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Udo Richard Averweg

*eThekweni Municipality and University of KwaZulu-Natal Durban, South Africa, [udo.averweg@gmail.com](mailto:udo.averweg@gmail.com)*

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# Information Technology Acceptance in South Africa: An Investigation of Perceived Usefulness, Perceived Ease of Use, and Actual System Use Constructs

**Udo Richard Averweg**  
eThekweni Municipality and University of KwaZulu-Natal  
Durban, South Africa  
averwegu@durban.gov.za

## ABSTRACT

Information technology (IT) acceptance studies pay much attention to issues of significance in assessing the contributions of variables explaining IT usage for decision-making in organizations. Davis' Technology Acceptance Model (TAM) states that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the two factors that govern the adoption and use of information technology. Actual System Use (behavior) consists of the number of times of systems use. The author conducted a survey of 31 organizations in KwaZulu/Natal, a region in South Africa, which implemented an Executive Information System (EIS). A validated survey instrument was administered to an EIS stakeholder in each organization surveyed. This paper reports on the PU, PEOU, and Actual System Use constructs for organizations surveyed in South Africa.

## Keywords

Executive Information Systems (EIS), Information Technology acceptance, Technology Acceptance Model (TAM)

## INTRODUCTION

Information Technology (IT) acceptance studies pay much attention to issues of significance in assessing the contributions of variables explaining IT usage for decision-making in organizations. Information Systems research continues to examine ways to improve support for decision-making in organizations. The importance of information in executive decision-making has been extensively documented (Walters, Jiang and Klein, 2003). Without concise and timely information (Khalil and Elkordy, 2005; Walters et al., 2003), executives will not be able to determine whether their views of the environment and their organization's position within it remain appropriate (Vandenbosch and Huff, 1997). An Executive Information System (EIS) is a computerised information system (IS) designed to provide managers in organizations access to internal and external information that is relevant to management activities and decision making. Averweg and Roldán (2006) suggest that EIS should be flexible to support different classes of business data (e.g. external, internal, structured, and unstructured) and different levels of users (e.g. executives and non-executive users).

User acceptance of 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 organizations. Researchers in the field 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). The objective of this paper is to discuss the Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Actual System Use (U) constructs during EIS development and implementation stages in organizations in the developing country of South Africa in Africa.

Much of the extant IT focuses on developed countries (Van Slyke, Bélanger and Sridhar, 2005). Less attention has been paid to IT in developing countries. It is important to consider the influence of local conditions on the adoption and assimilation of technologies (Hebert and Benbasat, 1994) in developing countries, such as South Africa.

## **INFORMATION SYSTEMS ADOPTION AND USAGE**

The greater the uncertainty in the business environment, the greater the need for information processing (Salmeron, Luna and Martinez, 2001). Computer or IS usage has been identified as the key indicator of the adoption of IT by organizations (Suradi, 2001). Igarria and Tan (1997) report that system usage is an important variable in IT acceptance as it appears to be a good surrogate measure for the effective deployment of IS resources in organizations. Clearly, IS usage is an important topic in scholarly discourse.

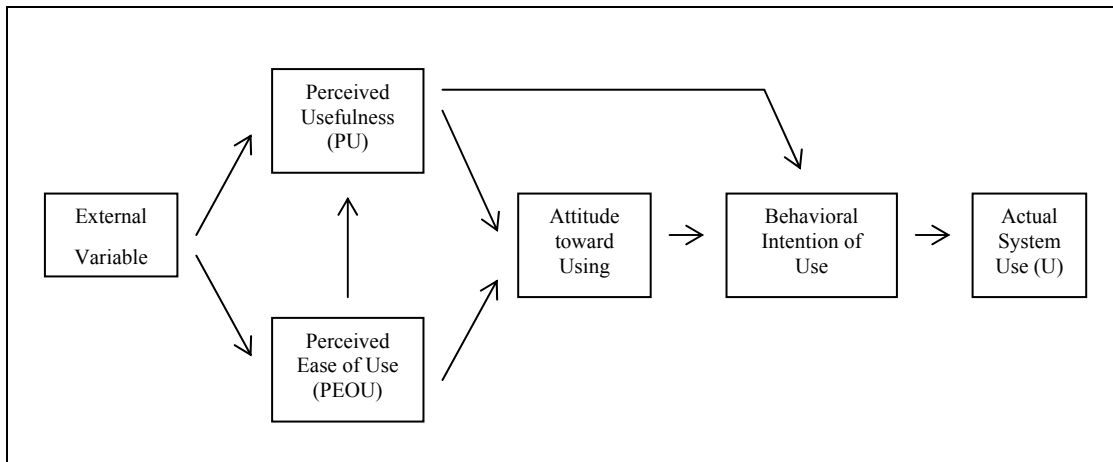
Davis, Bagozzi and Warshaw (1989) and Thompson and Rose (1994) argue that usage is a necessary condition for ensuring productivity payoffs from IS investment. Lu and Gustafson (1994) report that people use computers because they believe that computers will increase their problem solving performance (usefulness) and they are relatively effort free to use (ease of use). Lu and Gustafson (1994) suggest that the two belief variables, PU and PEOU, are the most important factors determining usage of computers or IS.

## **TECHNOLOGY ACCEPTANCE MODEL (TAM) LITERATURE REVIEW**

TAM was developed by Davis (1989) and postulates that two particular beliefs, PU and PEOU, are of primary relevance for computer acceptance behaviours (Davis et al., 1989; Igarria, Zinatelli, Cragg, Cavaye, 1997; Keil, Beranek and Konsynski, 1995). According to TAM, system use is determined by a person's attitude towards the system. See Figure 1.

