An analysis of information technology adoption situation in Botswana secondary schools and its impact on digital scholarship initiatives in institutions of learning

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Abstract

Sub Saharan Africa is both technologically and economically less developed, and this has led to the slow adoption of information technology. The use of Information Technology (IT) has led to major changes in the information era, one of which is known as digital scholarship, a term associated with the application of modern technology to teaching, learning and research activities. Governments in Africa invested in Information Technology and Botswana is among the countries that are currently attempting to promote Information Technology use in schools. Botswana has developed a Vision 2016, which aims at turning the country into an information society or an informed nation by the year 2016 (Long Term Vision 2016). The achievement of this goal of an informed nation implies the adoption, diffusion and use of information technology. This paper assessed the digital scholarship environment in educational institutions by analyzing the ramification of computer technology acceptance and use by school principals in Botswana secondary schools. Preliminary findings point to barriers to information technology adoption due to computer anxiety, digital literacy and lack of ease of use of the computer among some school principals.

Key words
Digital scholarship, computer acceptance, and information technology diffusion
Introduction

The Botswana government has recently equipped all secondary schools with computer laboratories (Revised National Policy on Education, 1994). This paper aimed at finding out if computers were adopted in schools and what implications that would have on digital scholarship. The readiness to adopt technology is indicative of the success of digital scholarship in institutions of learning.

This paper assessed the digital scholarship environment in educational institutions by analyzing the ramification of computer technology acceptance and use. School principals were chosen for this study because they were viewed as transformational leaders in the literature consulted (Doyle & Smith, 2001; Todd, 1999; Yee, 1998; Yuen et al., 2003). This paper is a result of a study carried out among the Botswana secondary school principals; using Technology Acceptance Model (TAM) constructs. The use of Technology Acceptance Model constructs in this research is specifically meant to target leaders who are expected to have a positive influence on the implementation of government policy on the use of computers in schools. The assumption here is that principals are in a position of influence both as opinion leaders and administrative leaders in the education environment. One of the objectives of the Vision 2016 is “All Batswana to use and apply the potential of computer equipment in their daily life” (p. 35). Computer acceptance by school principals is likely to facilitate the acceptance of computers by all the teachers and students, who look up to the leadership of principals.

Adoption and acceptance seem to be used to mean the same thing in the literature consulted. Barnett (1953) says that if an idea grows in popularity in the same place it originated, that process is called adoption or acceptance and if it is transferred to other places across ethnic boundaries, then that is “spreading, borrowing or diffusion” (p. 291). Rogers (1995), argues that, “a study of cultural change takes us beyond the appearance of a new idea into considerations of its acceptance and rejection” (p.291) and that innovation diffusion takes place “on a mental plane” (p. 181). This assertion shows the importance of perception, cognition, recall and affect during the diffusion process or the
adoption of new ideas. In this paper, acceptance and adoption shall be used to mean the
decision to accept and use an innovation.

Information Technology (IT) can be defined as a phrase that covers all forms of
technology that are used to create, store and distribute information in all its
formats, mostly using computers. “According to NDCC 54.59.01 Information
Technology means the use of hardware, software, services, and supporting
infrastructure to manage and deliver information using voice, data, and video”
(Definition of Information Technology, ¶ 1). Associated with information
technology is digital scholarship in education circles. Digital Scholarship,
according to Kirsten Foot (Assistant Professor, Department of Communication,
University of Washington), is any element of knowledge or art that is created,
produced, analyzed, distributed, published, and/or displayed in a digital medium,
for the purpose of research and teaching.

IT adoption failure or success has dominated discussion worldwide. Internationally,
researchers have found that computer anxiety, lack of perceived usefulness, and lack of
perceived ease of use of IT have led to low adoption and usage of Information
Technology (Davis, 1989; Karahanna and Straub, 1998; Legris et al, 2003; Straub, et al,
1997; Szajna, 1996; Venkatesh and Morris, 2000). Governments in Africa have made
significant efforts to equip schools and other institutions with computer technology,
however, this might not be enough to guarantee its use (Odedra et al, 1993). Research
from the African perspective mainly dealt with the national issues pertaining to social,
political and economic barriers in the diffusion or transfer of Information Technology
(Akpan, 2000, Jensen, 2002; Oladele, 2001; Onyango, 2000). It was established that
Africa is both technologically and economically least developed and that this has led to
the slow transfer and adoption of information technology (Onyango, 2000; Udo & Edoho,
2000). Some of the socio-economic barriers have to do with Africa’s underdevelopment,
civil wars, corruption in the government and poverty (Jensen, 2002). The political
barriers dealt with policy implementation failure, and the inadequacies of national
information policies Chowdhury (1998).
Botswana has made the first step in the transfer or diffusion of technology at a national level by installing computers in schools, therefore the environment is conducive for research on the individual’s intention to adopt and use computer technology. The present study examines the technology acceptance or adoption of the school principals, who are assumed to be transformational leaders in their communities. One of the most used models for studying individual intentions to adopt technology is the Technology Acceptance Model (1989).

