Individual Characteristics as Correlates of Use of ICT in Makerere University

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ABSTRACT
This survey sought to investigate links between use of ICT with six individual characteristics, namely interaction with ICT change agents, ICT training, cosmopolitanism, age, gender and income level. The study was a co-relational and cross-sectional survey biased to the quantitative approach, involving 145 teaching staff, 124 senior administrators and 175 graduate students. Primary data were collected using a self-administered questionnaire, and analysed using summary statistics (e.g. means and standard deviations), t-test, Analysis of Varince and Pearson correlation. Results indicated fair levels of use of ICT, although all individual characteristics but gender significantly related with use of ICT. Appropriate recommendations toward putting in place ICT change agents in all units in the University, training leading to possession of ICT qualifications, and special ICT help (including ICT training) for the less cosmopolitanism and the ageing and aged plus provision of institutional ICT so that the financially less able can also access and hence use the same, were accordingly suggested.

General terms: Higher education, ICT, individual characteristics, innovation adoption, Makerere University

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1. INTRODUCTION

Organizations wishing to survive have to foster use of innovations among their members (Mullins, 2002). One innovation that is particularly important for stakeholders in an academic institution these days is information and communication technology (ICT), given its innumerable benefits such as enhancing speed, efficiency and effectiveness of the user (Mullins, 2002). Unfortunately however, low levels of use of ICT in Makerere University have received increasing attention of recent (Agaba, 2003; Makerere University, 2000; Nakaye, 1998; Niwe, 2000; Nsobya, 2002; Nyakoojo, 2002) but the reasons why use of ICT in the University is low are not yet clear. This paper reports on a survey on use of ICT in Makerere University carried out with the purpose of linking use of ICT, an innovation with six individual characteristics, as suggested by Kibera (1997). The six individual characteristics were interaction with ICT change agents, ICT training, cosmopolitanism, age, gender, and income level. Taking ICT as an innovation, literature is hence reviewed on how each of the said individual characteristics relates with use of innovations.

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1.1 Interaction with change agents and use of innovations

Osuji (1988) gives some six definitions or conceptions of a change agent including that of Lippitt, Watson and Westley (1958), who according to Osuji (1988), first used the term change agent to refer to all helpers, no matter what system they work with; and that of Beckhard (1969) who defined change agents as those people, either inside or outside the organisation, providing technical, specialist or consulting assistance in the management of a change effort. Kibera (1997) asserts that a potential adopter who has more contacts with a change agent is more likely to benefit from the technological or technical knowledge of the agent and therefore to be more ready to use innovations than those with fewer contacts.

1.2 Training and use of innovations

Ntulume (1998) defines training as "the systematic modification of behavior through learning which occurs as a result of education, instruction, development and planned and unplanned experience" (P.11). Training is directed at changing people's knowledge, experience, skills and attitudes. It enables employees to be more adaptable, and as technological advances continue it is training that enables employees to cope with the changes (Wamala, 1996). In particular, ICT literacy defined as the degree to which an individual possesses masterly over ICT symbols in their written form and contributes to the process of adopting new technology by providing the means for ICT print media exposure and facilitating the retrieval of ICT print messages for later use (Kibera, 1997) among others.

1.3 Cosmopolitanism and use of innovations

Cosmopolitanism refers to the degree to which an individual is oriented outside the immediate social system or has urban influence is positively related to innovativeness (Kibera, 1997). Cosmopolitanism which is the rural or urban divide is theorized to relate to adoption of educational and agricultural innovations, health and/ or demographic innovations such as contraception because urban residents have more education than rural dwellers and have better accessibility to the services and have better access to media like television and internet, which are useful in communicating innovation gospels (Rogers, 2003).