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 use. In IT terms this means that the model attempts to explain the attitude towards *using* IT rather than the attitude towards IT *itself*.

Davis' model specifically postulates that technology use is determined by behavioral intention to use the technology; which is itself determined by both PU and PEOU. Additionally, behavioral intention to use the technology is also affected by PU directly. Behavioral intention to use the technology is then positively associated with U.



**Figure 1. Technology Acceptance Model (TAM)**

(Source: Davis et al., 1989)

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 (PU)**. PU is defined as the user's subjective probability that using a specific technology will increase his or her job performance within an organizational setting (Davis et al., 1989); and
- **Perceived Ease of Use (PEOU)**. PEOU is the user's assessment that the system will be easy to use and requires little effort.

**PU** and **PEOU** are operationalized by obtaining users' assessment of their PU and PEOU of EIS based on twelve similar items developed by Davis and adapted for the author's study.

**Actual System Use (U)** (behavior) consists of the number of times of systems use. Actual system usage is operationalized in terms of frequency of use of EIS (Davis, 1989, 1993; Fishbein and Ajzen, 1975; Kwon and Chidambaram, 2000; Malhotra and Galletta, 1999; Mao, 2002).

Straub, Keil and Brenner (1997) suggest that PU of computers has a positive effect on the adoption of IT. Adams, Nelson, and Todd (1992) and Davis (1989) report that PU affects both attitudes and actual computer use. While Hu et al. (1999) suggest PU to be a significant determinant of attitude and intention, Brown (2002) reports that PU is not a significant influence on use.

Money and Turner (2007) report that evidence of the research community's growing acceptance of TAM is reflected in the Institute for Scientific Information Social Science Index (January 2006) which listed more than 1,150 journal citations of the initial TAM research papers published by Davis (1989) (628 citations) and Davis et al. (1989) (513 citations). Clearly the most commonly investigated variables of TAM by researchers are PU and PEOU (Adams et al., 1992; Davis, 1989; Davis et al., 1989; Garrity and Sanders, 1998; Hu, Chau, Liu Sheng, and Yan Tam, 1999; Hubona and Geitz, 1998; Igarria, 1993; Ikart, 2005; Mathieson, 1991; Rose and Straub, 1998; Venkatesh and Davis, 2000; Venkatesh and Morris, 2000; Venkatesh, Morris, Davis, and Davis, 2003). TAM's popularity is due to "its common sense nature, appealing simplicity, and robustness" (Hendriks and Jacobs, 2003).

TAM has been successfully tested by several previous studies in North America across a wide variety of applications. However, only a few studies have been carried out to test the applicability of TAM outside

this region. Some of these studies are: Japan and Switzerland (Straub et al., 1997), New Zealand (Igarria et al., 1997), Hong Kong (Chua, 1996), Singapore (Teo, Lim, and Lai, 1999), Malaysia (Suradi, 2001), Arab world (Rose and Straub, 1998; Al-Gahtani, 2001) and United Kingdom (Al-Gahtani, 2001a). From the available literature, there is little evidence to suggest that TAM has been extensively investigated in developing countries or specifically in South Africa.

Davis (1989) suggests that a practitioner is likely to find his research of value as it “provides two validated questionnaires, one for measuring usefulness and the other for measuring ease of use. With only minor modifications to the questionnaires ... the questionnaires could be adapted to both internally developed systems and software products being considered for acquisition.” In this paper, Davis’ questionnaire has been adapted for the purposes of this research and the “internally developed systems” refers to existing EIS in organizations in KwaZulu/Natal, a region in South Africa.

## RESEARCH METHOD AND DATA GATHERING

The survey instrument developed by the author was based on previous instruments used in published research papers (see Davis, 1989; Davis et al., 1989). The questionnaire applicable to this research consisted of three parts. See Appendix 1.

Section 1 (demographic information comprised 8 statements) and Section 2 (attributes of an organization’s EIS comprised 16 statements) were extracted and translated from the Roldán (2000) EIS questionnaire. The measurement for usage (statements 2.12 and 2.13) was in terms of frequency of system use (i.e. ‘how often’). For statement 2.12, interviewee responses were assigned numerical values in the range *Very rarely or not at all* = 1 to *Frequently (several times per day)* = 7. Similar measurement was used in research on TAM by Davis (1989), Davis et al. (1989) and Malhotra and Galletta (1999).

Section 3 (comprised 14 statements numbered 3.1 - 3.14) was drawn from the established Davis (1989) questionnaire. This section dealt with the PU, PEOU, and U of the EIS in the interviewee’s organization. For the PU and PEOU constructs, the six-item instruments of the seven-point Likert scale statements for each construct were specifically drawn from the established Davis (1989) questionnaire. Appropriate modifications were made to make them specifically relevant to the author’s study (an identical approach was adopted by Al-Gahtani, 2001). This served to validate the author’s instrument.

**PU:** This construct was measured from statements 3.1 - 3.6. Interviewees were asked to indicate the extent of agreement or disagreement with six statements each concerning how useful they perceived EIS usefulness in their organization on a scale anchored with *extremely likely* and *extremely unlikely*.

**PEOU:** This construct was measured from statements 3.7 - 3.12. Interviewees were asked to indicate the extent of agreement or disagreement with six statements each concerning how useful they perceived EIS ease of use in their organization on a scale anchored with *extremely likely* and *extremely unlikely*.

