Perceived Characteristics as Correlates of ICT Adoption in Makerere University

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Abstract

This Paper reports on part of a survey of ICT adoption in Makerere University. The Survey of teaching staff, senior administrators ***and*** *postgraduate students, sought to investigate links between ICT adoption and perceived ICT characteristics (its perceived relative advantage, compatibility, user friendliness and observability). Results indicated low levels of ICT adoption, and the perceived ICT characteristics significantly affecting ICT adoption were; perceived relative advantage* ***and*** *observability of ICT. Appropriate recommendations toward making ICT to appear more relatively advantageous and observable in the respective units in Makerere University were accordingly suggested, in order to enhance ICT adoption in the University.*

Introduction

Low levels of ICT adoption in Makerere University have received increasing attention of recent (Nakaye, 1998; Niwe, 2000; Nassanga, 2001; Nyakoojo, 2002; Agaba, 2003). This Paper reports on part of a survey (Bakkabulindi, 2005) on ICT adoption in Makerere University carried out in early 2005 with the purpose of linking ICT adoption with perceived ICT characteristics (its perceived relative advantage, compatibility, user friendliness and observability), as suggested by Kibera (1997) .

Conceptual Framework

On the conceptual side, some four perceived innovation (in this case ICT) characteristics as in Fig 1;

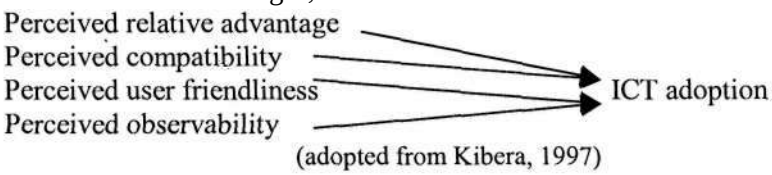

Fig 1: *Conceptual framework linking ICT adoption to four perceived characteristics*

Relative advantage and innovation adoption

Relative advantage (or superiority) is the degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 2003; Kotler, 1991), and is often expressed in terms of economic profitability and/ or social prestige (Rogers, 2003; Kyewalabye, 2001); in terms of productivity (Sentamu, 2001); in terms of convenience and/ or satisfaction (Kyewalabye, 2001); and so on. Lunkuse (2004) refers to the relative advantage of an innovation as its perceived usefulness, that is "the degree to which the user's subjective probability that using a specific system will enhance his or her productivity" (p. 14). The greater the perceived relative advantage/ superiority of an innovation, the more rapid its adoption (Rogers, 2003). Lunkuse (2004) argues that the importance of perceived usefulness in user behaviour is based on the Expectancy Theory which asserts that "the relative attractiveness of various options is related to people's beliefs about the consequences that each option will lead to their beliefs about the desirability of these consequences" (p. 14).

Compatibility and innovation adoption

Apart from perceived relative advantage, another important characteristic of an innovation affecting its rate of adoption is its perceived compatibility or acceptability (Kotler, 1991; Rogers, 2003; Sentamu, 2001). Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. Rogers (2003) contends that an innovation can be compatible or incompatible with (i) socio cultural values and beliefs (ii) previously introduced ideas and/ or (iii) client needs for the innovation. Eason (1988) distinguishes between user acceptability and organisational acceptability of an innovation, saying that as far as user acceptability is concerned, an innovation must offer its services in a way which its users will perceive, at a minimum, as not threatening aspects of their work and will perceive it as positively facilitating goals they wish to pursue. On organisational acceptability, Eason (1988) observes that since an organization at large has goals, policies and structures, the innovation must not only serve immediate task needs but must not impede other aspects of organizational functioning. Ideally it will serve as a vehicle to promote wider organizational goals; as a minimum it will provide an organisational match. Perceived compatibility is positively related to its rate of adoption (Rogers, 2003) in that an idea that is more compatible is less uncertain to the potential adopter and fits

more closely with the individual's situation. Such compatibility helps the individual give meaning to the new idea so that it is regarded as more familiar.

