will become a major factor in our world and it penetrate to every movement in our life so the persons who cant accept the innovation will face difficulties to walk together with the world. Different models of adoption, diffusion and technology acceptance have been used previously to study information technology adoption in all parts of the world. The main purpose of this study is to identify a viable model for the adoption of technology in Jordan and to determine the factors that influence technology adoption. Although a handful of studies conducted in industries nations do exist, there is a general paucity of studies in the academic literature or in the trade press relating to the experience of other developed and developing country. It is believed that the findings of this study will enhance our knowledge of the adoption and diffusion of ICT by focusing attention on an area hitherto neglected or overlooked. This paper will present an introduction of a PhD thesis in "The Adoption of ICT in developing countries" by taking Jordan as case study. The first part of this paper will explain some of the existing models followed by a discussion models of what are related to a study in the developing countries such as Jordan.

Keywords :

Adoption, Innovation, Diffusion, Information and Communication Technologies (ICT), Jordan.

1.0 INTRODUCTION

Advances in information and communication technologies (ICT) and the growing use of the Internet in individual, government, business and financial organizations in the entire world have changed the face

of world. In the developing countries, poor economies, lack of education and infrastructure are among the factors that contribute to the slow adoption of technology. Jordan, for instance, is still in the infancy stage of computerizing and transforming their administrations, businesses and individual life into an internet –based operations including e-government, e-commerce, and e-shopping. Among the neighboring countries, Jordan has good, convenient and high quality telecommunication facilities. It applies the latest technologies in telephone and Internet services. It is worth mentioning that Jordan is showing anxiousness toward e-commerce, e-governments, and m-commerce. The implementation of high-level technologies such as Internet banking or e-Government services in Jordan, however, is challenged by a number of problems including tribes and culture differences that could have hindering public' appreciation and willingness of ICT and Internet usage.

The importance of this study came along with the Jordanian understandable of the positive impact of the ICT on the different economies of the world. Upon accession to the throne, King Abdullah II launched concerted initiatives emphasizing on the importance of IT for the future of the country. The foresight of Jordan is to become a regional IT leader and an internationally recognized exporter of IT products and services such as electronic business application (i.e. e-government, e-commerce, and mcommerce). The contribution of this study is to enhance the understanding of the diffusion, adoption and acceptance of new information technology in developing country and in particular Jordan.

2.0 THE ADOPTION MODELS

2.1 Diffusion of Innovation

One major explanation for the growth of new information and communication technologies (ICTs) has been the adoption and diffusion process. These concepts are often discussed together although conceptually they are quite different. The adoption process model was first

introduced by Rogers (1962), based on the fact that an individual goes through a series of steps which are: knowledge, persuasion, decision, implementation, confirmation.

Rogers defines diffusion as a process by which an innovation is communicated through certain channels over time among the members of a social system. Further, innovation has been described as an idea, a product, a technology, or a program that is new to the adopting unit.

The diffusion of innovation theory proposes that perceptions of technology characteristics, such as its relative advantage, compatibility, complexity, trialability, and observability impact the adoption of any new product. Many researchers have applied Rogers' theory in their studies, for example Raisinghani & Schkade's (1998) in explaining the adoption of Internet, intranet, extranet technologies for electronic commerce applications, and Tan & Teo's (2000) in describing factors influencing the adoption of internet banking in Singapore. These studies have depicted that the diffusion of innovation follows an S-curve (Luftman, 2004) as in Figure 1.

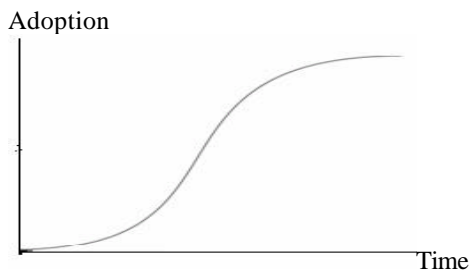


Figure 1: Diffusion of innovation (Rogers, 1962)

2.2 Theory of Reasoned Action

Theory of Reasoned Action (TRA) was developed by Fishbein and Ajzen in (1975) to present a broader range of behaviors based on particular situations combinations of individual beliefs and attitudes, and the affect of beliefs of other relatives to the individual. Fishbein and Ajzen persuade that the belief is concerned with the behavior that is more important rather than the beliefs about the objects in the world. Some of relevant beliefs influence of individual's attitude toward behavior, other beliefs are normative in nature that is beliefs where referents think the individual should or should not execute the behavior. A person behavioral intention appears as a factor of one's attitude toward behavior and one's subjective norm. Attitude and subjective norm affect the individual behavioral intention, and the intentions consequently impinge on an individual behavior (Figure 2). Fishbein also demonstrates that one can build new beliefs by performing some behavior; these beliefs provide the basis for the construction of the attitude toward the objects, attitude in turn determine the individual's intention to perform the behavior in future and this intention lead to performance or nonperformance of the behavior. The most used of this model is the health-related fields and medical innovation

(Beadnell, Blair, and Baker, Sharon A., 2008; Hale et al., 2003, and Hoffman, 1999).