**U:** Davis (1989) used a seven-point Likert-type scale statement for the U construct. Statement 3.13 was an adaptation of Davis’ statement but using this researcher’s identical anchors: *extremely frequently* and *extremely infrequently*. Statement 3.14 was an adaptation by the author of Statement 3.13 for predicting future continuous (regular) use of the EIS in an interviewee’s organization. Interviewees were asked to indicate the extent of agreement or disagreement with each of these two statements.

For questions 3.1 – 3.12, Likert scale item responses were assigned numerical values in the range *extremely likely* = 3 to *extremely unlikely* = -3. A similar process was adopted for questions 3.13 – 3.14 anchored by *extremely frequently* = 3 to *extremely infrequently* = -3.

The sample was selected using the unbiased ‘snowball’ sampling technique. Cooper and Emory (1995) state that this technique has found a niche in recent years in applications where respondents are difficult

to identify and are best located through referral networks. During the initial stage of snowballing individuals are ‘discovered’ and may or may not be selected through probability methods. The group is then used to locate others who possess similar characteristics and who, in turn, identified others. In this way a researcher collects evidence from a group of qualified respondents (Remenyi and Williams, 1995). Steer (1995) indicates that the snowball sampling technique is a widely accepted business approach in business research. The snowball sampling technique was also adopted by Roldán and Leal (2003) in their EIS study of organizations in Spain. It is estimated by the author that the projected total population of organizations with EIS in the eThekweni Municipal Area (EMA), KwaZulu/Natal, South Africa is 150. From an identified organization with EIS in the EMA and using the snowball sampling technique, the author was able to target 31 sizeable organizations in the EMA which have EIS experience. Every individual organization that was referred to the author was willing to participate in the survey and is included in the convenience sample. A formal extensive interview schedule was compiled and used for the structured interviews. Interviews were conducted during May-June 2002 at the interviewee’s organization. eThekweni Municipality is the most populous municipality in South Africa and has a population of 3.09 million citizens (Statistics South Africa, 2001). EMA’s geographic area size is 2,300 km<sup>2</sup>. The author’s survey of organizations in KwaZulu/Natal that have implemented EIS was confined to organizations in the EMA.

Some studies suggest that EIS should not only be accessed by executive users (see, for example, Rai and Bajwa, 1997; Volonino, Watson, and Robinson, 1995). With the evolution of distributed IT, paved by the rapid adoption of web technology, there is a growing need for improved decision making at any time, anywhere, and with any participants (Erwin and Averweg, 2003). Due to a maturing market, corporate spending priorities are shifting from extracting and storing data toward accessing and delivering the information to a wider range of users (PricewaterhouseCoopers, 2002). Salmeron (2001) notes EIS as the technology for information delivery for all business end users. It is evident that EIS requires continuous input from three different stakeholder groups (known as constituencies):

- EIS executives/business end-users;
- EIS providers (i.e. persons responsible for developing and maintaining the EIS); and
- EIS vendors or consultants.

All constituencies were surveyed in the author’s data sampling. A field study of 31 different organizations in the EMA which have successfully implemented EIS was conducted. From the previous EIS studies reflected in Table 1, it will be noted that the author’s study of 31 organizations exceeds the previous EIS survey sample size in South Africa (during 1995 I. J. Steer surveyed 24 organizations) and the majority of EIS sample sizes in other countries.

Authors	Year	Investigation	Country	Replies (n)
Watson, H. J., Rainer, R. K., Jr., and Koh, C. E.	1991	Executive Information Systems: A Framework for Development and a Survey of Current Practices	United States of America	112 suitable replies of which 50 have an EIS in operation or in an advanced stage of implementation
Fitzgerald, G.	1992	Executive Information Systems and Their Development in the U. K.	United Kingdom	77 questionnaires received, 36 of whom are proceeding with an EIS
Watson, H. J., Rainer, R. K., Jr., and Frolick, M. N.	1992	Executive Information Systems: An Ongoing Study of Current Practices	United States of America	68 questionnaires received of which 51 indicated they have an EIS

Steer, I. J.	1995	The Critical Success Factors for the Successful Implementation of Executive Information Systems in the South African Environment	South Africa	24 questionnaires from organizations with EIS implementation
Theodenius, B.	1995	The Use of Executive Information Systems in Sweden	Sweden	29 replies from organizations with EIS implementation
Watson, H. J., Watson, T., Singh, S., and Holmes, D.	1995	Development Practices for Executive Information Systems: Findings of a Field Study	United States of America	43 suitable questionnaires from organizations with EIS implementation
Allison, I. K.	1996	Executive Information Systems: An Evaluation of Current UK Practice	United Kingdom	19 suitable questionnaires received from organizations with EIS
Park, H. K., Min, J. K., Lim, J. S., and Chun, K. J.	1997	A Comparative Study of Executive Information Systems between Korea and the United States	Korea and United States of America	27 suitable questionnaires from organizations with EIS implementation
Pervan, G. P. and Phau, R.	1997	A Survey of the State of Executive Information Systems in Large Australian Organizations	Australia	12 suitable questionnaires from organizations with EIS implementation
Poon, P. and Wagner, C.	2001	Critical success factors revisited: success and failure cases of information systems for senior executives	Hong Kong, China	6 suitable questionnaires from organizations with EIS implementation

**Table 1. Investigations about EIS with descriptive endings**

(Source: Averweg and Roldán, 2007)

The author's sample of 31 completed questionnaires complies with the minimum recommended size that is needed for statistical inference purposes (Siegel and Castellan, 1988).