User friendliness and innovation adoption

User friendliness (or usability, ease of use or non-complexity) is the degree to which an innovation is perceived as relatively easy to understand and use (Rogers, 2003). Lunkuse (2004) observes that technology users perceive a technology as user-friendly if it is easy to learn, become skillful, flexible and is controllable. Dawa (2004) refers to the ease of use of an innovation as its usability, quoting the International Standards Organisation (ISO 9241-11) as defining usability as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a given context" (Dawa, 2004: 43). Eason (1988) defines usability of a system as the system offering its functionality in such a way that the planned users will be able to master and exploit it without undue strain on their capacities and skills. It is in this domain that the importance of user friendliness, ease of use and ease of learning are usually emphasized. The complexity of an innovation, as perceived by members of a social system, is negatively related to its rate of adoption (Rogers, 2003).

Observability and innovation adoption

Observability, also known as communicability, demonstrability or describability, is the degree to which results of an innovation are visible to others. Whereas some ideas are easily observed and communicated to other people, other innovations are difficult to observe or to describe to others. For example, the innovation in this study, ICT, has two components; (i) hardware which is the physical part of the tool, and (ii) software that consists of the information base for the tool. Thus the software component of a technological innovation (e.g. ICT) is not so apparent to observation: So innovations in which the software aspect is dominant possess less observability, and usually have a relatively slower rate of adoption (Rogers, 2003). Rogers & Shoemaker (1971) and Denisoff & Wahran (1983) explain that Ogburn's (1922) Cultural Lag Theory, which claims that material innovations diffuse and are adopted more readily than non-material ideas, fits very well into the present discussion of observability. The observability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption (Rogers, 2003).

Hypotheses:

From the above literature, the study was guided by the following hypotheses;

(i) Perceived relative advantage (of ICT) is positively correlated with ICT adoption in Makerere University
(ii) Perceived compatibility (of ICT) is positively correlated with ICT adoption in Makerere University
(iii) Perceived user friendliness (of ICT) is positively correlated with ICT adoption in Makerere University
(iv) Perceived observability (of ICT) is positively correlated with ICT adoption in Makerere University

Method

The study took the quantitative correlational survey design based on a sample of 145 teachers, 124 senior administrators and 175 postgraduate students in Makerere University to whom a self-administered questionnaire with 27 questions on knowledge of ICT and 27 questions on actual use of ICT. The questionnaire also had a section on the independent variables under study, namely the following perceived ICT characteristics: Relative advantage (five questions); compatibility (five questions); user friendliness (seven questions) and observability (five questions). The data were duly processed. The analysis was quantitative, that is statistical involving summary statistics (especially means and standard deviations), Factor Analysis and Multiple Regression Analysis.

Findings

The dependent variable in this study was ICT adoption, conceptualized as knowledge of, and actual use of ICT (Rogers & Shoemaker, 1971) among staff and students of Makerere University. Thus a section of the instrument was devoted to this dependent variable, with 27 items or questions on knowledge and 27 items or questions on actual use of basic ICT facilities. In each case the respondent was asked to do self-rating in terms of knowledge and/ or use of a particular ICT facility using a scale ranging from a minimum of one, for little or no knowledge or use, to a maximum of five, for very much knowledge or use. For purposes of correlating ICT adoption with the independent variables, the researcher aggregated all the 27 items or questions on ICT knowledge and the 27 items or questions on ICT use into one index, hereafter referred to as the

aggregate ICT adoption index, with arithmetic mean of 2.8 and standard deviation of .85. These results suggest that ICT adoption in Makerere University is low ($\tilde{x}$ = 2.8), given that the arithmetic mean is below the median (3 i.e. neither low nor high adoption). However, the distribution of the aggregate ICT adoption index was normally distributed, which implied that the index could be confidently subjected to linear regression analyses (Sweet & Grace-Martin, 2003). Now the aggregate ICT adoption index is related to the respective independent variables in the study.

Perceived relative advantage and ICT adoption

The study wanted to see the influence of ICT's perceived relative advantage or superiority on ICT adoption in Makerere, conceptualizing this relative advantage as the extent to which it has a potential positive influence on work (five items or questions) using a scale ranging from a minimum of one, for little or no potential influence or effect, to a maximum of five for very much potential influence or effect. Table 1 gives resulting descriptive statistics in descending order of mean scores.

