

Toward An Information and Communication Technology Development in Developing Countries

Mohammad M.F. Khasawneh, University Utara Malaysia, Kedah, Malaysia, m_khasa@yahoo.com

Huda Bt Hj. Ibrahim, University Utara Malaysia, Kedah, Malaysia, huda753@uum.edu.my

ABSTRACT

The rapidly development and exceptional growing of Information and Communication Technology (ICT) have continuously affected all aspects of life and activities in the world. ICT becomes a major factor that drives social, economic and human or individual development in one country. Individual who can't accept or use the technology innovation will suffer difficulties to go together with the world especially after a period of time when the innovation becomes an available commodity in the world. In spite of great development of ICT and high acceptance of the technology by organizations and individuals in developed nations, adoption and acceptance of ICT innovations, due to some determinants, are still low in developing countries including the Arab countries. Therefore a study, based on some relevant adoption model, needs to be conducted to understand and further discover about the adoption of ICT in developing countries especially in Arab world. The study includes comparing several adoption and innovation model in a way to identify a viable model for the adoption of technology in Jordan and other similar developing countries. The findings of the study will enhance our knowledge of the adoption and diffusion of ICT by concentration on an area hitherto neglected.

Keywords:

Information and Communication Technology (ICT), Adoption, Innovation, Technology Acceptance, Diffusion, Developing Countries.

1.0 INTRODUCTION

Advances in information and communication technologies (ICT) and the growing use of the Internet in individuals, organizations in the entire world have changed the face of world. In developing countries, poor economy, lack of resources 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. Among the neighboring countries, and its strategic place, Jordan has good, convenient and high quality telecommunication

facilities. Moreover its government encourages the investment to apply 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. But these implementations of high-level technologies such as Internet banking, e-Government services, and ICT in teaching and learning in Jordan and Arab countries will face many challenges such as culture differences, tribes, and religion 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. Jordanian shows the progress in the developed countries and the rising of ICT in the world. So 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 m-commerce).

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 of the technology itself. 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 (1998) in explaining the adoption of Internet, intranet, extranet technologies for electronic commerce applications, and Tan & Teo (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.

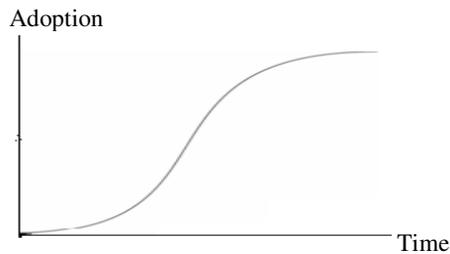


Figure 1: The S-Curve

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 and Baker, 2008; Hale et al., 2003, and Hoffman, 1999).

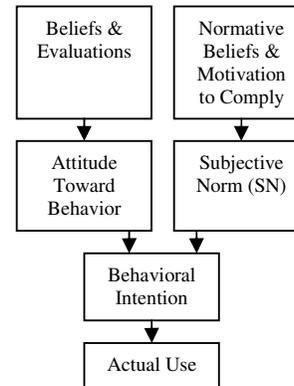


Figure 2: Theory of Reasoned Action (Fishbein & Ajzen, 1975)

2.3 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 3). Attitude toward a behavior, subjective norm, and perceived behavioral control influence an individual's intention to perform a given behavior.

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 (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 researches that have used this model include a study Tan and Teo (2000) on the factors influencing the adoption of internet banking. In particular, several studies show that TPB would better help to predict health-related behavioral intention and improved the predictability of intention in various health-related fields such as on condom use (Fishbein et al. 2001, Sheeran & Taylor, 1999), leisure (Ajzen & Driver, 1992), exercise (Nguyen et al., 1997), and on diet (Conner et al., 2003).

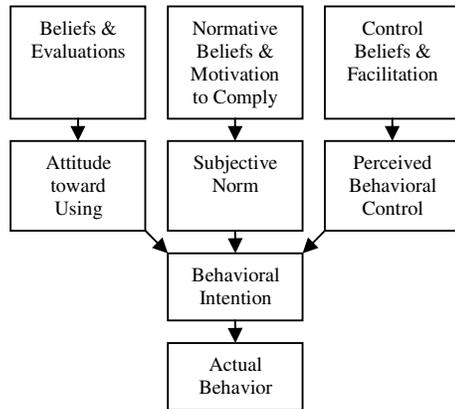


Figure3: Theory of Planned Behavior
(Ajzen, 1985)

2.4 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 4). 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.