## RESULTS AND DISCUSSION

The three EIS constituencies and number of interviewees surveyed and associated percentages per constituency are reflected in Table 2.

Stakeholder groups (constituencies)	Number of interviewees surveyed and associated percentage of total sample
EIS executives/business end-users	20 (64.5%)
EIS providers	7 (22.6%)
EIS vendors or consultants	4 (12.9%)
SAMPLE SIZE	31 (100%)

**Table 2. EIS constituencies and number of interviewees surveyed per constituency**

Interviewees' responses to the other statements in Sections 1 and 2 of the author's questionnaire are reported in Averweg and Roldán (2006). Interviewee's responses to statements 2.12, 2.13, and the statements in Section 3 are reflected in Appendix 2.

For the PU and PEOU constructs, Davis (1989) calculated the Cronbach alphas. The magnitude of coefficient alpha is a function of the ratio of the sum of the inter-item covariances to the variance of the total score (Ghiselli, Campbell, and Zedeck, 1981). Ghiselli et al. (1981) state that the sum of the

covariances in turn is largely a function of the intercorrelations among the parts. According to UCLA Academic Technology Services (see <http://www.ats.ucla.edu/stat/spss/faq/alpha.htm>), the Cronbach alpha can be written as a function of test items and the average intercorrelation among the items:

$$\alpha = \frac{N \times \bar{r}}{1 + (N - 1) \times \bar{r}}$$

*N* is equal to the number of items (*N* = 31 in authors’ survey) and  $\bar{r}$  is the mean inter item correlation among the items. Intercorrelations between the scale values to statements 3.1 - 3.6 (PU) and intercorrelations between the scale values to statements 3.7 - 3.12 (PEOU) constructs were calculated. The results are given in Tables 3 and 4, respectively.

Statement Number and associated text	3.1	3.2	3.3	3.4	3.5	3.6
3.1: Using the EIS enables me to accomplish tasks more quickly in my job	1					
3.2: Using the EIS improves my performance in my job	0.581381	1				
3.3: Using the EIS in my job increases my productivity	0.625311	0.451258	1			
3.4: Using the EIS enhances my effectiveness in my job	0.324384	0.334883	0.439406	1		
3.5: Using the EIS makes it easier for me to do my job	0.407905	0.293303	0.379525	0.589805	1	
3.6: I find the EIS to be useful in my job	0.343011	0.343651	0.320175	0.136704	0.379525	1

**Table 3. Intercorrelations between scale values to statements 3.1 - 3.6 (PU)**

From Table 3, the mean intercorrelation was 0.3966818. Substituting  $\bar{r} = 0.3966818$  and *N* = 6 in the above equation, the Cronbach coefficient alpha for PU construct = 0.80.

Statement Number and associated text	3.7	3.8	3.9	3.10	3.11	3.12
3.7: Learning to operate the EIS is easy for me	1					
3.8: I find it easy to get the EIS to do what I want it to do	0.122943	1				
3.9: Interacting with the EIS is clear and understandable	0.555738	0.065362	1			
3.10: I find the EIS to be flexible to interact with	0.320175	0.108040	0.423216	1		
3.11: It is easy for me to become skillful at using the EIS	0.517940	0.026549	0.361211	0.517940	1	
3.12: I find the EIS easy to use	0.406961	0.125034	0.561226	0.541171	0.630256	1

**Table 4. Intercorrelations between scale values to statements 3.7 - 3.12 (PEOU)**

From Table 4, the mean intercorrelation was 0.3378450. Substituting  $\bar{r} = 0.3378450$  and *N* = 6 in the above equation, the Cronbach coefficient alpha for PEOU = 0.75.

The Cronbach alpha measures how well a set of items (variables) measures a single one-dimensional latent construct, i.e. the reliability of measurement. In the Davis (1989) study “Cronbach alpha was 0.98 for perceived usefulness and 0.94 for perceived ease of use.” Subsequent studies have reported reliability scores ranging from 0.82 (Igbaria, Guimaraes, and Davis, 1995) to 0.95 (Davis et al., 1989) for perceived usefulness and 0.85 (Igbaria et al., 1995) to 0.91 (Davis et al., 1989) for perceived ease of



use. While the author's Cronbach alpha of 0.80 for perceived usefulness may be regarded as "just acceptable," the Cronbach alpha of 0.75 for perceived ease of use is relatively low. This casts some doubt on the reliability of measurement as a relatively low alpha indicates that the data could be multi-dimensional. Factor analysis can be performed on the data. For the purposes of this paper, the multi-dimensionality aspect is not explored further since this was not within the scope of the Davis (1989) study. It may, however, provide an opportunity for future research.

The Spearman rank-order correlation coefficients  $r$  were calculated for PU and intended use; and PEOU and intended use. Allowing for tied observations (see Siegel and Castellan, 1988),  $r = 0.144$  for PU and  $r = 0.373$  for PEOU. These correlation values are considerably lower than expected. For example, Davis (1989) reports "Perceived usefulness was correlated .63 with self-reported current use in Study 1 and .85 with self-predicted use in Study 2. Perceived ease of use was correlated .45 with use in Study 1 and .69 in Study 2." The author's correlation for usefulness-use ( $r = 0.144$ ) is *lower* than for ease of use-use ( $r = 0.373$ ) and is therefore not consistent with Davis' findings. Furthermore, because of the author's low correlation values PU is **not** "significantly more strongly linked to usage than was ease of use" (Davis, 1989). Davis (1989) emphasizes that "perceived usefulness and ease of use are people's subjective appraisal of performance and effort, respectively, and do not necessarily reflect objective reality."

