Testing Technology Acceptance Model in Developing Countries: the Case of Jordan

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Abstract

This study duplicates and broaden Davis (1989) pioneering technology acceptance model (TAM) within a highly dynamic and competitive educational industry in a developing Middle-Eastern country, Jordan. A survey was conducted among universities faculty members in Jordan. A total of 747 completed questionnaires were returned resulting in a response rate of 29.9 percent was utilized in the study. A total of 11 hypotheses related to technology acceptance antecedents and consequences were examined by estimating multiple regression models. The study findings lend support to the technology acceptance model. However, a number of observations can be made. The study confirms the technology acceptance –computer usage relationship is robust cross divers contexts. Although, individual attitude and behavior toward computer technology are consistent predictors of technology acceptance, organizational supports (end user support and administrative support) factors as direct and linear determinants of technology acceptance are not completely stable. Further, the nature of the correlations between organizational supports, beliefs and behavior, and computer usage may be more complex than what has been believed because of within country variations along Hofstede's cultural dimensions. This paper provides further validation for a TAM model and unveils some of its weaknesses and strengths. More research is recommended regarding the Technology acceptance model in developing countries.

Keywords: Technology Acceptance; Organization Supports, Computer Usage: Jordan.

Introduction

Technology acceptance is pervasive in education and business (Summer, 1988; Bandura and Wood, 1989; Davis, 1980; 1989; Hess, 1994; Igbaria and Iivari, 1995; Gos, 1996; Hofstede, 1997; Orr, Allen, and Poindexter, 2001; Adams, 2002). Particularly, models concerning technology acceptance – and usages relationships and its various moderators and mediators are legion in both business and education management literature (Hawkins, 1985; Yildirim, 2000; Fandy, 2000; Sweanney, et al., 2001; Lee and Park, 2003). Although the pioneering work of Davis (1980; 1989) involved a process-model with organizational and individual traits as determinants of technology acceptance, which in turn influenced computer usage, most subsequent studies primarily focused on the latter linkage, that is, technology acceptance – computer usages. The attempt to replicate the complete pioneering model in diverse context is rare, which may be limiting to theory building. This study replicates and broaden Davis (1989) model in a developing country, Jordan, within the competitive and dynamic educational industry. Scholars suggest that developing countries are challenging testing grounds for determinant-strategy-performance linkages (Straub, Keil, and Bernner, 1977; Ighbaria and Livari, 1995; Dutta et al., 2003). Not only this study helpful in ensuring the universal applicability of Davis's (1980; 1989) initial technology acceptance model, but also in further validating the measurement scales of the constructs in the model. This study may also be helpful in redrawing the attention to the early stage, the determinants, of technology acceptance, which may be as important as the consequences of technology acceptance itself (Dutta et al., 2003; Ma and Lui, 2004).

1. Davis (1980, 1989) Technology Acceptance Model

The technology acceptance model (TAM) proposed by Davis (1980; 1989) is arguably one of the most cited and influential models that aim at explaining the factors that determine Information Technology (IT) acceptance.

TAM model was successfully tested by several previous studies in North America; just a few studies were carried out to test the applicability of TAM outside that region (Markham, William, and Watt, 2003). It has been argued that the TAM model may not hold equally well across cultures (Straub, Keil, and Bernner, 1997). The primary purpose of this study is to replicate TAM model and to validate theoretical hypotheses empirically demonstrating how the perceptual and attitudinal constructs in the model are likely to be influenced by differences in culture.
As shown in Figure 1, the model included organizational supports (end user support and administrative support) factors as direct and linear relationships with beliefs and behavior toward computer technology (attitude toward computers, computer anxiety, computer self-efficacy) as predictors of technology acceptance. Computer usage was considered as the consequence of technology acceptance. The linkage between organizational support, technology acceptance and computer beliefs and behavior and computer usage is based on the logic that organizational support will enhance positive computer beliefs and behavior that would be translated into better technology acceptance, which in turn, would result into more efficient and effective computer usage.

