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ABSTRACT

Antecedents of the technology acceptance model have been the focus of research on user intentions toward, and usage of, new technology. This research has found that in developed countries, the antecedents of the technology acceptance model are valuable predictors of perceived usefulness and perceived ease of use. These findings can potentially translate into new methods that businesses can implement to improve employee acceptance and use of new systems. The present study investigates whether these same antecedents are significant and valid predictors of perceived usefulness and perceived ease of use in developing countries, specifically in Saudi Arabia. The findings indicate that the antecedents of the technology acceptance model do, in fact, apply in Saudi Arabia, and therefore also have implications for businesses in developing countries to improve the user acceptance and use of new technologies.

Keywords

Technology acceptance model (TAM), TAM antecedents, perceived usefulness, perceived ease of use, culture

INTRODUCTION

The acceptance and use of technology by users has been a subject of particular interest for businesses, as more and more of their investment dollars are spent on information systems to improve business performance. Therefore, there is a need to determine why users choose to embrace certain systems, but not others, in today's technology-driven business environment. Consequently, there is a substantial research stream within the field of information systems on the user acceptance and use of new technologies, with one of the predominant theories being the technology acceptance model (TAM) (Davis, 1989). However, the vast majority of this research has been conducted in industrialized, western nations, both in Europe and in North America, raising the question of the implications of this research stream for less-developed regions of the world.

In the original TAM research, Davis had considered antecedents to perceived usefulness (PUSE) and perceived ease of use (PEOU), but asserted that they were fully mediated by PUSE and PEOU (Davis, 1989). More recently, several studies have re-examined potential antecedents to PUSE and PEOU in order to produce a model that can be better acted upon to influence intention to use and ultimately actual system use (Venkatesh, 2000; Venkatesh and Davis, 2000). These studies have evaluated potential antecedents to PUSE and PEOU in North American organizations, but the validity of these antecedents in the context of other cultures has yet to be determined. This is an important consideration because research has shown that culture can play a significant role in the acceptance and use of information technologies (Png, Tan and Wee, 2001), and the current shift to globalization means that more organizations are operating across cultures. Therefore, the goal of this research is to evaluate the predictive validity of these antecedents on PUSE and PEOU, but within the context of an Arab country to determine whether they are valid for organizations working within that culture.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

In one study of the antecedents to PUSE and PEOU, Venkatesh and Davis (2000) specifically focused on the antecedents to perceived usefulness in developing a model they called TAM2. Their findings were based on four longitudinal field studies and the results showed that *subjective norms*, *image*, job relevance, output quality, and *result demonstrability* were all significant predictors of perceived usefulness. Another study by Venkatesh (2000) investigated the antecedents to perceived

ease of use and found that *computer self-efficacy*, perception of external control, *computer anxiety*, and computer playfulness were all significant anchors in predicting perceived ease of use, with *perceived enjoyment* and objective usability functioning as adjustment variables. The antecedents to TAM evaluated in this research are selectively taken from these two studies. We tested a subset of these original antecedents based on the likelihood of cultural influence.

 TAM has had a significant research history, with the vast majority of that research being conducted in developed countries. As we transition to a global economy with organizations becoming increasingly multi-national, the need to carry information technology (IT) research to developing countries has increased. This has resulted in more studies testing TAM in the developing world (Anandarajan, Igbaria and Anakwe, 2002; Hubona, Truex, Wang and Straub, 2006; McCoy, Everard and Jones, 2005; Mao and Palvia, 2006). However, research has yet to be published which evaluates the antecedents to PUSE and PEOU in developing countries. Accordingly, the aim of this work is to fill that gap to determine if the predictive capability of these antecedents will carry over to organizations in developing countries. It is intended that the findings of this research may facilitate the development of policies and practices by organizations in developing countries that are effective in influencing technology acceptance and use.