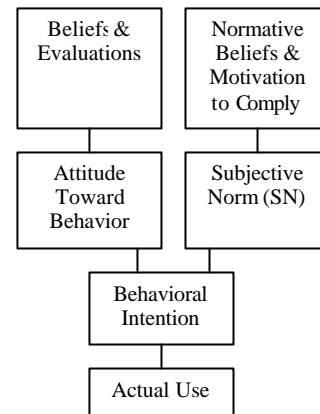


Figure 2: Theory of Reasoned Action (Fishbein & Ajzen, 1975)

2.3 Technology Acceptance Model

Technology Acceptance Model (TAM) was developed by Davis (1989) to study diffusion and adoption of new technology at individual levels, and to clarify computer usage behavior. The basic factors in TAM are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (Figure 3). Davis defines PU as the "Degree to which individual believes using the information System will enhance the performance" while PEOU as "Individual believes the given Information System will reduce the intensity of their work". Of these two factors, Davis concluded that PU was the most important, the reason is that a after period of time in actually using the innovation (post adoption) the beliefs of Perceived Ease of Use (PEOU) has losing effect on intention, while Perceived Usefulness has cohesiveness strong positive and effect on intention.

On other hand researchers can use external variables in extended TAM to measure the acceptance of new innovation technology in their study, the external variables in TAM includes:

- System design characteristics.
- User characteristics (Cognitive style and other personality variables).
- Task characteristics (Nature of the development or implementation political influences and organization structure).

Several Researchers used TAM in there studies such as (Adams, Nelson & Todd, 1992; Davis et al., 1989; Hendrickson, Massey & Cronan, 1993; Segars & Grover, 1993; Subramanian, 1994; Szajna, 1994) to provide empirical evidence on the relationships that exist between usefulness, ease of use and system use. (Adams et al, 1992) replicated the work of Davis (1989) to demonstrate the validity and reliability of his instrument and his measurement scales. Also this model has been used to examine the acceptance of email systems (Straub et al., 1997), personal digital assistants (Yi et al. 2006), World Wide Web (Moon and Kim, 2001), Enterprise Resource Planning systems (Hwang, 2005), and internet (Shih, 2004).

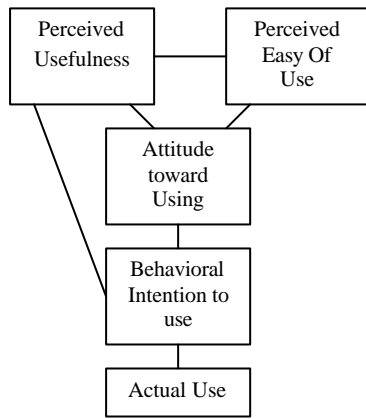


Figure 3: Technology Acceptance Model (Davis, 1989).

2.4 The Theory of Planned Behavior

The theory of planned behavior (TPB) developed by Ajzen (1985); it is based on TRA to present a comprehensive yet parsimonious psychological theory that identifies a causal structure for explaining a wide range of human behavior including leisure behavior, health care, and consumer purchasing behavior (Ajzen, 1991). TPB defines relationships between beliefs, attitudes, norms, perceived behavioral control, intentions, and behavior (Figure 4). Attitude toward a behavior, subjective norm, and perceived behavioral control influence an individual's intention to perform a given behavior.

(an individual's assessment of the importance of those resources to the achievement of outcomes). Specifically, control beliefs are defined as the presence or absence of requisite resources and opportunities necessary to perform a behavior. Previous research that have used this model include Margaret Tan, and Thompson S. H. Teo, (2000) who appear the factors influencing the adoption of internet banking, (TPB; Morris et al., 2005; Hardgrave and Johnson, 2003), Theory of Planned Behavior. In particular, several studies appear that the TPB would better help to predict health-related behavioral intention and improved the predictability of intention in various health-related fields such as condom use (Albarracin, Fishbein, Johnson, & Muellereile, 2001; Sheeran & Taylor, 1999), leisure (Ajzen & Driver, 1992), exercise (Nguyen., Potvin, & Otis, 1997), and diet (Conner, Kirk, Cade, & Barrett, 2003).

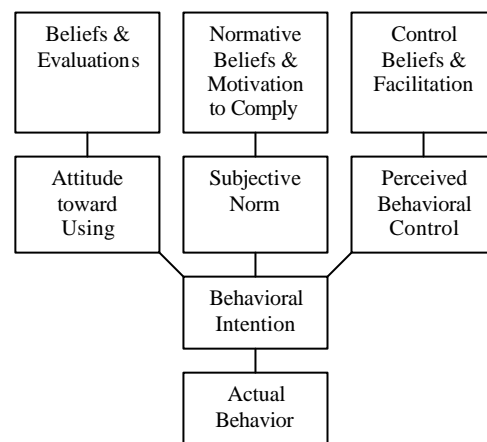


Figure 4: Theory of Planned Behavior (Ajzen, 1985)

The major difference between TPB and TRA is that TPB introduces the third determinant factor that is perceived behavioral control which is defined as the "... perceived ease or difficulty of performing the behavior" Ajzen (1991). Perceived behavioral control is divided into two factors: control beliefs (the availability of skills, resources and opportunities) and perceived facilitation

2.5 Summary of Models

Table 1 shows the summary of four widely used models that have been used in the study of adoption and diffusion of ICT in developed and developing countries.