Further, organizational support (end users and administrative supports) are predictors of technology acceptance either directly or indirectly through their impacts on faculty members' beliefs and behavior toward computers. For instance, end users supports for faculty members, is theorized to have an influence on their beliefs and behavior toward computers and ultimately technology acceptance and willingness to use computer technology in the classroom. Similarly, an administrative support for faculty members is also hypothesized as a predictor of technology acceptance and computer usage. (Friedberg, 2003; Allyn, 2003; Castro, et al., 2003; Taylor, 2004).
Further, Faculty members' beliefs and behavior toward computers (positive or negative) can impact computer technology acceptance (Bear, Richard, and Lancaster, 1987; Venkatesh and Morris, 2000). Further, Simonson et al. (1987) argue that positive attitude and beliefs reduce anxiety, promote self efficacy, and enhance computer usage. Meanwhile, negative attitude toward computers is inversely influence computer usages (Simonson et al., 1987; Venkatesh and Morris, 2000). Additionally, faculty computer anxiety has a negative impact in computer usage. Computer anxiety, according to McPherson (1998, 1) is "the anxiety that people feel that they experience when they are interacting with computer." Similarly, Jordanian culture is classified as high uncertainty avoidance (Hofstede, 1997), which does not relate to acceptance of innovation and technology. Thus, Cultural factors may reflect on inclination among Jordanian faculty members to resist integration of computer technology into education (Rogers et al., 1996; Dutta, et al., 2003; Alkadi, 2005).