This research asked the question: given that information technology, more specifically computer infrastructure, is in place in Botswana’s secondary schools, do the principals perceive them to be useful and easy to use? Since education is the most obvious means through which adoption and use can be positively influenced, early adoption and use by secondary school principals is likely to be a strong predictor of success or failure in digital scholarship.

**Methods**

A qualitative study, using telephone interviews was carried out among ten (10) participants, six male and four female, from senior and junior schools in Botswana. The participants were purposively selected to take part in telephone interviews. According to Babbie (2001), purposive sampling is necessary if interview data collection should be based on the knowledge of the participant. In this study there were adopters, neutral respondents and non adopters of computer technology, therefore purposive sampling was warranted. Telephone interviews were used for an in-depth analysis of the participants’ perceptions towards adopting and using computer technology.

This study used in-depth semi structured interviews with a purposive sample of ten (10) principals. Interviews were chosen for this study because these allow the participant to express themselves within some structure as well as to expand on their explanations (Babbie, 2001). Also participants can share their experiences beyond what the researcher had anticipated, thereby making the data richer (Creswell, 2002). This population was
selected because it is assumed that principals are leaders in education and therefore they play an important role in the adoption and use of computer technology. This assumption is based on the literature which has established that school principals are expected to be change agents and to be effective leaders in the information era (Telem, 1996; Todd, 1999; Yee, 1998, Yuen et al. 2003).

Research Questions

The interview questions consisted of the following overarching question:

- Do principals of secondary schools perceive computers to be useful, and easy to use?

To find out the adoption status of the principals, the overarching question was subdivided into three questions following closely the TAM constructs as follows:

a. Are school principals comfortable with using the computer?

b. Do some principals think that computers do not increase their job performance?

c. Do some principals think that it is not easy to learn how to use the computer?

Discussion of Results

To address each of the issues raised above, objectives and interview lead questions were formulated. The first objective addressed whether principals reported that they have computer anxiety. It asked the question, “Are school principals comfortable with using the computer?” The next objective dealt with whether the computer increases job performance and the question was, “Do some principals think that computers do not increase their job performance?” The last objective addressed the issue of learning how to use the computer. The question asked was, “Do some principals think that it is not easy to learn how to use the computer?”

The objectives, questions, and interview lead questions asked appear in Table 1 below.
Table 1: Interview objectives and questions

<table>
<thead>
<tr>
<th>Objective</th>
<th>Question</th>
<th>Interview lead Question</th>
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<tbody>
<tr>
<td>To find out if principals are comfortable with computers</td>
<td>Are school principals comfortable with using the computer?</td>
<td>“What is your comfort zone around computers? Do you feel comfortable around computers?”</td>
</tr>
<tr>
<td>To investigate how useful the computer is to school principals</td>
<td>Do some principals think that computers do not increase their job performance?</td>
<td>“Do you find the computer useful to you as a school principal?”</td>
</tr>
<tr>
<td>To find out if learning how to use the computer is a problem for principals</td>
<td>Do some principals think that it is not easy to learn how to use the computer?</td>
<td>“Do you find the computer easy to use or learn how to use?”</td>
</tr>
</tbody>
</table>

The previous section introduced and discussed the interview questions as posed by the researcher as well as the objectives behind the questions. In this section the responses of the participants to the three questions posed were discussed. To protect the identity of participants, participants were given false names. Question 1 is discussed next.