Table 1 Descriptive statistics on ICT's perceived relative advantage

Attitude toward a given ICT's relative advantage	**Number of respondents**	**Arithmetic mean**	**Standard deviation**
Potential to raise convenience at work	432	4.20	1.02
Potential to raise speed at work	428	4.17	**1.10**
Potential to raise efficiency at work	430	**4.11**	**1.07**
Potential to raise effectiveness at work	**431**	4.11	1.08
Potential to raise job satisfaction	**427**	4.00	1.12

(unrotated) component matrix (Kaiser, 1958's Varimax Rotation as recommended by Foster, 1998 and Manly, 1994 was not applicable to one component) in Table 2;

Table 2 (Unrotated) component matrix for factors on ICT's perceived relative advantage

Attitude toward a given ICT's relative advantage	Component
Potential to raise speed at work	0.922
Potential to raise effectiveness at work	0.941
Potential to raise efficiency at work	0.920
Potential to raise convenience at work	0.917
Potential to raise job satisfaction	0.836

Taking only high factor loadings in Table 2, that is, those above 0.5 (Foster, 1998; Manly, 1994) the one and only component seems to be; "general satisfaction with ICT's relative advantage". This component when correlated with the aggregate ICT adoption index yielded the correlation: r = 0.502** (p = 0.000), suggesting that general satisfaction with ICT's relative advantage is positively correlated with ICT adoption in Makerere University, at the one percent level of significance (p < 0.01).

Perceived compatibility and ICT adoption

The study wanted to see the influence of ICT's perceived compatibility or acceptability on ICT adoption in Makerere, conceptualizing this compatibility as the extent to which five different ICT facilities fit in the work of the respondent, using a scale ranging from a minimum of one for little or no fit, to a maximum of five for very much fit. Table 3 gives descriptive statistics there from, in descending order of mean scores;

Table 3 Descriptive statistics on ICT's perceived compatibility

Attitude toward a given ICT's fit or compatibilty	Number of respondents	Arithmetic mean	Standard deviation
PC's fit in work	438	4.20	1.09
Internet's fit in work	428	3.65	1.40
School or faculty or institute LAN's fit in work	431	3.61	1.31
Makerere WAN (i.e. Maknet's) fit in work	434	3.54	1.34
African Virtual University's fit in work	426	2.19	1.38

Table 3 reveals that four of the five ICT items recorded mean attitude scores above three (i.e. median score) that is, were perceived as having much fit or compatibility in respondents' work. Only the African Virtual University scored a mean attitude score way below three (i.e. median score) that is, was perceived as having little fit or compatibility in respondents' work. Factor Analysis reduced the five indicator variables on ICT's perceived compatibility in Table 3 to one factor accounting for almost 55% of the variation among the variables, and the unrotated component matrix in Table 4 (rotation was not possible on just one component);

Table 4 (Unrotated) component matrix for the factor on ICT compatibility

Attitude toward a given ICT's fit or compatibility	Component
PC's fit in work	0.684
School or faculty or institute LAN's fit in work	0.864
Makerere WAN (i.e. Marknet's) fit in work	0.838
African Virtual University's fit in work	0.572
Internet's fit in work	0.699

From Table 4, all the five variables had high factor loadings, that is, were above 0.5 (Foster, 1998; Manly, 1994) and the resulting component seems to be; "general satisfaction with perceived ICT's compatibility". This component or factor, when correlated with the aggregate ICT adoption index, yielded a correlation, r = 0.511** (p = 0.000), suggesting a significantly positive relationship between ICT's perceived compatibility and ICT adoption in Makerere University, at the one per cent level of significance ($p < 0.01$).

Perceived user friendliness and ICT adoption

The study wanted to see the influence of ICT's perceived user friendliness (or usability, ease of use or non-complexity) on ICT adoption in Makerere, conceptualizing this user friendliness as the extent to which the respondent found some seven ICT facilities easy to learn to use, using a scale ranging from a minimum of one for very hard or yet to try, to a maximum of five for very easy. Table 5 gives the resulting descriptive statistics in descending order of mean scores.