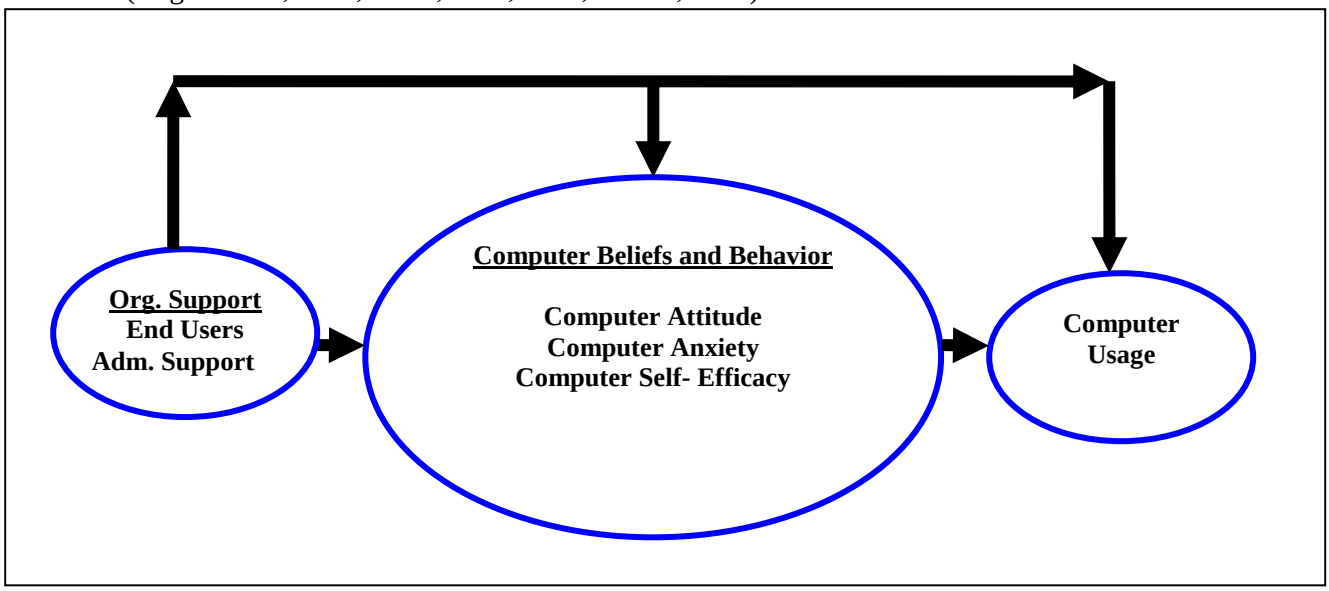

Figure 1: Conceptual Model for Computer Usage

Moreover, literature review illustrated that faculty computer self-efficacy can impact technology acceptance either positively or negatively (Compeau and Higgins, 1995; Compeau, Higgins, and Huff, 1995). Bandora (1986, 391) define self efficacy as "people's judgments of their abilities to organize and excite course of action required to attain designed types of performance." It is concern not with skills one has but one's judgment of one can do with whatever skills he/she possess. In other words, computer self efficacy reflect judgment of one's ability to use computer. It is concern not with what one has done in the past, but rather could be done in the future (Compeau and Higgins, 1995; Venkatesh, et al., 2003; Fagan, et al., 2004).

Several studies explore the impact the self-efficacy concept on computer usage (Compeau, Higgins, and Huff, 1995). Furthermore, research indicated the links between self-efficacy and computer attitude, and anxiety computer usage (Compeau and Higgins, 1995). Based on this discussion, the contention of this study that Jordanian faculty members' computer self-efficacy will be positively correlated with their computer usage.

2. Technology Acceptance Model in Relation to Jordanian Universities

The researchers foresee Davis (1980; 1989) technology acceptance model to be applicable in the context of Jordanian educational setting. Specifically, the hypothesized relationships in the model are likely to hold in terms of their effects and directions (Markham, et al., 2003; Venkatesh, et al., 2003; Morris Kuada and Buatsi, 2005). This is because Jordanian educational industry is one of the fastest growing industries not only in Jordan but also in the entire Middle-East. A free market economic policy led to the emergence of diverse types of universities including government owned, local-private, Middle-Eastern-regional, joint-ventures with other Arab countries, and joint-ventures with Western countries (Dutta, et al., 2003). Since Jordanian universities graduates have to compete in a free local and regional labor markets which are favorable for computer literate and users, this situation pushed universities in Jordan to create a technology acceptance educational environment. Thus, the relationships among the variables were hypothesized as follow:

H_1: In Jordan, the more positive the faculty members' attitude toward computers, the higher is their computer usage.
H_2: In Jordan, the higher the level of computer anxiety among the faculty members, the lower is their computer usage.
H_3: In Jordan, the higher the level of faculty members' computer self-efficacy, the higher is their computer usage.

3. Organizational Support Impact on Computer Beliefs and Behavior

3.1 End-User Support includes the availability of system assistance, specialized instruction, and guidance in using computer applications (Igbaria et al., 1997). End-user support is an organizational variable that might determine the success of computer technology integration into education. Top management involvement in providing high-quality end user support is essential to enhance the level of computer technology acceptance by promoting positive beliefs and behavior toward computers. Such support includes skills, opportunities, and resources needed to use the computer system. As the literature illustrates, an individual's decision behavior to use or ignore the new technology is highly influenced by his/her perception of the availability or lack of availability of required resources and opportunities necessary to perform the task (Ein-Dor and Segev, 1988). Traditionally, Jordanian administrators tend to centralize information sources such as manuals, handbooks, and pamphlets in one place (Bakhtari, 1995; Hasan and Ditsa, 1998). The centralization of information sources hinders its usefulness because users show unwillingness to spend effort to seek information (Davis, 1989).Research reveals that effective and efficient end-user support correlates positively with users' attitudes toward computers and negatively with anxiety. Furthermore, the availability of assistance to individuals is likely to enhance their self-efficacy, perceived usefulness, and perceived ease of use of computers (Igbaria and Iivari, 1995, Trevino and Webster, 1992). Based on this reasoning, the following hypotheses are posed:

H_4: In Jordan, faculty members' attitudes toward computers will be positively associated with end-user computer support.
H_5: In Jordan, faculty members' computer anxiety will be negatively associated with end-user computer support.
H_6: In Jordan, faculty members' computer self-efficacy will be positively associated with end-user computer support.