The author's results are not in support of the basic tenets of TAM. TAM has emphasized the importance of PU (over PEOU) as the key determinant of acceptance. Empirical evidence has constantly borne out this claim leading to PEOU 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. The author's results partially support this finding, i.e. perceived ease of use can be a stronger catalyst (over PU) fostering IT acceptance. The author's results support Brown's (2002) findings that "perceived ease of use takes on increased importance, as it influences both usage and perceived usefulness." Doll, Hendrickson, and Deng (1998) indicate that "[d]espite its wide acceptance, a series of incremental cross-validation studies have produced conflicting and equivocal results that do not provide guidance for researchers or practitioners who might use the TAM for decision making." Furthermore, Legris, Ingham, and Collette (2003) suggest that analysis "of empirical research using TAM shows that results are not totally consistent or clear." In a developing country in Africa, the conventional wisdom that PU is the main predictor of adoption has been challenged (Anandarajan, Igbaria, and Anakwe, 2002). TAM was developed and tested mainly in developed countries where the culture has been described as associative (Brown, 2002).

In order to investigate the author's low correlation values, an inspection was made of the raw data (interviewee responses to statements 3.13 and 3.14). For statement 3.13, 19 (61.3 percent) respondents reported that they currently use EIS extremely frequently in their job. Nine (29 percent) respondents reported that they currently use EIS quite frequently in their job and 3 (9.7 percent) respondents reported that they currently use EIS slightly frequently in their jobs. It is evident that there is little variation in these responses: only 3 (out of 7 possible) different Likert scale categories. Moolman (2002) notes that when "a correlation coefficient is based on values from a 3-point scale there is the potential for a problem." For statement 3.14, 27 (87.1 percent) respondents predict that in the future they will use the EIS in their organization extremely frequently and 4 (12.9 percent) respondents predict that in the future they will use the EIS in their organization quite frequently. Moolman (2002) notes, that this "low correlation value will not be changed by using an alternative formula. To get a higher correlation you will need more variation among the intended usage responses" (*sic*).

While these low correlation results may appear to be disappointing, given the very small statistical variation in interviewee responses, this accounts for the fact that the author's results are not consistent

with previous findings where significantly higher correlations are reported (see, for example, Al-Gahtani, 2001; Davis, 1989; Suradi, 2001). While the author's study was limited to existing EIS in organizations in the EMA, it can be stated that due to the similarities between the economy in KwaZulu/Natal and the rest of South Africa, the author's results can be considered as approximately indicative for the South African economy. However, this statement is not categorical. The author's results are therefore limited and at best provide a reflection of EIS adoption in the EMA. It is therefore concluded that in this study there is little evidence to support that the theoretical use aspects of TAM are echoed in EIS implementations in KwaZulu/Natal.

From the interviewee responses to statement 2.12, the frequency of EIS usage reported by the respondents is reflected in Table 5. For comparative purposes, the results of an EIS usage study in organizations in Australia by Ikart (2005) are also included in Table 5. Obtaining a user's self-assessment of the number of times they use EIS in a week and/or their frequency of using EIS was the measure used in both the author's and Ikart (2005) studies. Although previous research suggests that self-reported frequency measures are appropriate or relative measures (Blair and Burton, 1987), they should not be regarded as precise measures of actual use frequency (Davis et al., 1989).

Frequency of EIS use in organization	Tally and associated percentage of EIS use in organization as reported by respondents in sample surveyed (N=31 <sup>a</sup> ) - author's study	Tally and associated percentage of EIS use in organization as reported by respondents in sample surveyed (N=121) - Ikart (2005) study
Rarely or not at all	1 (3.2%)	4 (3.3%)
Occasionally (less than 1 per week)	1 (3.2%)	21 (17.4%)
Sometimes (more than 1 but less than 4 times per week)	2 (6.4%)	43 (35.5%)
Regularly (several times per week)	16 (51.6%)	34 (28.1%)
Frequently (several times per day)	13 (41.9%)	19 (15.7%)

a – Respondents could give more than one answer

**Table 5. Frequency of EIS usage reported by respondents and associated percentages**

From Table 5, in the author's study, the modal group of EIS use was 'Regularly (several times per week)' – see left shaded area. However, in the Ikart (2005) study, the modal group was 'Sometimes (more than 1 but less than 4 times per week)' – see right shaded area. In the survey of EIS applications in Taiwan, Liang and Hung (1997) state that "over half of the respondents reported using their systems every day." Given the use results as reflected in Table 5, it can be concluded that there appears to be no consistency in the frequency of actual EIS use, i.e. no common frequency value for U. From a practitioner's perspective this tends to suggest that EIS use may also be mitigated by 'other' variables, such as

- an organization's operational requirements (time of month); and
- the stage of EIS development and implementation.

In respect of the EIS development and implementation stages, Pervan and Phua (1997) note that "this issue may increase in significance as more organizations progress from the evaluation stage to the

operational stage.” However, in the author’s study, one respondent who had reported his most recent EIS implementation as ‘Not Successful,’ **had** progressed from the EIS evaluation stage to the operational stage and this finding does not appear to be consistent with the Pervan and Phua (1997) study. This may require further investigation.