Table 5 Descriptive statistics on ICT's perceived user-friendliness

Attitude toward a given ICT's user friendliness	Number of respondents	Arithmetic mean	Standard deviation
PC's user friendliness	435	3.86	1.20
ICT in general's user friendliness	434	3.36	1.19
Internet's user friendliness	431	3.31	1.34
School, faculty or institute LAN's user friendliness	429	3.22	1.28
Makerere WAN (i.e. Maknet's) user friendliness	431	3.16	1.37
ICT change and its user friendliness	430	3.10	1.23
African Virtual University's	411	1.99	1.24

From Table 5, six of the seven ICT items recorded mean attitude scores above three (i.e. median score) that is, were perceived as being user friendly by respondents. Only the African Virtual University scored a mean attitude score way below three (i.e. median score) that is, was perceived as having little user friendliness by respondents. The seven indicator variables of ICT's perceived user friendliness (Table 5), were reduced using Factor Analysis to one factor accounting for over 57% of the variation among the variables, and the unrotated component matrix in Table 6 (rotation was not possible on just one component);

Table 6 (Unrotated) component matrix for the factor on ICT's perceived user friendliness

Attitude toward a given ICT's user friendliness	Component
PC's user friendliness	0.722

From Table 6, all the seven variables had high factor loadings, that is, were above 0.5 (Foster, 1998; Manly, 1994) and the resulting component seems to be; "general satisfaction with ICT's user friendliness", which when correlated with the aggregate ICT adoption index, yielded a correlation, r = 0.665** (p = 0.000), suggesting a significantly positive relationship between ICT's perceived user friendliness and ICT adoption in Makerere University, at the one percent level of significance (p < 0.01).

Perceived observability and ICT adoption

The study wanted to see the influence of ICT's perceived observability (or communicability, demonstrability or describability) on ICT adoption in Makerere, conceptualizing this observability as the extent to which some five ICT facilities had had positive impact on respondents' work, using a scale ranging from a minimum of one for very little or no actual impact, to a maximum of five for very much actual impact. Table 7 gives descriptive statistics from the responses to the five items or questions in descending order of mean scores;

Table 7 Descriptive statistics on ICT's perceived observability

Attitude toward a given ICT's actual impact or observability	**Number of respondents**	**Arithmetic mean**	**Standard deviation**
PC's impact on work	434	4.01	1.18
Internet's impact on work	426	3.42	1.39
School/ faculty/ institute LAN's impact on work	428	3.31	1.33
Makerere WAN (i.e. Maknet's) impact on work	428	3.07	1.38
African Virtual University's impact on work	415	1.89	1.15

It is noteworthy from Table 7 that four of the five ICT items recorded mean attitude scores above three (i.e. median score) that is, were perceived as having observability in respondents' eyes. Only the African Virtual University scored a mean attitude score way below three (i.e. median score) that is, was perceived as having little observability by respondents. The five indicator variables of ICT's perceived observability (Table 7), were factor analysed to one factor accounting for over 54% of the variation among the variables, and component matrix in Table 8;

Table 8 (Unrotated) component matrix for the factor on ICT's perceived observability

Attitude toward a given ICT's actual impact or observability	**Component**
PC's impact on work	0.683
School, faculty or institute LAN's impact on work	0.852
Makerere WAN (i.e. Maknet's) impact on work	0.827
African Virtual University's impact on work	0.576
Internet's impact on work	0.703

From Table 8, all the five variables had high factor loadings, that is, were above 0.5 (Foster, 1998; Manly, 1994) and the resulting component seems to be; "general satisfaction with ICT's observability". This component or factor, when correlated with the aggregate ICT adoption index, yielded a correlation, r = 0.577** (p = 0.000), suggesting a significantly positive relationship between ICT's perceived observability and ICT adoption in Makerere University, at the one percent significance level (p < 0.01).

Testing for perceived ICT characteristics with significant influence on ICT adoption in University

Bivariate analyses suggested 0.81g8-0.032 Tc468i8g86Tj2.4597 Tw-0.123 Tc(influenc) Tj6Tc(t) T

Table 9 Regression results of ICT adoption on perceived ICT characteristics

(a) ANOVA table

F statistic	Significance level (p)	Adjusted R square
81.38	.000	0.537

(b) Coefficients

	Beta, β	Significance level
Constant	2.78	0.000
General satisfaction with ICT's relative advantage	0.21	0.000
General satisfaction with ICT's compatibility	0.10	0.061
General satisfaction with ICT's user friendliness	0.42	0.000
General satisfaction with ICT's observability	0.09	0.156

Part (a) of Table 9 suggests that the perceived ICT characteristics considered, were collectively good explanatory variables of ICT adoption in Makerere University ($F = 81.38$; $p = 0.000$), accounting for almost 54% of the variation in the aggregate ICT adoption index (Adjusted R square = 0.537). Table 9 (Part b) further suggests that of the factors, only "general satisfaction with ICT's user friendliness" ($P = 0.42$; $p = 0.000$) and "general satisfaction with ICT's user relative advantage" ($P = 0.21$; $p = 0.000$) significantly correlated with ICT adoption, at the one percent level of significance ($p < 0.01$ in both cases).

