6 Applicability of the Technology Acceptance Model in three developing countries: Saudi Arabia, Malaysia and South Africa

This chapter appears in *Alter*nation journal guest edited by Rembrandt Klopper.

6.1 Introduction

User acceptance of information technology (IT) has been a primary focus in the IT implementation research for the past two decades where IT adoption and use has been a major goal of modern organisations. Recently, researchers in the field have begun to rely on the theories of innovation diffusion to study implementation problems (Al-Gahtani, 2001b). Davis' Technology Acceptance Model (TAM) states that perceived usefulness and perceived ease of use are the two factors that govern the adoption and use of IT (Davis, 1989).

Almost all research in Information Systems (IS) originates in Western countries, particularly the United States of America (USA), where conditions are very different from developing countries (Kirlidog, 1996). For a discussion of the term 'developing country', see Averweg and Erwin (1999). Saudi Arabia, Malaysia and South Africa are developing countries. Conditions in developing countries are often greatly different from those of developed countries. For example, the African continent has the least developed telecommunications network in the world (Coeur de Roy, 1997). For a discussion of the challenges to an IT-supported technology transfer to developing countries, see, for example, Nahar *et al.* (2000). There is a need for organisations to adapt to constantly changing business conditions (Erwin and Averweg, 2003).

TAM has been successfully tested by several previous empirical studies in North America; however, only some studies were carried out to test the applicability of TAM outside this region. The primary objective of this study is to report on the applicability of TAM studies in the Arab world (Saudi Arabia), Malaysia and Africa (South Africa).

6.2 Information Systems adoption and usage

The study of IT adoption has recently gained new attention after being popularly studied in the 1980s (Rose and Straub, 1998). The more sophisticated computer technology that includes the Internet is perceived to be part of modern organisations (Suradi, 2001). Many cases of technology adoption are direct political or cultural responses to the unwanted effects of globalisation rather than economic pursuits (Bird, 1995; Sherry, 2002). Little research on IT adoption has been conducted in less developed countries (Prescott and Conger, 1995). Developing countries have much to gain from the revolution in communication and information access (Vinaja, 2003). Even as IT in business organisations around the world converge, the meanings conveyed through them as well as the outcomes of their use may remain culture specific (Limaye and Victor, 1991).

Computer or IS usage has been identified as the key indicator of the adoption of IT by organisations (Suradi, 2001). Igbaria and Tan (1997) report that system usage is an important variable in IT acceptance since it appears to be a good surrogate measure for the effective deployment of IS resources in organisations. Lu and Gustafson (1994) report that people use computers because they believe that computers will increase their problem solving performance (usefulness) and they are relatively effort free to use (ease of use). Given the complexity of data processing for decision support, the perception of a system's ease of use may significantly affect the level of its adoption by prospective users (Shin, 2003). A person who believes that performing a certain behaviour will lead to mostly positive outcomes will have a favourable attitude towards performing that behaviour (du Plooy, 1998). A person who believes that performing that behaviour will lead to mostly negative outcomes, will have an unfavourable attitude.

6.3 Technology Acceptance Model (TAM)

TAM was developed by Davis (1989) and postulates that two particular beliefs, Perceived Usefulness and Perceived Ease of Use, are of primary relevance for computer acceptance behaviours (Davis *et al.*, 1989; Keil *et al.*, 1995; Igbaria *et al.*, 1997). According to TAM, system use is determined by a person's attitude towards the system.

The basic TAM model consists of external variables which may affect beliefs. This model is derived from the general Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975) in that TAM is intended to explain computer usage. In IT terms this means that the model attempts to explain the attitude towards *using* IT rather than the attitude towards IT *itself*.

The most commonly investigated variables of TAM by researchers are Perceived Usefulness and Perceived Ease of Use (Davis, 1989; Davis *et al.*, 1989; Mathieson, 1991; Adams *et al.*, 1992; Igbaria, 1993; Straub *et al.*, 1997; Garrity and Sanders, 1998; Hubona and Geitz, 1998; Rose and Straub, 1998). Straub *et al.* (1997) suggest that Perceived Usefulness of computers has a positive effect on the adoption of IT. Davis (1989) and Adams *et al.* (1992) report that perceived usefulness affects both attitudes and actual computer usage.