Dimensions	Descriptions	United States	Saudi Arabia
Power-Distance (PDI)	Degree of inequality among people which the population of a culture considers normal	40	80
Uncertainty Avoidance (UAI)	Degree to which people in a culture feel uncomfortable with uncertainty and ambiguity	46	68
Individualism (IDV)	Degree to which people in a culture prefer to act as individuals rather than as members of groups	91	38
Masculinity (MAS)	Degree to which values like assertiveness, performance, success, and competition prevail among people of a culture over gentler values like the quality of life, maintaining warm personal relationships, service, care for the weak, etc.	62	52

Table 1. Hofstede's Four Cultural Dimensions

In order to properly evaluate the implications of a theoretical model developed in one culture, as it applies to another culture, it is critical to understand the distinctions between the two cultures. Several studies are available that make comparisons between western and Arab cultures, but the one chosen for this research is Hofstede's cultural dimensions (Hofstede, 1980; Hofstede, 2001). Hofstede was chosen both because it is standardized for multi-country comparisons, and because it has been used in other TAM studies (McCoy et al., 2005). Hofstede's dimensions, measured with standardized scores for the United States and Saudi Arabia, and based on Straub, Keil and Brenner (1997), are shown in Table 1.

Hofstede's relative country scores on these four cultural dimensions (which reflect work related values), indicate some pertinent cultural differences between Saudi Arabia and the United States. It is appropriate to examine Hofstede's relative country scores to inform about cultural differences even though we did not employ cultural constructs at the individual level. Particularly, there are large differences in the power-distance, and in the individualism scores of Saudi Arabia compared to the United States. Additionally, the other cultural dimension scores are not so dramatically different between the two countries, but they may still have an effect on the relative applicability of these TAM antecedents in the two cultures.

We propose the theoretical model displayed in Figure 1. The model is segmented into three subsections, based on the underpinning studies which derive each set of research variables.

We utilize constructs from three distinct published models to construct our theoretical model. Specifically, we selected *image*, *result demonstrability*, and *subjective norm* from Venkatesh and Davis (2000) as viable antecedents to perceived usefulness in the context of Arab culture. We also selected *computer self-efficacy*, *computer anxiety*, and *perceived enjoyment* from Venkatesh (2000) as viable antecedents to perceived ease of use. The predicted variables of *perceived usefulness*, *perceived ease of use*, and *intention to use* were drawn directly from Davis (1989).
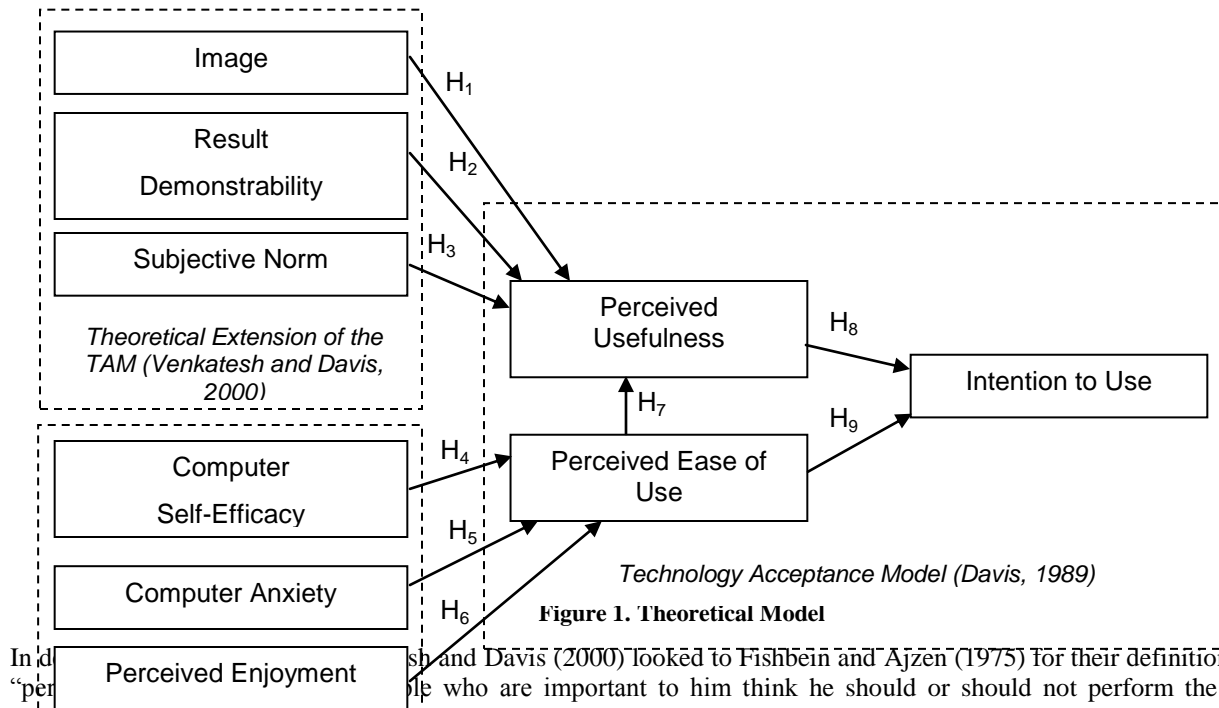
Image