Discussion, Conclusions and Recommendations

The study has suggested that ICT adoption (i.e. knowledge and actual use of ICT/ computers) in Makerere University is low, which finding corroborates those of earlier researchers who found this to be true in the areas of utilization of computers in the management of students' information such as admissions (Nakaye, 1998; Zziwa, 2001); Internet utilisation by teaching staff as source of information (Agaba, 2003; Niwe, 2000); student participation in ICT usage and management (Nassanga, 2001), and; teaching (Nyakoojo, 2002). Now the discussion, conclusions and recommendations turn to the influence of each perceived ICT characteristic on ICT adoption in Makerere University;

Perceived relative advantage and ICT adoption

The study revealed that the higher the perceived relative advantage or superiority of ICT, the higher the ICT adoption (Table 9 b: |3 = 0.21; p = 0.000), in line with the theoretical assertion that perceived relative advantage is a significant influence on adoption of innovations. The results corroborating such studies as Kyalwazi-Katumba (1994) and Okello (2000) thus strengthen the theoretical assertion that the greater the perceived relative advantage of an innovation, the more rapid its adoption (Kolter, 1991; Rogers, 2003), and dismissed the position of those who submit that perceived relative advantage of an innovation does not necessarily mean its adoption (e.g. Basisa, 1999) and past studies in that direction (e.g. Bukirwa, 1999; Byarugaba, 1998). Contextually, this study thus concludes that perceived relative advantage of ICT in Makerere University positively influences ICT adoption, implying that these levels of ICT's perceived relative advantage should not only be maintained but probably also be raised via training (Luyimbaazi, 1997) in order to enhance ICT adoption.

Perceived compatibility and ICT adoption

Results showed that perceived compatibility is a positive correlate of ICT adoption in Makerere University (Table 9 b: p = 0.10), a result consistent with theory that stipulates that perceived compatibility, which is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters, is positively related to the rate of adoption of the innovation (Kotler, 1991). An idea that is more compatible is less uncertain to the potential adopter and fits more closely to the individual's situation. Such compatibility helps the individual give meaning to the new idea (innovation) so that it is regarded as more familiar (Rogers, 2003). It was to the extent of establishing positive correlation, consistent with several researchers (e.g. Akello, 2001; Bosu, 2002 and Fedorowicz & Gelinas, 1998), who found compatibility as a factor enhancing innovation adoption. However the correlation was insignificant (Table 9 b: p = 0.061), which unexpected finding made the researcher suspect that his conceptualization of ICT compatibility in the study may have been inadequate, because as Rogers (2003) asserts, while an innovation can be compatible or otherwise with (i) socio- cultural values and beliefs (ii) previously introduced ideas and/ or (iii) client needs for the innovation, the five questions (Table 3 or Table 4) used to conceptualize ICT compatibility may not have adequately captured all these. Further studies are recommended to close this conceptual gap.

With respect to theory, the study concludes that perceived compatibility, may be positively related to adoption of an innovation (Kotler, 1991) but not significantly, and in the context of Makerere University, the conclusion is that ICT's compatibility is a necessary but not sufficient factor in enhancing ICT adoption in the University.

Perceived user friendless and ICT adoption

Findings revealed that ICT's user friendliness correlated positively and significantly with ICT adoption in Makerere University (Table 9 b: (3 = 0.42; p = 0.000), a finding conforming to the researcher's intuition and formal theory such as that by Kibera (1999) and Roger's (2003) to the effect that user friendliness of an innovation, that is the degree to which the innovation is perceived as relatively easy to understand and use by members of a social system, is positively related to its adoption. This finding corroborated earlier studies which found user friendliness as a catalyst to innovation adoption such as automated teller machines (ATMs) in Uganda (Kiiza, 2003); computers in government ministries in Uganda (Mwanja, 2001); adoption and usage of Control Objectives for Information and related Technology (COBIT), an auditing software package in the developed world (Fedorowicz & Gelinas, 1998). The finding thus strengthens the theoretical assertion that user friendliness enhances innovation adoption, and in the Makerere context the study leads to one major conclusion here, namely that to enhance ICT adoption in Makerere University, user friendliness should be ensured by for example, acquiring hardware or software whose user interfaces (e.g. screens) give clues to the user on what to enter, how to enter, and so on and accompanied by user manuals and the like (Bakkabulindi, 2002).