**Computer Anxiety: Self Descriptions**

**Question 1:** Are school principals comfortable with using the computer?
The main questions the researcher asked the participants were, “What is your comfort zone around computers?” and “Do you feel comfortable around computers?” In response to the questions above, two participants, Setho and Tebogo, reported that they were very comfortable with the use of computers. They described themselves as “very comfortable.” Three participants, Otsile, Baeti and Botho, described themselves as “comfortable” around computers, while three participants, Selelo, Tshekiso and Batsile expressed some discomfort around computers. They said they were “not comfortable” around computers. This is what Baeti said in relation to discomfort, “Also people are afraid of new things and they consider the computer to be too complex and complicated beyond their understanding.” Taolo, confirming this fear as discussed above said, “Eh.. personally, you see, I see it as a good thing, but you see, I have a phobia for computers and also I am old, I am just about to retire. You see the phobia is not about computers only, its about all the other new gadgets as well. So personally I have that phobia.”

The word *phobia* was also introduced by the participants to answer a question that asked about their “comfort.” One of the participants, Ditshupo was non committal, and did not seem to label himself as comfortable or uncomfortable. Ditshupo said, “I do not have phobia as such” In response to the question asking about computer comfort.

In summary, it can be concluded that according to the reports of the principals, some principals are comfortable around computers while others are not. One of the findings from the interviews is that there are distinct groups within the research population. There are two people who fall in one group of “Very Comfortable” users, three in a group of “Uncomfortable” users, three in a group of the “Comfortable” users, one in the “Neutral” position, and one in the stage of “Phobia.” This indicated that within the research population, there was a group of participants who experience some computer anxiety. Figure 1 below shows the groups as described above and their self description about their comfort around computers.
Figure 1: Computer Comfort Self descriptions

The next section discusses the question on the usefulness of the computer to the principals.

Perceived Usefulness: Self Descriptions
The next question dealt with the usefulness of the computer to the school principals. It is possible that some principals might not think that the computer has the potential to increase their job performance. This statement was investigated in the interview.

**Question 2:** Do some principals think that computers do not increase their job performance?

In response to the interview question on the perceived usefulness of the computer, all participants described the computer as useful. The interview question that asked about the usefulness of the computer was responded to positively. The question was, “Do you find the computer useful to you as a school principal?” All ten participants reported that the computer was very useful to them. Most of the adjectives used express the extent of its usefulness to them. Some of these are, “essential and necessary”, “very useful” and “highly useful.” Two participants expressed very strongly how useful the computer is to them. One of them responded by saying, “Oh Yes! Ah! In these times, is there anybody who can say they do not see its usefulness? Using the computer is not a choice.” The other participant said, “Extremely, it is not a question of usefulness, it is part of my life as a school head.”

All the adjectives and statements summarize the extent of the usefulness of the computer. Therefore, there is no evidence from the responses that the principals report that computers do not increase work performance. Figure 2 below shows the responses.
The last question of Part 1 of the interviews focused on the Perceived Usefulness variable. The possibility of principals finding computers difficult to use was investigated in the interviews and the question asked was, “Do you find the computer easy to use or...
learn how to use?” Varied responses were reported to this question, with some principals saying they find it easy to use and others reporting that they do not find it easy to use.

**Question 3:** Do some principals think that it is not easy to learn how to use the computer?

The responses to question 3 indicated that there were two major camps within the research group. The first camp of participants consisted of all of those who had previously reported that they are very comfortable around computers and two participants who said they were comfortable with computers. They said that they find the computer easy to use. The reasons given for the ease of use by the members in this camp were practice and the interactive nature of the computer. Baeti, who had earlier said she was comfortable about computers, also said: “It is easy to use because it interacts with you. If you make a mistake it tells you.” The main reasons given here are practice and the interactive nature of the computer. In the second camp were those who did not find the computer easy to use. This camp had one member, Otsile, who had earlier said that he was comfortable about computers, all three members who were uncomfortable, Selelo, Tsekiso and Batsile, the phobia participant, Taolo and the neutral member, Ditshupo, making it six members who did not find computers easy to use.

Participants in the second camp confirmed that the learning and use of computers poses some challenges. One principal, commenting on the learning and use of computers said that, “It’s a real problem.” Otsile expressed that he is “still struggling to learn how to use the computer.” Selelo responded that: “at the moment it’s not easy for me, I don’t find it easy to use.” This finding of lack of perceived ease of use is supported in the literature on computer use in schools (Flanagan and Jacobsen, 2003). The factors or causes of lack of perceived ease of use, discussed next, explain why it was regarded as a “real problem” to learn how to use computers. They complement the theme on computer anxiety discussed earlier, where it was established that some principals experience computer discomfort and even phobia.
Participants confirmed that some of the reasons for the lack ease of use of the computer were lack of practice, lack of time and lack of training. The lack of training is related to digital literacy. One participant, commenting on lack of practice by themselves said, “Practice makes perfect.” Another participant summarized the practice factor in one metaphor: “I think the greatest point is that computers are not like riding a bicycle, if you don’t practice, you forget, the skills sort of diminishes as you reduce the usage and practice.” This metaphor explains the fact that learning how to use the computer is a dynamic process, it is not static, therefore the skills one has need to be constantly renewed through practice and usage. Unlike the skills of learning the bicycle (which are routine), the rules of learning the use of the computer keep on changing. One other participant supports this statement when he says, “You can’t say you are computer literate without using it.”