Result Demonstrability

Subjective Norm

Theoretical Extension of the TAM (Venkatesh and Davis, 2000)

Computer Self-Efficacy

Computer Anxiety

Perceived Enjoyment

Theoretical Determinants (Venkatesh. 2000)

H₁

H₂

H₃

Perceived Usefulness

H₈

Intention to Use

H₇

H₄

Perceived Ease of Use

H₅

H₆

H₉

Technology Acceptance Model (Davis, 1989)

Figure 1. Theoretical Model

In discussing subjective norm, Venkatesh and Davis (2000) looked to Fishbein and Ajzen (1975) for their definition which is a: "person's perception that most people who are important to him think he should or should not perform the behavior in question." We speculate that the relatively high power-distance found in Saudi Arabian culture will make this a significant predictor of perceived usefulness because organizations typically prescribe technology use in a top-down approach. Users will have a desire to please their superiors and will therefore be more likely to consider a technology useful if they believe their superiors want them to use that technology. The relatively low individualism should also make subjective norm a significant predictor of perceived usefulness, because users will desire to fit into the group and therefore will be less likely to reject technologies that are prescribed by the organization. Looking next to *image*, Venkatesh and Davis (2000) used Moore and Benbasat's (1991) definition which is: "the degree to which use of an innovation is perceived to enhance one's … status in one's social system." For this factor, high power-distance and low individualism may have opposing effects. Low individualism will make users less focused on standing out, and they may therefore not consider a technology useful simply because its use will improve their social status in the organization. On the other hand, we speculate that a high power-distance will enhance the effect of image because users will wish to be recognized by their superiors. Therefore, users will find a technology useful if it helps them gain this recognition. Finally for *result demonstrability*, Venkatesh and Davis (2000) referenced Moore and Benbasat (1991) for a definition which is the: "tangibility of the results of using the innovation." It is hypothesized that *result demonstrability* will span cultural boundaries and continue to have a positive impact on perceived usefulness regardless of cultural differences. These beliefs about the antecedents of perceived usefulness are operationalized in the first three research hypotheses:

> *H₁: Image will have a positive effect on perceived usefulness.*

> *H₂: Result demonstrability will have a positive effect on perceived usefulness.*

> *H₃: Subjective norm will have a positive effect on perceived usefulness.*

In regard to the antecedents of perceived ease of use, it is again suggested that cultural factors may have an impact on the influence of these antecedents. This is particularly likely in this situation where the technology being studied is the general use of computers, rather than the use of a specific application system. We first consider *computer self-efficacy* which Venkatesh (2000) defines as an internal control: "that represents one's belief about her/his ability to perform a specific task/job using a computer." Computer self-efficacy is linked to experience with computers and the likely wider range of experience levels for users in a developing country will make this factor a stronger predictor of PEOU. *Computer anxiety* which Venatesh (2000) defines as: "an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers" is the antithesis of computer self-efficacy. Individuals with low computer self-efficacy will likely have a higher level of computer anxiety than individuals with high computer self-efficacy. Therefore, if computer self-efficacy is a good predictor of PEOU then computer anxiety should also be a good predictor, but in the opposite direction of influence. The final antecedent to PEOU in this model is *perceived enjoyment*. Venkatesh (2000) adapts Davis, Bagozzi and Warshaw

(1992) for a definition of perceived enjoyment as: "the extent to which the activity of using a specific system is perceived to be enjoyable in it's own right, aside from any performance consequences resulting from system use." Regardless of Hofstede's dimensions, enjoyment as a variable is a likely candidate to be influenced by cultural differences. The anticipated effects of these antecedents of perceived ease of use are operationalized in the next three hypotheses.