Davis' model specifically postulates that technology usage is determined by behavioural intention to use the technology (B); which is itself determined by both perceived ease of use (PEOU) and perceived usefulness (PU). See Figure 1.

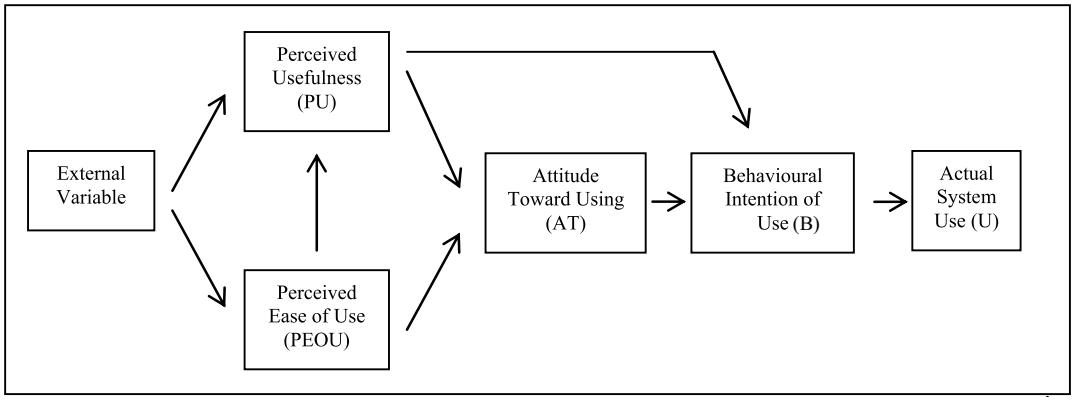

Figure 1: Technology Acceptance Model (TAM)
(Source: Davis *et al.*, 1989)

Additionally behavioural intention to use the technology (B) is also affected by perceived usefulness (PU) directly. Behavioural intention to use the technology is then positively associated with actual system use (U). The TAM model of IS success relies on Fishbein and Ajzen's (1975) and Ajzen and Fishbein's (1980) TRA to assert that two factors are primary determinants of system use:

Perceived Usefulness. Perceived Usefulness (PU) is defined as the user's subjective probability that using a specific technology will increase his or her job performance within an organisational setting (Davis *et al.*, 1989); and

Perceived Ease of Use. Perceived Ease of Use (PEOU) is the user's assessment that the system will be easy to use and requires little effort.

In the context of the Internet and the World Wide Web several studies have confirmed these relationships still hold true (Teo *et al.*, 1999; Lederer *et al.*, 2000). However, Straub *et al.* (1997) demonstrate that the nature of relationships between these TAM constructs differs across cultures. Agarwal and Prasad (1999) show the importance of individual differences as predictors of perceived ease of use specifically demonstrating prior experience, role with regards to IT and level of experience as factors of influence.

6.4 TAM research in three selected developing countries

Few studies have been carried out to test the applicability of TAM outside North America. Some of these studies by country are: in Japan and Switzerland (Straub *et al.*, 1997), New Zealand (Igbaria *et al.*, 1997), Hong Kong (Chua, 1996), Singapore (Teo *et al.*, 1999), United Kingdom (Al-Gahtani, 2001a), Arab world (Rose and Straub, 1998; Al-Gahtani, 2001b), Malaysia (Suradi, 2001) and South Africa (du Plooy, 1998; Brown, 2002; Averweg, 2002). The author reports TAM findings from three selected developing countries: Saudi Arabia, Malaysia and South Africa.