Perceived observability and ICT adoption

The study found a positive correlation between ICT's observability (or communicability or demonstrability or describability) and ICT adoption (Table 9 b: P = 0.09), a finding consistent with formal theory which has it that the observability of an innovation, that is the degree to which the results of the innovation are visible to others as perceived by members of a social system, is positively related to its rate of adoption (Kibera, 1997; Rogers, 2003). The finding was to that exitent of positive correlation in consonance with several past studies (e.g. Mwebesa, 1997; Nakiganda, 2004; Ssemaana, 1998). However the correlation was not significant (Table 9b: p = 0.156). One possible explanation for the unexpected finding could

be inadequate conceptualization (Table 7 or Table 8) since some innovations are difficult to observe or to describe to others (Rogers, 2003). Further studies should look into this in the future. Nevertheless in conclusion, the study finding is suggesting that although perceived observability (i.e. perceived actual positive impact) was important in innovation adoption, it was not a significant correlate of the same. In the study context, the conclusion is that Makerereans do not necessarily have to first see "miracles" performed by ICT elsewhere or for other people in order to adopt it; hence the University should not capitalize on the past which is generally full of ICT failures. Instead it should have an ICT vision for the future and work toward total ICT adoption since the past ICT failures are not an obstacle in this effort.

References

Agaba, D. (2003). *Utilization of Makerere University Library electronic information resources by academic staff: Challenges and the way forward.* Unpublished masters (of Sc in info Sc) dissertation, Makerere University, Kampala, Uganda.

Akello, Z. (2001). *Gender and utilization of draft animal power technology for food production: The case of Kumi District.* Unpublished master (of Arts Gender studies) dissertation, Makerere University, Kampala, Uganda.

Bakkabulindi, F.E.K. (2002). *Information systems/ technology by example.* Unpublished manuscript.

Basisa, M.C. (1999). *Farmer characteristics influencing the adoption of organic farming techniques among the partner farmers of Africa 2000 Network in Kasese District Uganda.* Unpublished masters (of Sc. Agric Ext. /Educ.) dissertation, Makerere University, Kampala, Uganda.

Bosu, R.S. (2002). The use of educational technology at the University of Cape Coast, Ghana. *African Journal of Educational Planning and Policy Studies,* 8(1), 1-9.

Bukirwa, J. (1999). *Factors affecting utilization of antenatal services: Study of Kiryandongo Refugee Settlement in Masindi District.* Unpublished masters (of Arts, Social Sector Planning & Mgt.) dissertation, Makerere University, Kampala, Uganda.

Byarugaba, R. (1998). *Some selected socio-economic and demographic determinants of modern contraceptive use in Uganda: Study of Western Region.* Unpublished master (of Arts, Demo.) dissertation, Makerere University, Kampala, Uganda.

Dawa, S. (2004). *Information technology personnel competencies and computer-based information system usability in Uganda.* Unpublished master (of Bus. Adm.) dissertation, Makerere University, Kampala, Uganda.

Denisoff, R.S. & Wahrman, R. (1983). *Introduction to sociology* (3rd ed.). NY: Macmillan.

Eason, K. (1988). *Informational technology and organizational change.* London: Taylor & Francis.

Fedorowicz, J. & Gelinas, U.J. Jr. (1998). Adoption and usage patterns of COBrT: Results from a survey of COBIT purchases. *[Information systems] IS Audit & Control Journal, 6,* 45-51.

Foster, J.J. (1998). *Data analysis using SPSS for Windows.* London: Sage.

Kibera, F.N. (1997). Critical review of theories of adoption of innovations. *Makerere Business Journal* (pp. 195-204): Summary of papers presented at the 4th Annual International Management Conference on the theme: Modernisation of African economies; challenges and strategies, Nov 24-28, organised by the Makerere University Business School, Kampala.