## CONCLUSION

In this study, Cronbach’s coefficient alphas (degree of reliability) for PU and PEOU constructs were not within generally accepted limits. Low correlation coefficients were calculated for PU and Intended Use, and PEOU and Intended Use constructs. The correlation for usefulness-use was *lower* than for ease of use-use and therefore not consistent with Davis’ findings. However, the author’s results (1) *partially* support Venkatesh’s (1999) findings that PEOU can be a stronger catalyst (over PU) in fostering IT acceptance; (2) support Brown’s (2002) findings wherein the PEOU-Use TAM relationship was higher than PU-Use; and (3) indicate there is no consistency in the frequency of U of EIS.

Brown (2002) reports that PEOU takes on increased importance, as it influences both use and PU. Legris et al. (2003) 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. The author’s results tend to support this viewpoint.

Future research may need to be directed to investigate the role of other potential antecedents to enhance IT adoption and assimilation variances in developing countries. One suggestion in this regard is investigating normative and cultural beliefs to increase the final IT usage prediction of EIS in organizations in South Africa. Some additional ideas for future research are:

- several recent studies have shown how contextual factors such as socio-economic conditions, national environment, and culture can be incorporated into typical investigations of technology adoption (Brown, Hoppe, Mugeru, Newman, and Stander, 2004; Musa, Meso and Mbarika, 2005; Srite and Karahanna, 2006);
- the ‘first’ economy and ‘second’ economy dichotomy in South Africa may serve as an appealing context in which to investigate IT adoption; and
- further richness in IT studies can be used through the use of alternative qualitative research methodologies, e.g. grounded theory methodology, actor network theory, etc.

Such IT acceptance studies should pay attention to issues of significance in assessing the contributions of variables explaining IT usage for decision-making in organizations in developing countries.

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## **PREAMBLE TO STRUCTURED INTERVIEW QUESTIONNAIRE**

Computers have been used as tools to support managerial decision-making for over three decades. The evolutionary view of computer-based information systems has led to the classification of the following major computerised support systems:

- G Transaction Processing Systems (TPS);
- G Management Information Systems (MIS);
- G Decision Support Systems (DSS);
- G Expert Systems (ES); and
- G Executive Information Systems (EIS).

The attributes of each support system are shown in the table below.

This interview conducted focuses **solely on the EIS classification**. Some (or all) of these support systems may exist in the interviewee's organisation but are not considered for the purpose of this study. This interview is concerned with non-technical EIS aspects. The focus is on perceived EIS usefulness, perceived EIS ease of use, EIS usage and the impact of Web-based technologies on EIS implementation. No consideration is to be given to aspects such as networks, hardware platforms and software development tools of the interviewee's EIS in his organisation.

Different EIS definitions exist, however, the author considers the following definition of an EIS as appropriate:

**“A computerized system that provides executives with easy access to internal and external information that is relevant to their critical success factors.”**

**Attributes of Major Computerised Support Systems**

Dimension	Transaction Processing Systems (TPS)	Management Information Systems (MIS)	Decision Support Systems (DSS)	Expert Systems (ES)	Executive Information Systems (EIS)
Applications	Payroll, inventory, record keeping, production and sales information	Production control, sales forecasting, monitoring	Long-range strategic planning, complex integrated problem areas	Diagnosis, strategic planning, internal control planning, strategies	Support to top management decision, environmental scanning
Focus	Data transactions	Information	Decisions, flexibility, user friendliness	Inferencing, transfer of expertise	Tracking, control, 'drill down'
Data base	Unique to each application, batch update	Interactive access by programmers	Database management systems, interactive access, factual knowledge	Procedural and factual knowledge; knowledge base (facts and rules)	External (online) and corporate, enterprise wide access (to all databases)
Decision capabilities	No decisions	Structured routine problems using conventional management science tools	Semi-structured problems, integrated management science models, blend of judgment and modelling	The system makes complex decisions, unstructured; use of rules (heuristics)	Only when combined with a DSS
Manipulation	Numerical	Numerical	Numerical	Symbolic	Mainly numeric; some symbolic
Type of information	Summary reports, operational	Scheduled and demand reports, structured flow, exception reporting	Information to support specific decisions	Advice and explanations	Status access, exception reporting, key indicators
Organisational level served	Sub-managerial, low management	Middle management	Analysts and managers	Managers and specialists	Executives and business end-users
Focus	Expediency	Efficiency	Effectiveness	Effectiveness and expediency	Timeliness



## **EXECUTIVE INFORMATION SYSTEMS (EIS) QUESTIONNAIRE**

### **SECTION 1 - DEMOGRAPHIC INFORMATION**

You are asked to answer each question by ticking (☑) the appropriate box.

1.1 To which activity sector does your organisation belong?

- G Agriculture, stock farming, game and timber
- G Chemical
- G Commercial
- G Communications
- G Construction
- G Financial services
- G Fishing
- G Food processing
- G Health and veterinary, social services
- G Hospitality and entertainment services
- G Hotel
- G Manufacturing
- G Metal processing
- G Ore Mining industries
- G Production and distribution of electrical power, gas and water
- G Public administration, defence and organisation's safety responsibilities
- G Real estate and letting of property, management services
- G Transport and warehousing
- G Other (please specify) .....