Researchers, on the other hand, can use external variables in the extended TAM to measure the acceptance of new innovation technology in their study. The external variables in TAM include:

- 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 have used TAM in their studies including the study of Adams et al., (1992), Davis et al., (1989), Hendrickson et al. (1993), Segars & Grover (1993), Subramanian (1994), and 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. This model has also 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).

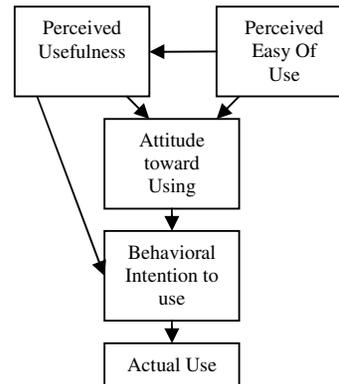


Figure 4: Technology Acceptance Model
(Davis, 1989).

2.5 Summary of Models

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

Table 1: Summary of Models in Adoption

Models	AUTHOR /YEAR	FACTORS	USAGE	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 L. Schkade, 1998; Margaret Tan, and Thompson S. H. Teo, 2000; Thomas W. Valente; Susan M. Hubbard and Susan W. Hayashi 2003; Charles Henderson and Melissa H. Dancy 2005; Carol A. Savery, 2005.
TRA	MARTIN FISHBEIN & LCEK AJZEN (1975)	- Attitude Toward Behavior (A) - Subjective Norm (SN)	Most use in medical innovation such as (Dieting, Condom, Limiting sun exposure)	Sejwacz, Ajzen, & Fishbein, 1980; Sparks, Shepherd, & Frewer, 1995; Greene, Hale, & Rubin, 1997; Hoffman, 1999; Hale et al., 2003; Beadnell, Blair, and Baker, Sharon A., 2008
TPB	LCEK AJZEN (1985)	- 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, Leisure, Exercise, Diet)	Ajzen & Driver, 1992; Nguyen, Potvin, & Otis, 1997; Sheeran & Taylor, 1999; Albarracin, Fishbein, Johnson, & Muellerleile, 2001; Conner, Kirk, Cade, & Barrett, 2003.
TAM	FRED DAVIS (1989)	- Perceived Usefulness (PU) - Perceived Easy Of Use (PEOU)	Acceptance of innovation of technology such as (Mobile, PDA, E-Commerce, Internet Banking)	Davis et al., 1989; Adams, Nelson & Todd, 1992; Hendrickson, Massey & Cronan, 1993; Segars & Grover, 1993; Subramanian, 1994; Szajna, 1994; Straub et al., 1997; Moon and Kim, 2001; Hwang, 2005; Shih, 2004; Yi et al. 2006.

3.0 A CASE STUDY OF JORDAN

There are differences in terms of how people in developed and developing countries use ICT. One difference that can be traced relates to the culture and language of people in both countries. Most ICT are innovated and produced in industrial nations or developed nations. The technology was introduced under the developed nation's culture and language. People in these countries can easily adopt the new technology with no culture and language barrier. However, people in developing countries have differences in culture and language. This scenario inadvertently could create challenges in the adoption and innovation of the new technology.

Using ready benchmarks from developed nations to study 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 be easily found in the internet, many of these studies are not formally conducted as a research and the data is not readily available. There is rarely sufficient local content to draw conclusions about the Jordanian readiness toward electronic services. In relation to this, a study needs to be conducted to investigate the current adoption of ICT in Jordan under the culture and language influences.

As being highlighted in the literature, many models have been used in studying the adoption of technology, service and product including Diffusion of Innovation (DOI) by Rogers, Theory of Reasoned Action (TRA) by Fishbein

& Ajzen, Theory of Planned Behavior (TPB) by Ajzen, and Technology Acceptance Model (TAM) by Davis. Comparing these four widely used models, TAM (Davis, 1993, 1992, 1989) has some characteristic to be applied in this study. Literature review 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.