3.2 Administrative Support includes top management encouragement and allocation of resources (Igbaria et al., 1997). Several research studies emphasize the importance of administrative support for the success of computer integration into education and for members to learn and use computer technology in their daily operations (Ein-Dor and Segev, 1978; Fuerst and Cheney, 1982)**.** Lack of administrative support will hinder the implementation of computer technology and discourage the use of computers (Lucas, 1978; Fuerst and Cheney, 1982). Top administrators play a critical role in shaping the organization's values, beliefs, and behavior (Simon, 1997). Their support of and commitment to computer technology are required to give their employees a positive signal about the importance of computer technology. Top administrators can be a model for creating a culture of innovation and positive attitudes toward computer technology by emphasizing the advantages of computer integration into educational practices to faculty and staff through speeches, policy statements, personal actions, and initiatives.

Moreover, top administrators could play a facilitative role by encouraging computer technology programs and training by providing the required resources and updating the computer systems' essential activities to enhance favorable attitude, reduce anxiety, enhance self efficacy, and change perception toward computer usefulness and ease of use (Davis, et al., 1989; (Shafritz, Ott, and Jang, 2005**)**. In a collectivistic society like Jordan, individuals (including faculty members) rely on the opinion of others as well as the support and encouragement they receive to inform judgments about their own abilities (Hofstede, 1980; Igbaria and Iivari, 1995; Chandler, et al., 2000). Thus, administrative support in term of resources and encouragement enhance faculty members' self-efficacy to perform the task (Igbaria and Iivari, 1995). Therefore, the following hypotheses are posed:

H_7: In Jordan, faculty members' attitudes toward computers will be positively associated with administration support.
H_8: In Jordan, faculty members' computer anxiety will be negatively associated with administration support.
H_9: In Jordan, faculty members' computer self-efficacy will be positively associated with administration support.

3.3 Organizational Support Impact on Computer Usage

Research suggests that organizational support has direct and indirect positive impacts on computer literacy and computer utilizations through beliefs and behavior (Davis 1989; Igbaria et al., 1989)**.** Lack of organizational support associates negatively with effective computer usage or utilization (Igbaria and Iivari, 1995). Computer usage is enhanced not only by management support, but also by their willingness to align computer information technology strategy with the organization's objectives (Rajiv and Kirs, 1994). Moreover, the organization's administration which has a high level of computer information technology sophistication tends to participate in computer technology planning to integrate it into overall organizational strategic plans. Rajiv and Kirs (1994, 306) argue that in such organizations both the "organizational plan and computer information plan are more likely to affect each other, and greater alignment between critical success factors and information technology capability may therefore be expected." However, top administrators in Jordanian universities are more likely to have been exposed to computer technology during their education and training in computerized countries. Hasan and Ditsa (1998, 12) points out that Middle Eastern managers and administrators, including Jordanians, "feel uncomfortable seeking advice from their own workers, but in both Jordan and Turkey, we noticed the role of an external IT consultant was often used to solved this dilemma."

Similarly, based on the TAM (Davis, Bagozzi, and Warshaw, 1989), availability of an end-user support center promotes computer literacy and usage. The quality of an end-user computer support system is an important determinant of computer technology acceptance and the intention to use (Davis, Bagozzi, and Warshaw, 1989; Igbaria and Parasuraman, 1989). Further, the perception of end-users about the quality of the support system promotes their willingness to use computers more frequently (Igbaria and Iivari, 1995). Thus, the following hypotheses are proposed:

H_{10}: In Jordan, faculty members' computer usage will be positively associated with end-user computer support.
H_{11}: In Jordan, faculty members' computer usage will be positively associated with administration support.

4. Method of the Study

4.1 Collection of the data:

Data for the study were collected through a field study with Jordanian faculty members as the subject. A national sample of 2500 faculty members of 16 universities listed in the 2009/2010 Directory of the Ministry of Higher Education in Jordan, participated in the study. Each of the faculty members was hand-delivered one copy of the questionnaire. A total of 747 completed questionnaires were returned resulting in a response rate of 29.9 percent was utilized in the study. The characteristics of the sample indicate that 79.4 percent of the respondents were males while 20.6 percent were female faculty members. Meanwhile, 68.8 percent of the respondents were below 51 years old and 31.2 percent over 51 years old. Hence, it is very likely that the respondents were responsible persons and had answers to questions asked in this study.