H_4: *Computer self-efficacy will have a positive effect on perceived ease of use.*

H_5: *Computer anxiety will have a negative effect on perceived ease of use.*

H_6: *Perceived enjoyment will have a positive effect on perceived ease of use.*

Following the traditional TAM structure proposed by Davis, we complete our proposed model with the final three hypotheses.

H_7: *Perceived ease of use will have a positive effect on perceived usefulness.*

H_8: *Perceived usefulness will have a positive effect on intention to use.*

H_9: *Perceived ease of use will have a positive effect on intention to use.*

Each of these nine hypotheses are mapped to specific individual paths in the research model depicted as Figure 1.

RESEARCH METHOD

This research is based on a larger study recently conducted in Saudi Arabia and financed by the Saudi government to elicit perceptions and intentions for the general use of computer systems by Saudi knowledge workers. Major companies from all four of Saudi Arabia's main provinces were invited to participate in this study. The organizations that accepted this invitation included representatives from the petroleum, manufacturing, banking, and merchandising industries. The study utilized a written survey to elicit responses and included question sets from the original technology acceptance model, TAM2 and UTAUT, as well as additional question sets for new constructs. In this paper we are focusing specifically on the portion of the survey that considered the antecedents of perceived usefulness: *image*, *result demonstrability*, and *subjective norm*, proposed by Venkatesh and Davis (2000); and the antecedents of perceived ease of use: *computer self-efficacy*, *computer anxiety*, and *perceived enjoyment*, proposed by Venkatesh (2000).

The survey solicited responses from professional knowledge workers engaged in the use of "desk top computers for the purpose of their work." Through this procedure, a total of 1,190 usable survey responses were collected. Of the 1,190 usable surveys, 102 responders indicated that they were foreign Nationals (e.g. non-Saudis) who were working in Saudi Arabia. Because we wanted our sample to exclusively represent Saudi workers in order to more effectively represent the influence of non-western culture, we excluded these 102 non-Saudi respondents, leaving a sample size of 1,088 survey responses.

RESULTS

The Structural Model

Figure 2 presents the results of the structural model. The beta values of the path coefficients, indicating the direct influences of the predictor upon the predicted latent constructs, are presented. *Result demonstrability* exhibited a significant positive influence on *perceived usefulness*. *Subjective norm* also exhibited a significant positive influence on *perceived usefulness*, as did *image*. *Computer self-efficacy* exhibited a significant positive influence on *perceived ease of use*. *Computer anxiety* exhibited a significant **negative** influence on *perceived ease of use*. *Perceived enjoyment* also exhibited a significant positive influence on *perceived ease of use*. Finally, *perceived ease of use* exhibited significant positive influences on both *perceived usefulness* and on *behavioral intention* to use. Lastly, *perceived usefulness* had a significant positive influence on *behavioral intention* to use.

The direct influences of *result demonstrability*, *subjective norm*, *image* and *perceived ease of use* account for approximately 29% of the variance in *perceived usefulness* (R^2 = .292). The direct influences of *computer self-efficacy*, *computer anxiety* and *perceived enjoyment* account for approximately 40% of the variance in *perceived ease of use* (R^2 = .400). Lastly, the direct influences of *perceived ease of use* and *perceived usefulness* account for approximately 38% of the variance in *behavioral intention* (R^2 = .377) to use computers.