The time factor appeared to be yet another barrier to the learning and use of the computer. The participants mentioned lack of time from two points of view. Some participants felt that they did not make the time to learn and use the computer while others felt that the employers ought to create the time for them to learn. Those who subscribe to the first view said, “I created time to learn.” The other participant blamed himself for the lack of time; “I do not give myself enough time to be given more information on the use of the computer. There are some opportunities if you give yourself time to learn you can learn.”

Those who thought the employers should create time wanted training to be formalized. One said, “I think eh training should be formalized you know, because if it is formalized, eh… everybody will find time to do it.” The issues raised here border on digital literacy. Digital literacy is associated with development of basic computer skills and using elementary functions of standard software like spreadsheets, e-mail, web browser, etc. Ditshupo, whose response to the comfort with computers question was neutral, said that during training he “could not grasp” most of the things introduced. Taolo (phobia participant) had not tried to learn how to use the computer because of the dread of computers and “all the new gadgets.” He said, “you have to be bold or “segathlamela
“masisi” to learn how to use it.” [Segatlhamela masisi is a Setswana phrase for describing a brave and fearless person]. Therefore time and training seem to be intertwined in this theme.

Based on the above mixed responses to the question on the ease of using the computer, there were indications that indeed there were some principals who did not find the computer easy to learn how to use. Six members out of the ten participants reported that the computer was not easy for them. As for the causes of the lack of ease of use, some members mentioned that the training was not adequate, others mentioned lack of practice, while Taolo, had a phobia about computers and therefore could not learn how to use them.

In summary, the two camps discussed above agree that one of the reasons for lack of ease of using the computer is lack of practice. Those who did not find it easy to use mentioned lack of training and anxiety or phobia around computers, time constraints, in addition to practice. The above section concludes the analysis of the interview questions, which established whether participants reported that they were comfortable around computers, and whether they reported that computers were easy to use and useful to them as school principals. Figure 3 below shows the self reported statements from the participants regarding perceived ease of use of the computer.
Figure 3: Perceived ease of use
Findings

Telephone interviews were administered to 10 participants in order to find out their computer technology adoption status. In this study principals were assumed to be in a position to transform the school system through computer technology; therefore knowing whether they intend to adopt computers is crucial for successful technology implementation and digital scholarship.

Using the participants responses, four distinct groups were identified based on their self reported confidence levels around computers. The participants were grouped by like or similar characteristics to make the discussion more meaningful. The groups were based on the participants’ descriptions of themselves in response to the first interview question on computer comfort or discomfort. From the responses to the interview questions by the ten participants, the researcher labeled each according to their self-reported status. The participants were grouped into “Very Comfortable”, “Comfortable”, “Uncomfortable”, “Neutral” and “Phobia” for purposes of analyzing the characteristics of each group. The phobia for computers has been identified in the literature as computer anxiety. Compeau & Higgins (1995, p. 189), writing on computer anxiety, mentioned that, “computer anxiety is related to computer self-efficacy, which was found to exert a significant influence on individuals’ expectations of the outcomes of using computers, in terms of their emotional reactions to computers (affect and anxiety).” This assertion is supported in this research. Based on the above, preliminary findings point to the fact that phobia and varying degrees of discomfort exist amongst some principals.

Regarding the Perceived Usefulness of the computer, there was no evidence from the responses that computers do not increase the principal’s work performance. There is a possibility of social pressure, as Hendrickson et al. (1993) pointed out in their research, where subjects might feel obligated to give certain answers because it is the proper thing to do. Therefore it is possible that the participants feel the pressure to conform to the objectives of the Long term Vision 2016. One of the objectives of Vision 2016 is
“Botswana to recognize the importance of information and the development of efficient information systems and networks” (Long term Vision 2016, p. 71).