TAM research in Saudi Arabia

Straub *et al.* (1995) note that system usage has a notable practical value for managers interested in evaluating the impact of IT. While TAM has been widely applied and tested in North America, there have been rare attempts to extend this work to other regions of the world (Al-Gahtani, 2001b). It has been argued that TAM may not hold equally well across cultures (Straub *et al.*, 1997). Straub *et al.* (1995) elaborated that given the rapid globalisation of businesses and systems, there exists a pressing need to understand whether TAM applies in other cultures. Research was conducted by Al-Gahtani (2001b) to establish whether TAM, as an IT diffusion model which originated an tested in the developed Western world, would apply to developing countries. Lacking a strong *a priori* basis for the applicability of TAM in the Arab world (specifically in Saudi Arabia), the following question was posited by Al-Gahtani (2001b) in his study 'why TAM would not apply to Saudi Arabia as a developing country of different culture?' *ie*. the study specifically focused on whether TAM would be applicable to test IT adoption and diffusion in Saudi Arabia (which is an important part of the Arab world). At the end of this survey Al-Gahtani (2001b) reports that the study 'findings…confirm that TAM constructs are both valid and reliable', 'was successful as TAM effectively predicts computer technology adoption and use in the Saudi culture' and 'supports the applicability of TAM to the Arab culture'. As Saudi Arabia is an important developing country in the Arab world, South Africa is an equally important developing country in Africa.

TAM research in Malaysia

The National IT Agenda (NITA) provides the foundation and framework for the utilization of information and communication technologies (ICT) to transform Malaysia into a developing nation. The research by Suradi (2001) is similar in concept to Al-Gahtani (2001b) – the objective was to test TAM in a non-Western environment. Suradi (2001) also acknowledges that even though culture has been identified to play a role in the acceptance of certain models developed different from the local culture of a given country (*e.g.* USA), TAM was tested to be a workable model in the Malaysian environment. The results were similar to the findings of Davis (1989), Davis *et al.* (1992) and Igbaria (1993). Suradi (2001) reports that TAM can be applied in the Malaysian environment for organisations which intend adopting new IT applications. This research also underscores the author's viewpoint that TAM can be equally applied in the South African environment.

TAM research in South Africa

South Africa is a low to middle-income developing nation. In the study by Averweg (2002), the correlation for the TAM usefulness-usage construct was *lower* than for use-usage and was therefore not consistent with Davis' findings. Furthermore because of this researcher's low correlation values Perceived Usefulness was **not** 'significantly more strongly linked to usage than was ease of use' (Davis, 1989). Davis (1989) emphasises that 'perceived usefulness and ease of use are people's subjective appraisal of performance and effort, respectively, and do not necessarily reflect objective reality'. Averweg's results are not in support of the basic tenets of TAM. TAM has emphasised the importance of perceived usefulness (over perceived ease of use) as the key determinant of acceptance. Empirical evidence has constantly borne out this claim leading to perceived ease of use being treated as somewhat of a 'step-child' (Venkatesh, 1999). However, results of Venkatesh's research indicates that perceived ease of use **can** be a strong catalyst fostering acceptance. Averweg's results partially support this finding *ie*. perceived ease of use can be a stronger catalyst (over perceived usefulness) fostering IT acceptance. In summary the results from Averweg's (2002) study shows that ease of use on intended usage is greater than the effect of perceived usefulness on intended usage.

Legris *et al.* (2002) suggest that analysis 'of empirical research using TAM shows that results are not totally consistent or clear'. Clearly, the results found in the TAM studies conducted in Saudi Arabia, Malaysia and South Africa highlights this inconsistency and provides support for Legris *et al.* (2002). TAM has been empirically proven successful in predicting about 40% of a system's use (Hu *et al.*, 1999). Legris *et al.* (2002) report that although the results are most convergent, there are situations where they are conflicting.

In summary, research by Al-Gahtani (2001b) in Saudi Arabia supports the applicability of TAM to the Arab culture. Similarly research by Suradi (2001) shows that TAM can be applied in the Malaysian environment. However, the study by Averweg (2002) does not provide any direct evidence to support the applicability of Davis' determinants of usage (within TAM) in South Africa. In this study low correlation coefficients were calculated for Perceived Usefulness and Intended Usage, and Perceived Ease of Use and Intended Usage constructs. The correlation for usefulness-usage was *lower* than for use-usage and therefore not consistent with Davis' findings. However, Averweg's (2002) results *partially* support Venkatesh's (1999) findings that perceived ease of use can be a stronger catalyst (over perceived usefulness) in fostering IT acceptance. Brown (2002) reports that it has been shown that perceived usefulness is not a significant influence on usage, consistent with previous studies in some developing countries. Averweg's (2002) results support Brown's (2002) findings that 'perceived ease of use takes on increased importance, as it influences both usage and perceived usefulness'.

