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Enhancing Sustainability with the Impact of Organizational Learning on the Change to the Use of Free and Open-Source Software at a South African University

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Abstract: Information Systems development have undoubtedly contributed towards development and sustainability in advanced countries. Development typically can simply be explained as positive change over certain period of time. While change is evident in our daily life, an example of positive change is technological change which has taken humankind from the primitive era to the level of civilization existing today, becoming necessary for organizational survival. If so then, why do people and organization however usually feel reluctant to embrace even positive prospective beneficial change? An example of such change involves the introduction of the Free and Open-Source Software (FOSS). FOSS presents certain benefits and freedoms in the use of software. Such include freedom to access and enhance software source code at low or free cost, thereby demonstrating high potential to enhance the impact of ICT in the society, but some higher education institutions are yet to utilize the full benefits of the FOSS phenomena. The Tshwane University of Technology (TUT) and some other higher education institutions in South Africa are yet to really embrace and derive the benefits of the FOSS change phenomena. It thus seems like being unable to make sense of the FOSS phenomenon and generally in need some framework or perspective to deal with the change to FOSS. Dealing with change, according to literature and practice, requires a conducive organizational learning and culture. But to what extent is organizational learning being taken into account in the management of technological changes like FOSS at TUT? How then do we facilitate organizational culture and learning to enhance the management of the change to the use and adoption of FOSS at the Tshwane University of Technology (TUT)?

An interpretive research approach which is qualitative in nature is adopted to investigate this problem. A case study of TUT is conducted using questionnaire and interview triangulated with document review. By conducting a case study involving the use literature study, observation, semi-structured questionnaires and interviews, this study uses various theoretical and practical ideas on change management to analyse, explain and plan towards managing the adoption and use of FOSS at TUT. The findings indicate the need for enhancing organizational learning towards a conducive the organizational culture which will further imbibe the principle of continuous learning and continuously adjusting to new effective cultures in managing technological changes at TUT. Universities in developing countries need to adopt both single-loop learning that promotes "doing things better" as well as double loop learning that promotes "doing things differently" perspectives. This implies the need for management to encourage, participate, monitor and evaluate learning progresses and direct the attendant change appropriately. The study concludes organization could benefit with properly managed change initiative enhanced by a conducive organizational learning and culture at the University in which the management, staff members and students have various roles to play. Proactive actions and decisions need to be taken for universities in developing countries not to be left out of sustainable development. This will include seriously striving to benefit from the open-source initiatives saving costs and enabling learning through the openness of software programming codes, thus encouraging in-house development of information systems. And critical to this is continuous "learning and doing" leading to entrenched organizational learning culture to effect "small wins" in using Information Systems for competitive advantage towards enabling sustainable development.

Keywords: FOSS, Free and Open Source Software, Organizational learning, Information systems development, programming tools, sustainable development.

Introduction

Development typically can simply be explained as positive change over certain period of time. As described in Dehinbo (2022), Mansell and Wehn (1998, p.13) explain that while there is no `holygrail' offering a clear definition of the meaning of development, it has been understood since the end of second world war to involve economic growth, increases in per capita income, and attainment of a standard of living equivalent to that of the industrialised countries. This is positive change that can in simple terms be understood to refer to a state of improvement that is a desirable state for any society. An important aspiration of people is to sustain the state of development they might be, and to continue to grow more into further developmental state. Brown (2017) explains that sustainable development (SD) is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

Enormous knowledge has been expended and gained over the years and much progress has been made in the computerization of different aspects of life today. But for these innovation in technologies to work effectively, computer programming efforts are involved in the technological development and these efforts are carried out using tools generally referred to as programming languages and tools.

Most of these systems are developed in advanced countries and developing countries purchase them at exorbitant foreign currency-based prices. Given the level of poverty in developing countries, exorbitant foreign currency-based prices can become an impediment to development. However, an opportune solution came some two to three decades ago and such change involves the introduction of the Free and Open Source Software (FOSS). FOSS presents certain benefits and freedoms in the use of software. Such include freedom to access and enhance software source code at low or free cost, thereby demonstrating high potential to enhance the impact of ICT in the society. Duan and Lee (2022) includes sustainability as one of the advantages of FOSS. However, some higher education institutions are yet to utilize the full benefits of the FOSS phenomena (Dehinbo & Alexander, 2011). Dehinbo (2022) argues this should serve as catalysts towards using IT for development if well managed.

Dehinbo (2022) further explains how a needed well-managed IT-based change can bring development to a society in the form of the change to the use of Free and Open-Source Software. This is more paramount for two major reasons. First reason is that a free software could ease financial pressures on less privileged societies such as developing countries as they could be able to use Free and Open-Source software even though they cannot afford huge licensing fees for proprietary software. Second reason is that the availability of source codes for FOSS can enable viewing and learning from the codes, and in some cases even modifying the codes to improve or enhance functionalities. As learning from these are entrenched in organizations, it could bring more favourable organizational culture that perpetuates learning for further development.