4.2 Measures of the Constructs:

This study used existing scales with some refinements to measure the constructs. Scales are regarded to be acceptable if they have reliability coefficient that exceed 0.70, the landmark of an alpha co-efficient score recommended by Nunnally (1978). The scales for all the constructs have been adopted: Igbaria, Zinatelli, Cragg, and Cavaye's (1997) perception of end-user support scale (4 items); Igbaria, Zinatelli,

Cragg, and Cavaye's (1997) perception of administrative support scale (8 items); Igbaria and Parasuraman's (1989) attitudes toward computer technology scale (7 items); Thatcher and Perrewe's (2002) computer anxiety scale (4 items); Compeau and Higgin's (1995) computer self-efficacy scale (10 items); and Igbaria, Zintatelli, Cragg, and Cavaye's (1997) computer usage scale (29 items). All 6 constructs have a total of 62 items. Self-reporting questionnaire, utilizing a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) designed to measure respondents' perception of organizational support; beliefs and behavior, and computer usage

4.3 Validation of the Measures:

Exploratory factor analysis and coefficient alpha were estimated to assess the psychometric proprieties of the scales (Kaiser, 1974; Hair et al., 1987). The results of exploratory factor analyses identified 5 items with factor loadings less than 0.40 out of a total of 29. Consequently, AT3, AT4, SE1, SE2, and SE3 were dropped from beliefs and behavior toward computer scales (attitudes toward computers, computer anxiety, and computer self-efficacy. Cronbach alphas ranged from 0.80 to 0.90.

4.4 Method of Analysis and Results:

The data acquired from the sample used to test all the hypotheses (1-11) in this study. A series of analysis were conducted using multivariate regression approach. The regression models (1-4) analyzed and discussed next.
Model 1 used to test hypothesis H_1-H_6, the results of model 1 in Table1 illustrated that only anxiety is significantly affected by end-user support (β = .179, p= .002) while no effects are found for end-user support with respect to attitude (β = .025, p = .457), self-efficacy (β = .025, p = .557), These results provide support for H_2, while no support is found for H_1 and H_3. Moreover, the regression results shows that administrative support significantly affects all the dependent **v**ariables of attitude (β = .087, p = .038), anxiety (β = -.190, p = .007), self-efficacy (β = .097, p = .065). Therefore, hypothesis H_2, H_4, H_5, and H6 supported. While model 2 used to test hypothesis H_7 and H_8 (Table 2). The results shows that end-user support has no significant impact on faculty members' computer usage (β = .077, p = .106), H_7 not supported. However, the results of model 2, provide support for H_8. As can be seen, from model 2, the estimated parameters and their significance level indicate that administrative support (β = .125, p = .032) is significant and positively related to faculty members' computer usage.

Moreover, Model 3 used to test H_9, H_{10}, and H_{11}, (Table 3). The results shows that faculty members' attitudes toward computer (H_9) have significant positive association with faculty member's computer usage (β = .077, p = .106). However, computer anxiety (H_{10}) was found to have a significant negative impact on Jordanian faculty members' computer usage (β = .077, p = .106). Additionally, the regression result provides no support for H_{11}. It concluded that computer self- efficacy has no significant impact on faculty members' computer usage (β = .077, p = .106). Finally, in Model 4, was used to examine the interaction between the constructs. The regression results of table indicate that, out of the 3 interactions among computer beliefs and behavior variables, only one interactions anxiety*self-efficacy (β = -.155, p < .001) was significant and negatively related to faculty members computer usage.