6.5 Conclusion

Legris *et al.* (2002) suggest that while TAM is a useful model, it has to be integrated into a broader one which will include variables related to both human and social change processes and to the adoption of the innovation model. While Averweg's (2002) results are not in support of the basic tenets of TAM which emphasise the importance of perceived usefulness (over perceived ease of use) as the key determinant of IT acceptance, this is a possible indication of a difference in overall contextual factors, such as culture, prior experience and geography, and/or the impact of major user interface changes since the period (1986–1989) in which Davis published his studies. These issues may require further research in South Africa.

6.6 References

Adams, D.A., Nelson, R.R. and Todd, P.A. (1992). Perceived Usefulness, Ease of Use, and Usage of Information Technology: A Replication. MIS Quarterly, 16(2), 227–247.

Agarwal, R. and Prasad, J. (1999). Are Individual Differences Germane to the Acceptance of New Information Technologies? Decision Sciences, 30(2), 361–391.

Ajzen, I. and Fishbein, M. (1980). Understanding Attitudes and Predicting Social Behavior. Englewood Cliffs, NJ: Prentice-Hall.

Al-Gahtani, S.S. (2001a). The Applicability of the Technology Acceptance Model outside North America: An Empirical Test in United Kingdom. Information Resources Management Journal, 14(3), 39–50.

Al-Gahtani, S.S. (2001b). The Applicability of the Technology Acceptance Model outside North America: An Empirical Test in the Arab World. BITWorld 2001 Conference Proceedings, American University in Cairo, Egypt, 4–6 June.

Averweg, U.R. (2002). Executive Information Systems Usage: The Impact of Web-based Technologies. Master of Science dissertation, Faculty of Science & Agriculture, University of Natal, Pietermaritzburg, South Africa.

Averweg, U.R.F. and Erwin, G.J. (1999). Critical Success Factors for the Implementation of DSS at a Selection of Organisations in KwaZulu/Natal, South Africa. South African Computer Journal, 24, 95–104, November.

Bird, B. (1995). The EAGLE Project: re-mapping Canada from an indigenous perspective. Cultural Survival Quarterly, 18(4), 23–24.

Brown, I. (2002). Individual and Technological Factors Affecting Perceived Ease of Use of Web based Learning Technologies in a Developing Country. The Electronic Journal on Information Systems in Developing Countries, 9(5), 1–15.

Chau, P.Y.K. (1996). An empirical assessment of a modified technology acceptance model. Journal of Management Information Systems, 13(2), 85–204.

Coeur de Roy, O. (1997). The African challenge: Internet, networking and connectivity activities in a developing environment. Third World Quarterly, 18(5), 883–898.

Davis, F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 3(3), 319–342.

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(4), 1111–1132.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. Management Science, 35(8), 982–1003.

du Plooy, N.F. (1998). An analysis of the human environment for the adoption and use of information technology. Doctor Commercii (Informatics) thesis, University of Pretoria, Pretoria, South Africa.

Erwin, G. and Averweg, U. (2003). E-Commerce and Executive Information Systems: A Managerial Perspective. In S Lubbe (ed) The Economic and Social Impacts of E-Commerce, Chapter VII, 103–120, Hershey, PA: Idea Group Publishing.

Fishbein, M. and Ajzen, I. (1975). Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. Reading, MA: Addison-Wesley Publishing Company.

Garrity, E.J. and Sanders, G.L. (1998). Information Systems Success Measurement. Hershey, PA: Idea Group Publishing.

Hu, P.J., Chau, P.Y.K., Liu Sheng, O.R. and Yan Tam, K. (1999). Examining the Technology Acceptance Model Using Physician Acceptance of Telemedicine Technology. Journal of Management Information Systems, 16(2), 91–112.