Note: Path Coefficients:
* Significant at $p < 0.005$
** Significant at $p < 0.001$
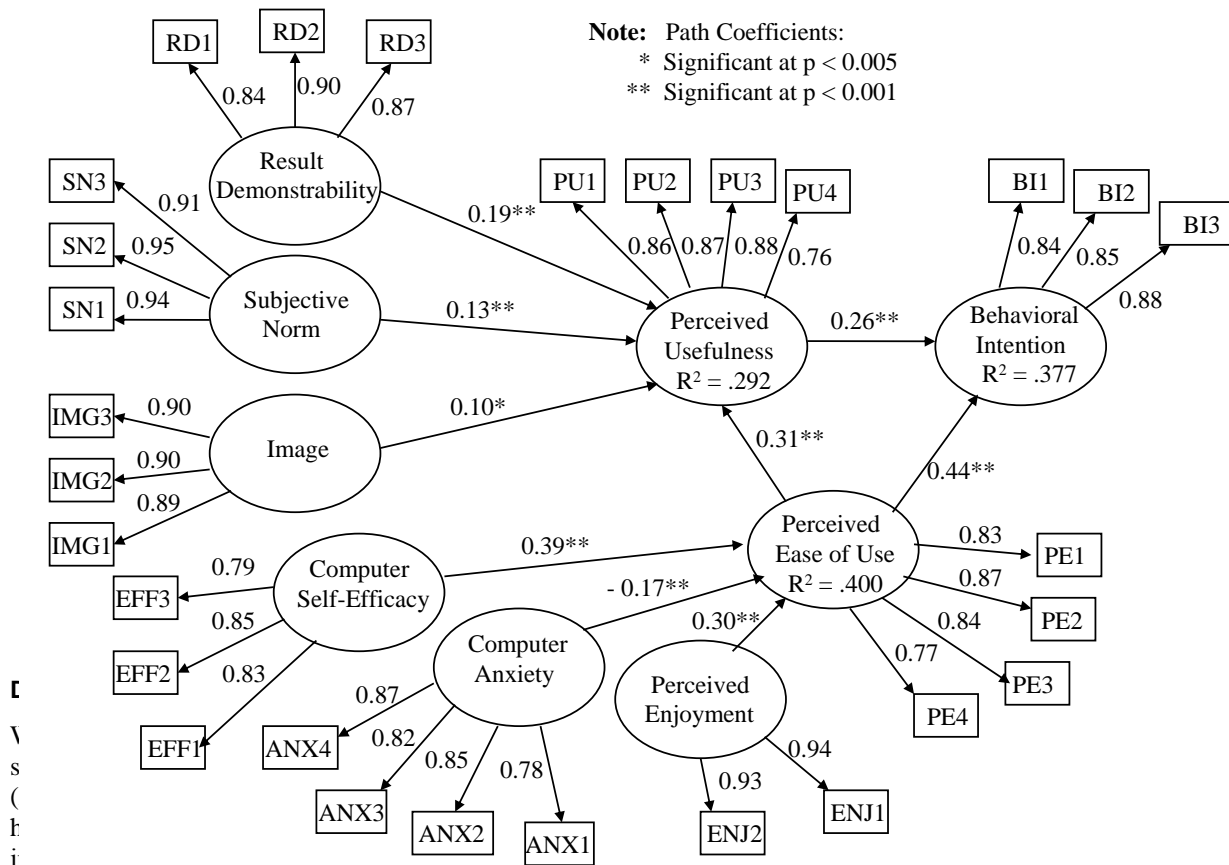
tasks in Saudi Arabia. With respect to the influence of result demonstrability on perceived usefulness (H$_2$), we found a positive beta coefficient of 0.19, at a significance level of $p < 0.001$. Venkatesh and Davis (2000) again reported higher beta coefficient magnitudes, ranging from 0.22 to 0.34, at a significance level of $p < 0.01$. Nevertheless, our results do validate the influence of result demonstrability on perceived usefulness in a non-western culture. Finally, with respect to the influence of subjective norm on perceived usefulness, we found a positive beta coefficient of 0.13, at a significance level of $p < 0.001$. Venkatesh and Davis (2000) reported that subjective norm had a more powerful positive influence on perceived usefulness (as high as beta = 0.50 at $p < 0.001$) early in a system implementation, but that this influence attenuated considerably to non-significant levels three months after the implementation of the target system.