5. Conclusion and Recommendations

This study replicated Davis (1989) Technology Acceptance Model within a highly growth oriented and competitive educational industry in an emerging Middle-Eastern economy. Not only technology acceptance research is rare in such a context but also the context has the characteristics that allow for a robust test for the complete technology acceptance model. The study findings generally resonate with the results of previous researches and offer one more support for the robustness of Davis (1989) technology acceptance model. In this study, out of the eleven hypotheses, seven were supported. However, a closer look into the results reveals some interesting insights. First, similar to the results of previous studies, it was also found some inconsistencies on how beliefs and behavior factors correlate with technology acceptance model. Perhaps the correlations of these factors and computer usage are much more complex, even though it seems that beliefs and behavior factors play a role in the technology acceptance model, the nature of that role is still unclear. Second, this study may have proved that within-country variations in Hofstede's cultural typology are possible. Hofstede identified that Jordan has a fixed set of cultural traits that are not conducive for computer technology as discussed earlier. However, a successful test of the model shows that adequate variations exist in technology acceptance and in other constructs in the model within Jordanian culture. This finding may indicates that computer technology acceptance is not culture bound. Finally, this study confirms that further attention to most scales in the technology acceptance model is essential. Most scales including computer usage did not remain intact.

Hypotheses tests were pursued with respecified scales and this is pervasive across computer information system research. Much more attention is needed in refining these scales. The implications of this study are several. The study findings strongly support previous studies findings in relationships between organizational supports, behavior and beliefs, and computer usage. Jordanian administrators and policy makers in the universities and other educational institutions have to cooperate to enhance faculty members' abilities to use computer technology in the classrooms, research, and others related activities. It is a well known fact, that administrators and policy makers could be very instrumental by utilizing their symbolism impacts as leaders of educational providers. Their supports and commitments to make the educational institution centers for innovations and technology applications are important and essential. The symbolism observed in top administrators and their commitment to innovation encourages and facilitates university-wide commitment to and use of computer technology. In the cultural context of Jordan, symbolism is very important to change and create positive beliefs and behavior toward computers. For instance, since His Majesty King Abdullah of Jordan began the REACH program, Jordanian organizations, including universities, have been very responsive to such an initiative. Likewise, top management support and encouragement of innovation enhance employees' trust of the administration, which is important in enabling faculty members and staff to take risks for integrating computer technology into educational practices without fear of penalty for failure. The authors hope that the results of this study might serve as a benchmark to stimulate additional research in the area of computer technology acceptance in the developing and emerging economy. Moreover, the authors suggest the duplication of such study in other industries and cross cultures.

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Table 1. Multivariate Regression Analysis Results

Independent Variables	**Dependent Variables**		
	Attitude	Anxiety	Self-Efficacy
End-User Support	0.025	0.179***	0.025
Administrative Support	0.087**	-0.190***	0.097*
R^2	0.025	0.103	0.085
Sign. Of F-Model	0.002	<0.001	<0.001

*** p < 0.01, ** p < 0.05, * p < 0.10

Table 2. Regression Analysis Results

Independent Variables	**Dependent Variable**	
	Computer Usage	
	Beta	**t-value**
End-User Support	0.077	1.62
Administrative Support	0.125	2.14**
R^2	0.102	
Significance of F-Model	<0.001	

*** p < 0.01, ** p < 0.05, * p < 0.10

Table 3. Regression Analysis Results

Independent Variables	**Dependent Variable**	
	Computer Usage	
	Beta	**t-value**
Attitude	0.115	2.03**
Anxiety	-0.187	-6.20***
Self-Efficacy	0.018	0.42
R2	0.605	
Significance of F-Model	<0.001	

*** p < 0.01, ** p < 0.05, * p < 0.10

Table 4. Regression Analysis Results

Independent Variables	**Dependent Variable**	
	Computer Usage	
	Beta	**t-value**
Attitude	0.115	2.03**
Anxiety	-0.187	-6.20***
Self-Efficacy	0.018	0.42
Attitude*Anxiety	0.045	0.82
Attitudes*Self-Efficacy	0.103	1.04
Anxiety*Self-Efficacy	-0.155	-3.40***
R^2	0.205	
Significance of F-Model	<0.001	

*** p < 0.01, ** p < 0.05, * p < 0.10