1.4 Age and use of innovations

Schiffman and Kanuk (2004) observe that age of the consumer innovator is related to the specific product category in which the consumer innovates, with consumer innovators tending to be younger than either late adopters or innovators because many of the products selected for research attention (e.g. fashion, automobiles) are particularly attractive to young consumers. Age is also theorized to be important in adoption of health and/ or demographic innovations such as family planning, contraception and health service utilization. Age is also theorized to be important in the adoption of agricultural innovations, although there are two conflicting explanations for this. For example Basisa (1999) points out that while older farmers may have more experience, education and farm resources which factors can be an incentive to try out a technology, young farmers tend to have more schooling and exposure to new ideas that may help to adopt a technology, which suggests an inconclusive debate and hence gap on this issue.

1.5 Gender and use of innovations

Gender comprises a range of differences between men and women extending from the biological to the social roles a woman has to play like caring for the children, cooking, fetching water and firewood, in addition to cultivation. Ssekiboobo (1995 cited in Basisa, 1999) argues that such roles may hinder her from easily adopting to technology use. According to Kato (2000), the marginalization of women in regard to technology adoption and transfer is reinforced by the African cultural system which requires women to remain at home while husbands attend seminars, yet they do not always teach women what they have learnt in extension meetings. Women do not have access to the key productive resources such as capital, as well as being underprivileged in education and knowledge. Mwebesa (1997) observes that technological changes are not usually aimed at women at all, and that large scale development projects and their attendant technology rarely include policy regarding women; that sexist bias was the most important factor explaining the inability of women to take advantage of new technology offered. He further contends that appropriate technology programmes reveal that many projects do not achieve positive results for women's lives; that in many projects, even technology introduced for the benefit of women has been co-opted by men for their own use.

1.6 Income level and use of innovations

On the importance of income in innovation adoption, Schiffman and Kanuk (2004) observe that "consumers innovators have… higher personal or family incomes, and are more likely to have higher occupational statuses… than late adopters or non-innovators" (p. 538). According to Morales-Gomez and Melesse (1998), access to Internet and other ICTs is only open to a small fraction of the population, a phenomenon which is a function of income; Internet users tend to have above average income. They further assert that the situation is even more dramatic in developing countries where the income gap is exorbitant; where literacy rates are remarkably lower; and where the users of telecom technologies are likely to belong to modern elite.

1.7 Hypotheses

From the literature, the research hypothesized that each of interaction with ICT change agents, ICT training, cosmopolitanism and income level, significantly positively correlated with use of ICT. However, age was hypothesized to be inversely related to use of ICT, while gender was postulated to relate to use of ICT, in such a way that males were better.

2. METHODOLOGY

Using a quantitative correlational survey design, data were collected using a self-administered questionnaire with questions of relevance in this paper, namely interaction with ICT change agents (one question on whether a given respondent's unit in the University had a noticeable ICT change agent); on ICT training (one question on whether a respondent possessed any ICT qualification); on cosmopolitanism (five questions: $\alpha = 0.8107$); and one question on each of three demographic factors, namely age, gender and income level. The questionnaire had six questions or items on use of personal computer (PC) applications software ($\alpha = 0.8174$) and eight questions or items on use of internet applications ($\alpha = 0.8864$). According to Cronbach's Alpha Coefficient Test (Cronbach, 1971), the questionnaire was reliable for the study as all alpha coefficients were above 0.5. Using the said questionnaire, data were collected from a sample of 145 teachers, 124 senior administrators and 175 postgraduates, and analysed using summary statistics (means and standard deviations), t-test, analysis of variance (ANOVA) and correlation analyses.

3. FINDINGS AND DISCUSSION

3.1 Background of respondents

Other details about the 444 respondents were as follows: according to age, 39% were aged between 30 and 40 years, followed by those below 30 years (35.8%), and the rest (25.2%) were above 40 years of age. Males (66.1%) dominated the sample, and regarding perceived income level, the medium income (63.8%) took a lion's share, followed by 31.1% of low income and only 5.2% of high income.