Hubona, G.S. and Geitz, S. (1998). External variables, beliefs, attitudes and information technology usage behavior. Proceedings of the 30th Annual Hawaii International Conference of System Sciences (HICSS-30), Hawaii, USA.

Igbaria, M. (1993). User Acceptance of Microcomputer Technology: An Empirical Test. Omega International Journal of Management Science, 21(1), 73–90.

Igbaria, M. and Tan, M. (1997). The consequences of information technology acceptance on subsequent individual performance. Information & Management, 32(3), 113–121.

Igbaria, M., Zinatelli, N., Cragg, P. and Cavaye, A.L.M. (1997). Personal Computing Acceptance Factors in Small Firms: A Structural Equation Model. MIS Quarterly, 21(3), 279–305.

Keil, M., Beranek, P.M. and Konsynski, B.R. (1995). Usefulness and ease of use: Field study evidence regarding task considerations. Decision Support Systems, 13(1), 75–91.

Kirlidog, M. (1996). Information technology to a developing country. Information Technology & People, 9(3), 55–84.

Lederer, A.L., Maupin, D.J., Sena, M.O. and Zhuang, Y. (2000). The Technology Acceptance Model and the World Wide Web. Decision Support Systems, 29(3), 269–282.

Legris, P., Ingham, J. and Collerette, P. (2003). Why Do People Use Information technology? A Critical Review of the Technology Acceptance Model. Information & Management, 40(3), 191–204.

Limaye, M.R. and Victor, D.A. (1991). Cross-cultural business communication research: State of the art and Hypothesis for the 1990s. The Journal of Business Communication, 28(3), 276–299.

Lu, H.P. and Gustafson, D.H. (1994). An empirical study of perceived usefulness and perceived ease of use on computerized support system use over time. International Journal of Information Management, 14(5), 317–329.

Mathieson, K. (1991). Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior. Information Systems Research, 2(3), 173–191.

Nahar, N., Lyytinen, K. and Huda, N. (2000). Challenges to an IT-Supported Technology Transfer to Developing Countries. BITWorld 2000 Conference Proceedings, Universidad Iberoamericana Sante Fe, Mexico City, Mexico, 1–3 June.

Prescott, M. and Conger, S. (1995). Information Technology Innovations: A Classification by IT Locus of Impact and Research. Database Advances in IS, 26(2 and 3), 20–41.

Rose, G. and Straub, D. (1998). Predicting General IT Use: Applying TAM to the Arabic World. Journal of Global Information Management, 6(3), 39–46.

Sherry, J. (2002). Land, Wind and Hard Words. Albuquerque, New Mexico: UNM Press.

Shin, B. (2003). An Exploratory Investigation of System Success Factors in Data Warehousing, Journal of the Association for Information Systems, 4, 141–170.

Straub, D., Keil, M. and Brenner, W. (1997). Testing the Technology Acceptance Model across Cultures: A Three Country Study. Information & Management, 33(1), 1–11.

Straub, D., Limayem, M. and Karahanna-Evaristo, E. (1995). Measuring system usage: implications for IS theory testing. Management Science, 41(8), 1328–1342.

Suradi, Z. (2001). Testing Technology Acceptance Model (TAM) in Malaysian Environment. BITWorld 2001 Conference Proceedings, American University in Cairo, Egypt, 4–6 June.

Teo, T.S.H., Lim, V.K.G. and Lai, R.Y.C. (1999). Intrinsic and extrinsic motivation in Internet usage. Omega, International Journal of Management Sciences, 27, 25–37.

Venkatesh, V. (1999). Creation of Favorable User Perceptions: Exploring the Role of Intrinsic Motivation. MIS Quarterly, 23(2), 239–260.

Vinaja, R. (2003). The Economic and Social Impact of Electronic Commerce in Developing Countries. In S Lubbe (ed), The Economic and Social Impacts of E-Commerce, Chapter II, 22–32, Hershey, PA: Idea Group Publishing.