1.2 What was the gross annual turnover (in South African Rands) of your organisation last year?

- G More than 500 million
- G Between 100 and 500 million
- G Between 20 and 100 million
- G Between 5 and 20 million
- G Between 1 and 5 million
- G Less than one million

1.3 How many permanent employees in your organisation?

- G More than 5,001 employees
- G Between 2,001 and 5,000 employees
- G Between 501 and 2,000 employees
- G Between 251 and 500 employees
- G Between 51 and 250 employees
- G Less than 51 employees

1.4 How many years has your organisation existed?

- G More than 25 years
- G Between 10 and 25 years
- G Between 5 and 10 years
- G Less than 5 years

1.5 How would you classify your organisation?

- G Public listed
- G Public non listed
- G Government or quasi-government body
- G Foreign enterprise
- G Private company
- G Incorporated not for gain
- G Other (please specify) .....

1.6 Name of interviewee and contact e-Mail address. **(Will not be published. For contact with author only)**

.....

1.7 Job title of interviewee in organisation.

.....

1.8 Are you an EIS user, or do you expect to be an EIS user, or .....? Please explain.

.....

.....

.....

## SECTION 2 - EIS IN YOUR ORGANISATION

You are asked to answer each question by ticking () the appropriate box(es). In some cases, there may be more than one answer.

2.1 What is the current situation regarding the executive information system (EIS) in your organisation?

- No EIS exists or is under consideration
- EIS has been proposed and its introduction is under evaluation
- Based on the evaluation, the EIS has been accepted and is under development and implementation
- The EIS is operational and in use by executives/business end-users
- EIS failure (where the EIS has gone into decline and has been phase out)

2.2 In the case of an operational EIS, how long did it take before it was in use by executives/business end-users?

..... days or ..... months

2.3 For what application(s) is/are the EIS used in your organisation?

- Office automation activities (e.g. diary, electronic mail)
- Access to current status information (e.g. performance reports and graphs)
- Access to projected trends of the organisation (e.g. forecasting reports and graphs)
- Querying corporate and external data bases
- Performing personal analysis (e.g. using spreadsheets)
- Other (please specify) .....

2.4 How many (if any) EIS users are there in your organisation?

.....

2.5 At which hierarchical employee level(s) is the EIS used in your organisation?

- Managing Director/Chief Executive Officer
- Director (or delegated)
- General Manager
- Senior Operations Manager
- Middle Manager
- Line Manager
- Business end-user
- Other (please specify) .....

2.6 In which functional area(s) is/are the EIS used in your organisation?

- Finance
- Planning
- Marketing
- Sales
- Personnel
- Production/Operations
- Entire organisation
- Other (please specify) .....

2.7 What type(s) of information is/are held by the EIS in your organisation?

- Strategic planning
- Inventory management/Suppliers
- 'Soft' information (e.g. opinions, ideas, predictions, attitudes, plans,)
- Finance
- Business/Sales
- Trade/Industry
- Human resources
- Quality
- External news services
- Production
- Competitors
- Stock exchange prices

G Other (please specify) .....

## 2.8 How is the information held in the EIS in your organisation?

G By products  
 G By projects  
 G By operational areas  
 G By geographic areas  
 G By strategic business units  
 G By processes  
 G By key performance indicators (KPIs)  
 G By company  
 G Other (please specify) .....

## 2.9 What source(s) of information support the EIS in your organisation?

G Corporate data bases  
 G Individuals  
 G Operational data bases  
 G External data bases  
 G Documents or reports  
 G Internet, intranet or extranet  
 G Other (please specify) .....

## 2.10 What approach was taken for the EIS development in your organisation?

G In-house development using existing software tools  
 G In-house development with critical EIS features developed initially and optional features added over time, using existing or commercially purchased software tools  
 G Fully developed by vendor  
 G In-house development with assistance from vendor

## 2.11 In the case of commercially purchased EIS software tools and/or ERP software with EIS features, which products (if any) are used in your organisation?

G Acuity/ES (Acuity)	G Hyperion (Hyperion)
G Brio.Portal/Brio Query (Brio Technology)	G InPhase (InPhase)
G Business Objects (Business Objects)	G JD Edwards BI (J.D. Edwards)
G Cognos (PowerPlay/Impromptu)	G Lightship/Command Center (Pilot)
G Commander Decision (Comshare)	G Lotus Notes (Lotus Corporation)
G Crystal Enterprise (Crystal Decisions Inc)	G Media (Speedware)
G DecisionSuite (Information Ad)	G MicroStrategy (MicroStrategy Inc)
G DSS Agents (MicroStrategy)	G Oracle (Oracle)
G EIS-Track (IOC)	G Pilot (Pilot)
G EKS/Empower (Metapraxis)	G ProClarity (ProClarity Corporation)
G Express/EIS (Oracle)	G SAP/EIS (SAP)
G FOCUS Six (Information Builders)	G SAS/EIS (SAS Institute)
G Forest & Trees (Platinum Technology)	G TRACK (Track Business Solutions)
G Gentia (Planning Sciences)	G Other (please specify) .....
G Holos (Seagate Software IMG)	

## 2.12 How frequently is the EIS used in your organisation?

G Very rarely or not at all  
 G Rarely (a few times per month)  
 G Occasionally (a few times per week)  
 G Sometimes (about once per week)  
 G Fairly regularly (several times per week)  
 G Regularly (once a day)  
 G Frequently (several times per day)

## 2.13 When used in your organisation, what is the average duration of an EIS 'session'?

G More than three hours  
 G Between 2 and 3 hours  
 G Between 1 and 2 hours  
 G Between 30 minutes and one hour  
 G Between 15 minutes and 30 minutes  
 G Less than 15 minutes

2.14 Before the EIS was implemented, what was your personal expectation of the success or failure of the implementation?

.....  
.....  
.....