3.2 Use of ICT

Use of ICT was conceptualized in terms of use of PC applications software (six questions) and internet applications (eight questions), each question scaled using the five-point Likert scale where 1 = Very rarely or never, including never heard of it; 2 = Rarely use; 3 = Neither rarely nor regularly; 4 = Regularly; and 5 = Very regularly. Tables 1 and 2 give summary statistics on the respective two concepts:

Table 1. Statistics on use of PC software

Indicator of use	Mean	Standard deviation
Word processing software	4.04	1.25
Spread sheet software	3.15	1.45
Database management software	2.33	1.39
Graphics software	2.51	1.33
Desktop publishing	1.73	1.13
Statistical or data analysis software	2.00	1.34

According to Table 1, only word processing had a reasonably high sample mean, implying very rare or no use of PC software by the majority of respondents. An average index ("Usepcsw" from Table 1) registered a mean = 2.63, which further suggested that overall, the majority of respondents were only fair users of ICT that is neither rare nor regular users of the same.

Table 2. Statistics on use of internet facilities

Indicator of use	Mean	Standard deviation
Email	4.21	1.19
Web surfing	4.00	1.27
Bulletin board, mailing lists and discussion groups	2.49	1.46
Computer conferencing systems	1.67	1.06
Video conferencing systems	1.48	0.90
Electronic journals and newsletters	2.43	1.41
Electronic databases	2.23	1.35
On-line library catalogs	2.17	1.33

According to Table 2, only E-mail and web surfing in that order, recorded reasonable levels of use, suggesting that respondents very rarely or never used Internet facilities. An average index ("Useint" from Table 2) scored a mean = 2.57, which suggested that the majority of respondents were only fair users of internet facilities. An average index ("UseICT" from the two indices, "Usepcsw" and "Useint" from Tables 1 and 2), had a mean = 2.60, which suggested that the majority of respondents only fairly used ICT, that is neither rare nor regular users of the same. This finding corroborated earlier researchers. For example, both Agaba (2003) and Niwe (2000) found teachers in Makerere poor at utilisation of the Internet as source of information. Nyakoojo (2002) found teachers in the University poor at utilisation of ICT as a pedagogical tool. Nakaye (1998) and Zziwa (2001) found that administrators in the University hardly utilized computers in the management of students' information such as in the area of admissions, while Nassanga (2001) found that students in the University hardly participated in usage and management of ICT.

3.3 Hypothesis testing

3.3.1 Interaction with ICT change agents and use of ICT

The first hypothesis in the study was that interaction with ICT change agents was a positive correlate of use of ICT. Respondents were thus prompted to state whether or not, in their observation, their department had at least one ICT change agent; that is a person promoting the cause of ICT. Table 3 gives pertinent summary statistics and Fisher's ANOVA results:

Table 3. Statistics and ANOVA on use of ICT by interaction with ICT change agents

Any departmental ICT change agents?	Count	Mean	Std dev	F	p
No	85	2.56	0.83	6.547	0.002
Yes	202	2.72	0.88		
Not observant	77	2.32	0.74		

Sample means in Table 3 suggested that those who interacted with ICT change agents (Mean = 2.72) tended to be better at using ICT than those who did not (Mean = 2.56) or were not observant about presence of ICT change agents (Men = 2.32). This was indeed supported by the very big F- value ($p < 0.01$), leading to acceptance of the research hypothesis that interaction with ICT change agents did significantly positively relate with use of ICT at the one percent level of significance. The finding corroborated earlier researchers (e.g. Kato, 2000) but was inconsistent with others (e.g. Luwedde, 1997). The finding thus strengthened theoretical assertions such as that by Kibera (1997) to the effect that a potential adopter who has more contacts with a change agent is more likely to benefit from the technological or technical knowledge of the agent and therefore to be more ready to use the innovation than those with fewer contacts. The finding led to one major conclusion namely that ICT change agents were necessary in all units in Makerere University, if only to enhance use of ICT by staff and graduate students. Hence the recommendation that ICT change agents be put in all units in the University by Top Management and Directorate of ICT Support.