Form an early observation, it is found that culture, and tribes, society, and language have influenced 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, language, security, privacy, and income will be investigated to understand their influences on the adoption of ICT in the

developing countries. Based on a few characteristics of TAM as being given earlier, the study decided to use the extended TAM. The factors such as culture and language therefore represent the external variables to be included in the extended TAM.

4.0 CONCLUSION

Adoption models are very important to measure the factors that influence the individuals and organizations to accept new technology. These models were developed 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.

REFERENCES

- Adams, D. A., Nelson, R. R., & Todd, P. A. (1992). Perceived Usefulness, Ease Of Use, And Usage Of Information Technology: A Replication. *MIS Quarterly*, Vol 16, pp. 227-247.
- Ajzen, I. (1985). *From Intentions To Actions: A Theory Of Planned Behavior*. Heidelberg: Springer.
- Ajzen, I. (1991). The theory of planned behavior, *Org. Behav. Human Decision Process*. vol. 50, pp. 179–211, 1991.
- Ajzen, I., & Driver, B. L. (1992). Application Of The Theory Of Planned Behavior To Leisure Choice. *Journal Of Leisure Research*, Vol 24(3), p. 207.
- Fishbein, Albarracin, D., M., Johnson, B. T., & Muellereile, P. A. (2001). Theories Of Reasoned Action And Planned Behavior As Models Of Condom Use: A Meta-Analysis. *Psychological Bulletin*, Vol 127(1), pp. 142-161.
- Beadnell, Blair, Baker, Sharona, Gillmore Maryrogers, Morrison Dianem, Huang Bu, & Stielstra Sorrel (2008). The Theory Of Reasoned Action And The Role Of External Factors On Heterosexual Men's Monogamy And Condom Use. *Journal Of Applied Social Psychology*, Vol 38, pp 97-134.
- Conner, M., Kirk, S. F. L., Cade, J. E., & Barrett, J. H. (2003). Environmental Influences: Actors Influencing A Woman's Decision To Use Dietary Supplements1, 2. *The Journal Of Nutrition*, Vol 133(6), p.1978.
- Davis, F.D. (1989). Perceived usefulness, perceived ease-of-use, and end user acceptance of information technology, *MIS Quarterly*, Vol. 13, N° 3, pp. 318-339.
- Davis, F.D. Bagozzi, R., & Warshaw, P. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science* 35(8), pp. 982-1003.
- David Gefen, & Detmar W. Straub. (1997). Gender Differences In The Perception And Use Of E-Mail: An Extension To The Technology Acceptance Model. *MIS Quarterly*, Vol. 21, No. 4, pp. 389-400.
- Fishbein, M. & Ajzen, I (1975). *Beliefs, Attitude, Intention and Behavior: An Introduction to Theory and Research*, Addison-Wesley, Reading, MA.
- Hale, J. L., Householder, B.J., & Greene, K.L. (2003). The Theory Of Reasoned Action. In J.P. Dillard & M. Pfau (Eds.). *The Persuasion Handbook: Developments In Theory And Practice*. pp. 259- 286.
- Hardgrave & Johnson. (2003). Towards An Information Systems Development Acceptance Model: The Case Of Object-Oriented Systems Development. *IEEE Transactions On Engineering Management*. Vol 50 I3. pp. 322-336.
- Hendrickson, A. R., Massey, P. D., & Cronan, T. P. (1993). On The Test-Retest Reliability Of Perceived Usefulness And Perceived Ease Of Use Scales. *MIS Quarterly*, Vol 17, pp. 227-230.
- Hoffman, D.L, Novak, T.P, & peralta M. (1999). Building consumer trust online. Association for computing machinery. *Communications of the ACM* ,Vol(42:4), p.80.
- Hwang, Y. (2005). Investigating Enterprise Systems Adoption: Uncertainty Avoidance, Intrinsic Motivation, And The Technology Acceptance Model, *European Journal Of Information Systems*, Vol. 14, No. 2, pp. 150–161.
- Ji-Won Moon, & Young-Gul Kim. (2001). Extending The TAM For A World-Wide-Web Context. *Elsevier Science Publishers B. V*, Vol 38 , Issue 4, pp. 217 – 230.
- Luftman, Jerry N. (2004). *Managing the Information Technology Resource: Leadership in Information Age*. (1st ed.): Prentice Hall.
- Raisinghani, Mahesh S., Schkade, Lawrence L. & Smith, Ashbel (1998). Diffusion of Innovations in the Cybierorganization. *IEEE*.
- Michael G. Morris, Viswanath Venkatesh, & Phillip L. Ackerman (2005). Gender and