2.15 Was the EIS implementation **successful** in your organisation?

.....  
.....  
.....

2.16 What factors were important to your EIS implementation?

.....  
.....  
.....

**SECTION 3 - PERCEIVED EIS USEFULNESS, EASE OF USE AND SYSTEM USE IN YOUR ORGANISATION**

The following statements are designed to determine the degree to which you perceive the EIS in your organisation to be useful, facilitates ease of use and EIS (and future) use in your organisation. You are asked to judge the rating for each statement by ticking (T) one rectangular box in the 'likely'/'unlikely' and 'frequent'/'infrequent' ranges respectively.

3.1 Using the EIS enables me to accomplish tasks more quickly in my job.

likely							unlikely	
	extremely	quite	Slightly	neither	slightly	quite	extremely	

3.2 Using the EIS improves my performance in my job.

likely							unlikely	
	extremely	quite	Slightly	neither	slightly	quite	extremely	

3.3 Using the EIS in my job increases my productivity.

likely							unlikely	
	extremely	quite	Slightly	neither	slightly	quite	extremely	

3.4 Using the EIS enhances my effectiveness in my job.

likely							unlikely	
	extremely	quite	Slightly	neither	slightly	quite	extremely	

3.5 Using the EIS makes it easier for me to do my job.

likely							unlikely	
	extremely	quite	Slightly	neither	slightly	quite	extremely	

3.6 I find the EIS to be useful in my job.

likely							unlikely	
	extremely	quite	Slightly	neither	slightly	quite	extremely	

3.7 Learning to operate the EIS is easy for me.

likely							unlikely	
	extremely	quite	Slightly	neither	slightly	quite	extremely	

3.8 I find it easy to get the EIS to do what I want it to do.

likely							unlikely	
	extremely	quite	Slightly	neither	slightly	quite	extremely	

3.9 Interacting with the EIS is clear and understandable.

likely							unlikely	
	extremely	quite	Slightly	neither	slightly	quite	extremely	

3.10 I find the EIS to be flexible to interact with.

likely							unlikely
	extremely	quite	Slightly	neither	slightly	quite	extremely

3.11 It is easy for me to become skilful at using the EIS.

likely							unlikely
	extremely	quite	Slightly	neither	slightly	quite	extremely

3.12 I find the EIS easy to use.

likely							unlikely
	extremely	quite	Slightly	neither	slightly	quite	extremely

3.13 I currently use the EIS in my job.

frequent							infrequent
	extremely	quite	Slightly	neither	slightly	quite	extremely

3.14 Assuming the EIS will be available in my job, I predict that I will use the EIS in the future.

frequent							infrequent
	extremely	quite	Slightly	neither	slightly	quite	extremely

**Interviewee's raw responses to statements in Sections 2 and 3 of survey instrument (Appendix 1)**

Respondent	Section 2		Section 3													
	2.12	2.13	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	3.10	3.11	3.12	3.13	3.14
1	6	4	1	1	1	1	1	2	2	2	1	2	2	2	1	1
2	6&7	4	2	2	2	4	2	1	1	3	1	3	2	1	2	1
3	6	1	2	2	2	2	1	1	2	2	2	3	1	1	1	1
4	6&7	3	2	3	2	1	1	2	2	2	2	2	2	1	3	1
5	7	4	1	2	1	2	2	2	1	2	1	1	1	1	1	1
6	7	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	7	5	2	1	2	2	2	2	3	3	3	3	3	2	1	1
8	6	4	3	2	2	2	2	1	2	3	2	2	3	2	1	1
9	5	5	1	1	1	1	1	1	1	2	1	1	2	1	2	1
10	5	2	1	1	1	1	1	1	2	1	2	2	2	1	1	1
11	4	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1
12	7	4	1	1	1	1	1	1	2	2	2	2	2	2	1	1
13	7	5	2	1	2	1	1	2	2	2	2	3	2	2	1	1
14	7	2	2	2	2	2	2	1	2	3	3	3	3	2	2	2
15	2	3	2	2	1	2	2	2	1	4	1	1	1	1	2	1
16	5	6	2	2	1	1	1	1	2	2	2	2	2	2	1	1
17	7	6	1	1	1	1	1	1	2	1	1	1	2	1	1	1
18	7	1	2	1	1	1	1	1	3	2	2	3	3	3	3	2
19	3	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1
20	6	5	2	1	2	2	1	2	1	2	1	1	1	1	2	1
21	6	3	1	1	1	1	1	1	1	2	1	1	1	1	1	1
22	7	5	1	1	1	1	2	2	1	2	2	2	2	2	3	1
23	6	4	2	2	1	2	2	2	2	2	2	2	2	2	2	2
24	6	4	2	2	1	1	1	1	2	2	1	2	2	1	2	2
25	6	3	1	1	1	1	1	1	3	2	2	1	1	1	1	1
26	7	4	1	1	1	1	1	1	1	1	1	3	3	3	1	1
27	5	5	2	3	2	1	1	2	1	1	1	3	1	1	2	1
28	6	4	4	2	2	1	2	2	2	2	2	3	3	2	1	1
29	7	3	2	2	2	2	2	2	1	1	1	2	1	1	1	1
30	7	4	1	1	2	1	2	1	2	3	2	1	3	2	2	1
31	1	3	1	1	1	1	1	1	2	3	1	1	2	1	1	1