3.3.2 ICT training and use of ICT

The second study hypothesis was that ICT training, proxied by possession of ICT qualification, positively related with use of ICT. Respondents were thus prompted using one item to state whether or not they possessed any ICT qualification. Pertinent summary statistics and t test results are given in Table 4:

Table 4: Statistics and t-test on use of ICT by possession of ICT qualification

Hold any ICT qualification?	Count	Mean	Std dev	T	P
No	185	2.36	0.80	5.406	0.000
Yes	181	2.83	0.86		

According to sample means in Table 4, holders of ICT qualifications were more frequent users of ICT than those who did not. This was supported by the very big t value ($p < 0.01$), which led to acceptance of the research hypothesis to the effect that possession of an ICT qualification and/ or training was a significant positive correlate of use of ICT at the one percent level of significance. The study finding was at par with such past studies as Fedorowicz and Gelinas (1998). It was in line with theoretical assertions such as that one by Kibera (1997) who argues that adaptability to technological advances is a factor of training. And contextually, the study concluded that perhaps low levels of formal ICT training in Makerere University are contributory to low levels of use of ICT in the University. It was thus recommended that for this to be reversed, then all stakeholders in the University deserve training, exposure and/ or encouragement with respect to ICT resources, in order to raise their propensity to use ICT. The University's Top Management and Directorate of ICT Support are called upon to offer the same.

3.3.3 Cosmopolitanism and use of ICT

The third hypothesis in the study was that cosmopolitanism directly correlated with use of ICT. Cosmopolitanism was taken as ranging from the worst case scenario of "rural poor" to the best case scenario of "urban elite". Thus respondents were asked to do self-rating as to the places where they were, at different levels in life, using a scale ranging from a minimum of 1 = rural poor, through 2 = rural but elite, 3 = urban poor, to a maximum of 4 = urban elite, and the resulting summary statistics are in Table 5:

Table 5. Statistics on cosmopolitanism at different levels in life

Level in life	Mean	Standard deviation
Childhood place	2.16	1.13
Primary schooling place	2.27	1.09
O-level schooling place	2.81	1.02
A-level schooling place	3.09	0.96
Current place of abode	3.61	0.70

Table 5 reveals that on average, respondents' cosmopolitanism rose with education level. An overall average index ("Cosmop", acronym for "cosmopolitanism" from the five items in Table 5) had a mean = 2.79, which suggested that overall, respondents rated themselves as "urban poor". Pearson linear correlation between the cosmopolitanism and use of ICT indexes ("Cosmop" from Table 5 and "UseICT" from Tables 1 and 2) gave $r = 0.226$, $p = 0.000$, which suggested a positive ($r > 0$) and very significant relationship ($p < 0.01$) between cosmopolitanism and use of ICT at the one percent level of significance.

The study finding was in agreement with some other studies (e.g. Nafuna, 2002), and supported the theoretical assertion that cosmopolitanism positively related with use of innovations because urban residents have more education than rural dwellers and have better accessibility to the services and have better access to media like television and Internet, which are useful in communicating innovation gospels (Rogers, 2003). The study thus concluded that the less cosmopolitan teachers, senior administrators and postgraduates in the University needed extra training, exposure and/ or encouragement with respect to ICT facilities. Hence the recommendation those relevant stakeholders such as the University's Top management and Directorate of ICT Support (DICTS) give them that preferential treatment.

3.3.4 Age and use of ICT

The fourth hypothesis in the study was that age was inversely related to use of ICT. Respondents were thus prompted to state their ages to the nearest year, yielding a mean and median of 36.1 and 35 years respectively. Age had a range of 47 years that is from a minimum of 22 to a maximum of 69 years. Pearson's Linear Co-relation between age and use of ICT index ("UseICT" from Tables 1 and 2), yielded $r = -0.144$, $p = 0.006$, leading to acceptance of the research hypothesis to the effect that age was significantly inversely related with use of ICT ($r < 0$) at the one percent level of significance ($p < 0.01$). The study

finding was consistent with several past studies (e.g. Byarugaba, 1998) but inconsistent with others (e.g. Ehikhamenor, 1999). The finding concurred with theoreticians such as Schiffman and Kanuk (2004) who observe that age is an important correlate of use of innovations, with consumer innovators tending to be younger than late adopters. In conclusion, aged and ageing teachers, senior administrators and graduate students needed extra encouragement and/ or special training with respect to ICT, which assistance relevant stakeholders such as Top Management and Directorate of ICT Support (DICTS) are called upon to offer.