The Perceived Ease of Use variable revealed that not all users find the computer easy to use or learn how to use. On examining the self reports, it was found that six members out of the ten participants did not think that the computer is easy to use or learn how to use. Of the 10 participants interviewed, three did not use the computer personally. This was another interesting finding because it ties in very well with the research in the area, in which it has been established that,

Although there is little doubt that technological developments will occur at a fast rate, it is not immediately obvious that individual users of the new technology will be able to adopt and use new technological artifacts at the same pace.”

(Karahanna & Straub (1998, p. 238)

The reasons given for lack of ease in using the computer included lack of practice or usage, lack of training, time constraints, and anxiety or phobia around computers. Therefore the PEOU finding complemented the findings on computer anxiety reported earlier. It can, therefore, be assumed that there was some computer anxiety amongst principals and that one of the reasons for it was negative perceived ease of use of the computer. This finding is in line with previous research in the area, which established that computer anxiety has an effect on the behavioral intention to adopt computer technology (Hackbarth, Grover & Yi, 2003).

Conclusions

The government of Botswana took the first step in the transfer of computer technology, by equipping all secondary schools with computers (The Revised National Policy on Education, 1994). This is the national level of the technology transfer, the next step in the diffusion or transfer concerns the user of the computer technology. The present study concentrated on the individual as a unit of analysis, using behavioral intention theories, specifically the Technology Acceptance Model (Davis, 1986), because the diffusion and
adoption of technology cannot be regarded as complete without the input of the individual for whom the system was put in place. One of the objectives of the Vision 2016 document is “All Batswana {Batswana refers to the people of Botswana} to use and apply the potential of computer equipment in their daily life” (p. 35). Therefore it was important to find out what individual principals think about adopting and using computer technology in this study.

The problems or the barriers to information technology adoption found in this research mainly deal with computer anxiety, and lack of perceived ease of use of the computer among the principals. Computer anxiety has been discovered to vary from one individual to another, based on the self descriptions using words like “phobia”, “intimidation”, “fear”, and “afraid.”

For perceived ease of use, learning how to use the computer was found to cause problems for some of the principals. Four factors were reported by the participants. These pertain to lack of practice, time constraints, lack of skills, and lack of training. Based on the above discussion, the information technology adoption barriers among school principals in Botswana qualify and add to the barriers associated with diffusion problems in Africa. Scholars identified low adoption of computers in Africa (Peterson, 1998) and the present study identified the causes or factors contributing to the low adoption. Also the literature in the field identified computer anxiety as a cause for information technology rejection; this study confirmed and qualified these reasons by identifying the different degrees of anxiety as well as the different groups within the research population. Lastly, another reason given in the literature was “dysfunctional behavior” (Odedra et al, 2000), where governments have installed computers and yet they are not used. These findings have implications for policy implementation and digital scholarship because Botswana has already made a significant investment in information technology and information technology infrastructure for its secondary schools (The Revised National Policy on Education, 1994). In the information era, leadership by the principals is crucial to the spread and use of computer technology in schools. The principals’ technology adoption situation is important for policy implementation.
The above findings have a bearing on the aims of digital scholarship. Digital scholarship is dependent on individuals and institutions to use information technology for teaching, learning and research. If there are some barriers as revealed in this study, the activities of digital scholarship will be negatively impacted. Therefore it is crucial for educational institutions to examine the information technology adoption phenomenon alongside the installation of information technology so as to ensure the success of digital scholarship.

**Limitations of the Study**

The purpose of this study was to predict the likelihood of technology acceptance by school principals who are an important group of opinion leaders in education. However, since this research targeted only secondary school principals, further research involving teachers and students in secondary as well as primary schools would be required to fully characterize the current computer adoption scene in schools.

**References**

Lawrence Erlbaum Associates.


Biographical Sketch

The author is a lecturer at the University of Botswana in the Department of Library and Information Studies. She holds a PhD. in Information Studies from the College of Information at Florida State University. Her interests are in information technology adoption and how it can enhance the use of information in the solution of Africa’s problems. A paper related to the research interest, presented at a conference is: Totolo, A. (2005). Information technology adoption in Botswana secondary schools and implications on leadership and school libraries in the digital age. In S. Lee, P. Warning, D. Singh, E. Howe, L. Farmer and S. Hughes (Eds.), IASL Reports 2005: Information leadership in a culture of change (p. 78). Erie, PA: International Association of School Librarianship.