Table 1: Summary of Models in Adoption

Models	AUTHOR/ YEAR	FACTORS	USAGE	RESEARCHERS	Model	Key Factors	Applications	Key Researchers
DOI	EVERETT M ROGERS (1962)	- Relative Advantage - Compatibility - Complexity - Trialability - Observability	Acceptance of any new innovation Such as (agricultural tools, TV, Wrist Watch, Democracy, Computer, Internet)	Lawrence Schkade, Margaret Tan, Thompson S. Teo, Thomas Valente; Susan Hubbard Susan W. Hay; Charles Henderson Melissa H. Davis; Carol Savery, 2005.	TAM	- Perceived Usefulness (PU) - Perceived Easy Of Use (PEOU)	Acceptance of innovation of technology such as (Mobile, PDA, E-Commerce, Internet Banking)	Hale, & Rubin, 1997; Sparks, Shepherd, & Frewer, 1995; Hoffman, 1999. Adams, Nelson & Todd, 1992; Davis et al., 1989; Hendrickson, Massey & Cronan, 1993; Segars & Grover, 1993; Subramanian, 1994; Szajna, 1994; Straub et al., 1997; Yi et al. 2006; Moon and Kim, 2001; Hwang, 2005; Shih, 2004;
TRA	MARTIN FISHBEIN & LCEK AJZEN (1975)	- Attitude Toward Behavior (A) - Subjective Norm (SN)	Most use in medical innovation such as (Dieting, Condom, Limiting sun	Beadnell, B and Baker, Sha A., 2008; Hale al., 2003; Seiw Ajzen, & Fishb 1980; Gre	TPB	- Attitude toward Using (A) - Subjective Norm (SN) - Perceived Behavioral Control (BC)	Several studies found that the TPB used to improved the predictability of intention in various health-related fields such as (Condom use,	Albarracin, Fishbein, Johnson, & Muellereile, 2001; Sheeran & Taylor, 1999; Ajzen & Driver, 1992; Nguyen, Potvin, & Otis, 1997; Conner, Kirk, Cade, &

3.0 A CASE STUDY OF JORDAN

There are differences between developed and developing countries in how they use information and communication technology that can be traced to differences in culture. Using ready benchmarks from developed nations for studying ICT adoption in developing nations is unreliable and ill-advised. To date there is not a great deal of literature on Jordanian ICT adoption status. Even though there are a number of reports and studies that can easily be found in the internet, many of these studies are not formally conducted as a research and the data is not readily available. There is seldom sufficient local content to draw conclusions about the Jordanian readiness toward electronic services. In relation to this, a study needs to be done to investigate the current adoption of ICT especially e-services in Jordan.

As being highlighted in the literature, many models have been used in the studies the adoption of technology, service and product including Diffusion of Innovation (DOI) by Rogers, Theory of Reasoned Action (TRA) by Fishbein & Ajzen, Technology Acceptance Model (TAM) by Davis, and Theory of Planned Behavior (TPB) by Ajzen. Comparing these four widely used models so far, none are as suitable as the Technology Acceptance Model (TAM) (Davis, 1993, 1992, 1989), to study this phenomena by using the external variables which will be included to a model that is going to be proposed for the developing countries especially in Arab world. A review of research on IS acceptance and usage recommend that TAM has appeared as one of the most influential models in this field of research. Moreover, the literature and an exploratory study in Jordan suggests that the Technology Acceptance Model (TAM), which is the basis of much of the research into information technology diffusion, may be useful only if it is extended to include specific issues. TAM has verified to be the most effective among models in the information systems literature for predicting user acceptance the new technology.

Furthermore, TAM uses TRA to determine causal connection between two relevant sets of constructs, *Technical concept* such as (perceived usefulness, perceived ease of use), and *Psychological/Social concept* such as (user attitude toward using, behavioral intention and actual computer usage behavior). Both of the keys construct, perceived usefulness and perceived ease of use in the TAM model, predict an individual's attitude towards using a computer system.

From an early observation, it is found that culture, tribes and society have influence the adoption of ICT in Jordan. However no empirical study has been conducted so far. Therefore, for the purpose of this study, factors including culture, tribes, society, security, privacy, and income could be investigated to understand and measure their level of influence on the adoption of ICT in the developing countries.

4.0 CONCLUSION

Adoption models are very important to measure the factors that influence the individuals and organizations to accept new technology. These Models develops to enhance the ability of individuals and organization to use the new innovation by Psychological /Social factors (Attitude toward Behavior, Subjective Norm, and Behavior control) and Technical factors (The Range of Usefulness, the Range of Ease of Use, Experience and other external variables). Finally, Technology Acceptance Model (TAM) which combine between the Psychological, Social, and Technical factors and can add to it external variables is the most useful model.

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