3.3.5 Gender and use of ICT

The fifth hypothesis was that gender related to use of ICT, with males being better. Summary statistics and t-test results there from, are given in Table 6:

Table 6. Statistics and t-test on use of ICT by Gender

Gender	Count	Mean	Standard deviation	t	p
Female	128	2.59	0.83	- 0.266	0.791
Male	253	2.61	0.87		

Means in Table 6 suggest that females and males were almost at par as far as use of ICT was concerned. The small t value ($p > 0.05$) supported this observation. Thus at the five percent, the null hypothesis to the effect that gender was not significantly related to use of ICT, was accepted. The study finding contrary to what was hypothesized, was similar to that of Ehikhamenor (1999), but disagreed with others (e.g. Mburu, Massimo and Mutua, 2000).

The possible explanation for the study finding is that levels of use of ICT may be so low among teachers, senior administrators and postgraduates in the University that they cut across the gender divide. In other words, both male and female teachers, senior administrators and postgraduates in the University may be equally poor at use of ICT. The study thus concludes that both male and female teachers, senior administrators and postgraduates in the University need the same treatment as far as the use of ICT is concerned. Hence the recommendation that the relevant stakeholders such as the top management and Directorate of ICT Support accord both the male and female in the University equal training, exposure and/ or encouragement with respect to ICT resources.

3.3.6 Income level and use of KMS

The sixth hypothesis in the study was that income level was positively related to use of ICT. Respondents were thus prompted to rate themselves on income on a scale where 1 = Low; 2 = Medium; and 3 = High. Table 7 gives pertinent summary statistics and ANOVA results:

Table 7. Statistics and ANOVA on use of ICT by income level

Income level	Count	Mean	Standard deviation	F	P
Low	111	2.44	0.86	3.254	0.040
Medium	244	2.65	0.85		
High	20	2.83	0.80		

Means in Table 7 suggested that use of ICT rose with income, which was indeed supported by the big F-value ($p < 0.05$), leading to acceptance of the research hypothesis that income level was a significant positive correlate of use of ICT at the five percent level of significance. In addition to being consistent with the hypothesis in the study, the finding also collaborated findings of other studies (e.g. Matovu, 2003). The finding thus strengthened the theoretical assertion that the higher the income, the easier it is for an individual to acquire personal ICT facilities, and to get informal exposure to ICT through ICT magazines and newspapers (Moralez-Gomez and Melesse, 1998). The study then concluded that income was a significant positive correlate of use of ICT by teachers, senior administrators and postgraduate students in Makerere University. Hence, the recommendation that the stakeholders like the Directorate of ICT Support provide institutional ICT and other computers so that the financially less able can also access and hence use ICTs irrespective of ability to own the same.

4. CONCLUSION

This survey sought to investigate links between use of ICT in Makerere University with six individual characteristics, namely interaction with ICT change agents, ICT training, cosmopolitanism, age, gender and income level. The study which was a co-relational and cross-sectional survey biased to the quantitative approach, indicated only fair levels of use of ICT. Furthermore, all individual characteristics but gender significantly related with the use of ICT. Appropriate recommendations toward putting in place ICT change agents in all units of the University, training leading to possession of ICT qualifications, and special ICT help (including ICT training) for the less cosmopolitanism and the ageing and aged plus provision of institutional ICT so that the financially less able can also access and hence use the same, were accordingly suggested. Because gender was an insignificant correlate of use of ICT, it was concluded that both male and female teachers, senior administrators and postgraduates in the University needed same treatment as far as use of ICT was concerned. Hence the recommendation that the relevant stakeholders accord both males and females in the University equal training, exposure and/ or encouragement with respect to ICT resources.

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