Kiiza, C.K.H. (2003), *Application of the Technology Acceptance Model on the use of electronic payment systems in Uganda: the case of automated teller machines.* Unpublished masters (of Sc. Ace./ Fin.) dissertation, Makerere University, Kampala, Uganda.

Kotler, P. (1991). *Marketing management :analysis, planning, implementation, and control.* NJ: Prentice-Hall.

Kyalwazi-Katumba, H. (1994). *Attitudes of modern Uganda small-scale farmers toward agrochemical use.* Unpublished masters (of bus. admin.) dissertation, Makerere University, Kampala, Uganda.

Kyewalabye, J.S.C. (2001). *Implementation and outcome of information technology investments in Uganda.* Unpublished masters (of business adm.) dissertation, Makerere University, Kampala, Uganda.

Lunkuse, F. (2004). *Adoption of technological innovations in Uganda's agricultural industry.* Unpublished masters (of Bus. Adm.) dissertation, Makerere University, Kampala, Uganda.

Luyimbaazi, CD. (1997). *Factors influencing the adoption of animal draught power technology in Rakai District.* Unpublished masters (of Sc. Agric. Ext. /Educ.) dissertation, Makerere University, Kampala, Uganda.

Manly, B.J.F. (1994). *Multivariate statistical methods: Primer.* (2 ed.). London: Chapman & Hall.

Mwebesa, J. (1997). *Impact of technological innovation on rural women's agricultural activities: Case of the solar drier.* Unpublished masters (of Arts, Women Studies) dissertation, Makerere University, Kampala, Uganda.

Nakaye, A. (1998). *Information utilization in managing admissions of students at Makerere University.* Unpublished masters (of Public adm. & mgt) dissertation, Makerere University, Kampala, Uganda.

Nakiganda, A.P.N. (2004). *Socio-economic factors influencing the use of agro-chemicals in vegetable production and the implications for land management in Buikwe County, Mukono District.* Unpublished masters (of Arts, Land Use & Regional Development, MA LURD) dissertation, Makerere University, Kampala, Uganda.

Nassanga, M. (2001). *Students' participation in ICT usage and management: a case study of EASLIS.* Unpublished bachelors (of librarianship and info Sc.) dissertation, Makerere University, Kampala, Uganda.

Niwe, M. (2000). *Assessing the potential of using the Internet as a tool for meeting information needs of academic staff in Makerere University.* Unpublished masters (of Sc in info Sc) dissertation, Makerere University, Kampala, Uganda.

Nyakoojo, S.A. (2002). *Training and individual learning at Makerere University Business School.* Unpublished masters (of business adm.) dissertation, Makerere University, Kampala, Uganda.

Okello, A.B. (2000). *An analysis of socio-economic factors affecting the adoption of irrigation technology in drought-susceptible areas of Uganda.* Unpublished masters (of Sc, Agric. Econ.) dissertation, Makerere University, Kampala, Uganda.

O'Mahoney, C. (2005). Reaping ITEM [Information technology in education management] benefits: Link between staff ICT access, ability and use. In Tatnall, A., Osorio, J. & Visscher, A. (Eds.). *Information technology in education management in the knowledge society* (pp.23-36), IFIP TC3 WG 3.7, 6th International Working Conference on ITEM, held July 11 to 15, 2004 at Las Palmas de Gran Canaria. Spain. NY: Springer.

Rogers, E.M. (2003). *The diffusion of innovations* (5th ed.). NY: Free Press.

Rogers, E.M. & Shoemaker, F. (1971). *Communication of innovations: a cross-cultural approach.* NY: Free Press.

Semaana, A.R. (1998). *Impact of on-farm trials and demonstrations on farmers in Southwestern Uganda.* Unpublished PhD (in Agriculture) thesis, Makerere University, Kampala, Uganda.

Sentamu, F.X. (2001). *Information technology, organizational culture and the performance of National Water and Sewerage Corporation.* Unpublished master (of Business Adm.) dissertation, Makerere University, Kampala, Uganda.

Sweet, S.A. & Grace-martin, K. (2003). *Data analysis with SPSS: a first course in applied Statistics.* (2nd ed.). Boston: Allyn & Bacon.

Zziwa, G. (2001). *Computer utilization in the management of students' information at Makerere.* Unpublished masters (of Arts in educ. mgt.) dissertation, Makerere University, Kampala, Uganda.