With respect to hypotheses H$_4$, H$_5$ and H$_6$, we again found the influence of the antecedent variables on perceived ease of use to be significant and in the anticipated direction (e.g. positive for computer self-efficacy and perceived enjoyment, but *negative* for computer anxiety). We found that computer self-efficacy (H$_4$) positively impacted (beta = 0.39, $p < 0.001$) the perceived ease of Saudi knowledge workers using desktop computers to perform job related tasks. Venkatesh reported similar findings, with computer self-efficacy positively impacting perceived ease of use, with beta coefficients ranging from 0.30 to 0.42 (at $p < 0.001$). Moreover, like Venkatesh (2000), we found that computer anxiety *negatively* impacted the perceived ease of using desktop computers. We found a beta coefficient of -0.17 ($p < 0.001$), whereas Venkatesh (2000) reported beta coefficients ranging from -0.25 to -0.30 (at $p < 0.01$). Finally, similar to our findings, Venkatesh also reports a positive impact of perceived enjoyment on perceived ease of use, with beta coefficients ranging from 0.19 to 0.24 at $p < 0.05$.

Our findings also validate the applicability of the basic TAM constructs, perceived usefulness, perceived ease of use, and behavioral intention in Saudi Arabia (hypotheses H$_7$, H$_8$ and H$_9$). From the results of our survey, perceived ease of use has significant, positive impacts on perceived usefulness (H$_7$) and on behavioral intention (H$_9$). Moreover, perceived usefulness also has a positive impact on behavioral intention (H$_8$).

Our findings suggest that the antecedents of perceived usefulness and perceived ease of use do function in the context of developing countries and non-western cultures. It would be useful to refine, and build upon, this current study in a number of ways. As previously mentioned, longitudinal studies would yield additional insights into the relative influences of these antecedent variables on the perceived usefulness and perceived ease of use of adopting new technologies in non-western

cultures. Moreover, the examination of specific target applications would further illuminate this process. With the increasing globalization of organizations, it would be instructive and productive to better understand those factors that influence the acceptance and adoption of new technologies in different cultural contexts.

REFERENCES

1. Anandarajan, M., Igbaria, M. and Anakwe, U. (2002) IT Acceptance in a Less-Developed Country: A Motivational Factor Perspective, *International Journal of Information Management*, 22, 1, 47-65.

2. Davis, F. D. (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, 13, 3, 318-340.

3. Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. (1992) Extrinsic and intrinsic motivation to use computers in the workplace, *Journal of Applied Social Psychology*, 22, 14, 1111-1132.

4. Fishbein, M. and Ajzen, I. (1975) Belief, attitude, intention and behavior: An introduction to theory and research, Addison Wesley, Reading, MA.

5. Hofstede, G. (1980) Culture's consequences: International differences in work-related values, Sage, Beverly Hills, CA.

6. Hofstede, G. (2001) Culture's consequences: Comparing values, behaviors, institutions and organizations across nations, Sage, Newbury Park, CA.

7. Hubona, G. S., Truex, D. P., Wang, J. and Straub, D.W. (2006) Cultural and globalization issues impacting the organizational use of information technology, in Galletta, D. F. and Zhang, P. (eds.), *Human-Computer Interaction and Management Information Systems - Applications*, M.E. Sharpe, Inc., Armonk, NY.

8. Mao, E. and Palvia, P. (2006) Testing an extended model of IT acceptance in the Chinese cultural context, *The Data Base for Advances in Information Systems*, 37, 2 and 3, 20-32.

9. McCoy, S., Everard, A. and Jones, B. M. (2005) An examination of the Technology Acceptance Model in Uruguay and the US: A focus on culture, *Journal of Global Information Technology Management*, 8, 2, 27-45.

10. Moore, G. C. and Benbasat, I. (1991) Development of an instrument to measure the perceptions of adopting an information technology innovation, *Information Systems Research*, 2, 3, 192-222.

11. Png, I. P. L., Tan, B. C. Y. and Wee, K. L. (2001) Dimensions of national culture and corporate adoption of IT infrastructure, *IEEE Transactions on Engineering Management*, 48, 1, 36-45.

12. Straub, D. W., Keil, M. and Brenner, W. (1997) Testing the technology acceptance model across cultures: A three country study, *Information & Management*, 33, 1, 1-11.

13. Venkatesh, V. (2000) Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the Technology Acceptance Model, *Information Systems Research*, 11, 4, 342-365.

14. Venkatesh, V. and Davis, F. D. (2000) A theoretical extension of the technology acceptance model: Four longitudinal field studies, *Management Science*, 46, 2, 186-204.