- Age Differences in Employee Decisions about New Technology: An Extension to the Theory of Planned Behavior. *IEEE*.
- Morris, M.G., Viswanath, V., & Ackerman, P.L. (2005). Gender And Age Differences In Employee Decisions About New Technology: An Extension To The Theory Of Planned Behavior. *IEEE Transactions On Engineering Management* Vol(52:1), P 69.
- Nguyen, M. N., Potvin, L., & Otis, J. (1997). Regular Exercise In 30- To 60-Year-Old Men: Combining The Stages-Of-Change Model And The Theory Of Planned Behavior To Identify Determinants For Targeting Heart Health Interventions. *Journal Of Community Health*, Vol 22(4), pp. 233-246.
- Rogers, E. M. (1962). *Diffusion of Innovations*, (1st ed): Free Press, New York.
- Rogers, E.M. (1995). *Diffusion of Innovations*, (4th ed.): Free Press, New York.
- Segars, A. H., & Grover, V. (1993). Re-Examining Perceived Ease Of Use And Usefulness: A Confirmatory Factor Analysis. *MIS Quarterly*, Vol 17, pp. 517-525.
- Sheeran, P., & Taylor, S. (1999). Predicting Intentions To Use Condoms: A Meta-Analysis And Comparison Of The Theories Of Reasoned Action And Planned Behavior. *Journal Of Applied Social Psychology*, Vol 29(8), pp.1624-1675.
- Shih, H. (2004). Extended Technology Acceptance Model Of Internet Utilization Behavior. *Information & Management*, Vol 41(6), pp. 719-729.
- Subramanian, G. H. (1994). A Replication Of Perceived Usefulness And Perceived Ease Of Use *Measurement. Decision Sciences*, Vol 25(5/6), pp. 863-873.
- Szajna, B. (1994). Software Evaluation And Choice: Predictive Evaluation Of The Technology Acceptance Instrument. *MIS Quarterly*, Vol 18(3), pp. 319-324.
- Tan, Margaret & Teo, Thompson S. H. (2000). Factors Influencing the Adoption of Internet Banking. *Journal of the Association for Information Systems*.
- Yi, M.Y., Jackson, J.D., Park, J.S., & Probst, J.C. (2006). Understanding Information Technology Acceptance By Individual Professionals: Toward An Integrative View. *Information & Management* Vol (43:3), pp. 350.
- publication permission agreement as a part of IBIMA copyright agreement. IBIMA may not necessarily agree with the content of the manuscript. The content and proofreading of this manuscript as well as and any errors are the sole responsibility of its author(s). No part or all of this work should be copied or reproduced in digital, hard, or any other format for commercial use without written permission. To purchase reprints of this article please e-mail: admin@ibima.org.

Copyright © 2008 by the International Business Information Management Association (IBIMA). All rights reserved. Authors retain copyright for their manuscripts and provide this journal with a

Information Technologies and International Development 4, 43-60 (2007) CrossRef Google Scholar. 5. Acharya, J., Lund, R.: Gendered spaces – socio-spatial relations of self-employed women in craft production, Orissa, India. Scopus Levis M. (2011) Working toward Women's Economic Empowerment: Using Information and Communication Technology in Developing Areas to Market Traditional Crafts. In: Jacko J.A. (eds) Human-Computer Interaction. Users and Applications. The development and spread of information and communication technology (ICT) is often touted as the harbinger of a new industrial revolution. In a strategy piece, Talero and Gaudette (1995) point out that the diffusion of information technologies to all areas of human activity is accelerating change in economies and societies. While empirical confirmation of the effects of ICTs on performance, especially in developing countries, is still awaited, ICTs certainly qualify and deserve the moniker of pervasive technologies on the basis of the first two criteria. 8 From a technical standpoint, the unifying characteristic of these technologies is "digitisation."