However, Dehinbo and Ditsa (2016) noted that in spite of the above, it is thus unfortunate and surprising that many Institutions of Higher Learning in South Africa are yet to utilize the full benefits and freedoms of FOSS to derive competitive advantage. Reijswoud and Mulo (2006) confirm this statement by indicating that "despite its obvious advantages, FOSS is not on the agenda for many decision makers in developing countries". Bakkabulindi and Ndibuuza (2015) also lamented the poor attitude to and hence the limited utilization of ICT innovations which includes FOSS. Namayala, Kondo and Mselle (2024) also observe that "despite the availability of various FOSS adoption studies, public discourse as well as information and communication technology (ICT) policies, FOSS applications are inadequately adopted in Tanzanian Higher Education Institutions (HEIs) due to lack of institutionalization".

Furthermore, even to date in 2025, it is difficult to find literature that showed any change in attitudes towards the use of FOSS for competitive advantage. Search through the literature database could not yield sources indicating the widespread change to the use of FOSS in South Africa and even in Africa. Everyday experience also shows that dominant use of proprietary software like Microsoft's Office by people is still continuing despite low funds for software purchases. One will struggle to find few people using Office.org for example even though it is available free of charge. Appendix 1 shows some quotations of proprietary software showing expensive costs that could be replaced by Free and Open-Source Software (FOSS) alternatives, yet there seems to be less interests. Missing in this regard is the culture of learning and utilizing FOSS to save cost and enhance expertise especially in academic institutions due to the ability of inspect codes and learning from them as well as enhancing the codes thereby also further contributing to the society.

Reluctance to change as the specific context to the research problem for this study

It is noteworthy that human beings and organizations exhibit reluctance to change and usually find it difficult to get used to changes. Yet, there is a general saying that "change is the only thing that is constant in life". Despite the necessity for change, Stanleigh (2007) observes that people often feel demoralized by change initiatives. This could explain why executives in organizations sometimes find it difficult to drive people out of their comfort zones (Kotter, 1995) to embrace change, even if the change holds prospective benefits. Dehinbo and Alexander (2011) explain that a recent change in the software landscape that we seem unable to make sense of and generally need some framework or perspective to deal with involves the introduction of the Free and Open Source Software (FOSS). This assertion emanates from the premise that FOSS provides free access to the use of a software as well as the opportunity and freedom to inspect, study, modify, extend and distribute the source code of the software (Ajila & Wu, 2007; Krogh & Spaeth, 2007; Henly & Kemp, 2008; Sowe et al, 2008; Cerri & Fuggetta, 2007). Gallego et al (2007) indicate that FOSS is radically changing perspectives in development, use and distribution of software. The free or possible low cost of FOSS should be of benefit to most higher education institutions, many of which are in a dire financial status.

Similarly, the freedom to inspect, study, modify, extend and distribute the source code of software should be of tremendous benefit to higher education institutions that consider it important to generate knowledge through exploration, collaboration, knowledge sharing and learning from examples. Yet, despite these foreseeable advantages of FOSS, it is yet to become widely used in most South African higher institutions including TUT. Boyle (2002) in Dehinbo (2010b) caution that "the only relevant learning done in a company is the learning done by those people who have the power to act". Yet, the people who have the power to act are still reluctant to institutionalize the use of FOSS. Could the reluctance to embrace the change to FOSS be because of lack of some framework or perspective to deal with possible implications that could emanate from its use?

Fortunately, the era of technological change is dawning on us as technological change is becoming the norm in the history of organizations and mankind. Much more encouraging is the fact that management of change is fast becoming a global phenomenon as a strategic initiative towards effective managerialism (Diefenbach, 2007). Jackson and Philip (2005) note that increasingly, researchers have focused their attention on understanding the cognitive and behavioural aspects of change, by turning their attention to organizational learning and culture. Hackney and Mcbride (1995) in Jackson and Philip (2005) indicate that lack of attention to organizational learning and culture is often cited as an important reason for change failure. Delisi (1990) cited in Jackson and Philip (2005) observes that given the changing nature of organizations today, organizational learning and culture is more important than ever before.

Therefore, we now present the purpose and research question for this study. Hofstee (2006:3) observes that the purpose of all good academic works is to attempt to find possible answers to unanswered questions, or to find better answers to incompletely answered questions. Identification of the research questions would enable the formulation of the approach for obtaining answers to the questions in clear, measurable and achievable terms.

Thus, the eventual research question for this study therefore is: To what extent is organizational learning being taken into account in the management of technological changes at TUT? According to Hofstee (2006:20), if one can name a problem or something to argue or find out more about, one should be able to guess a solution or an outcome and to formulate a position to argue. Therefore, the hypothetical proposition for this study is that effective use of Information Technologies such as FOSS for the benefit of the organization could be enabled with properly managed change initiative enhanced by a conducive organizational learning and culture at TUT.

Literature Review

Various works exist on FOSS. To enable a clearer understanding, Reijswoud and Mulo (2006) present a table on the identification of the main proprietary applications, their usage and FOSS alternatives as given in table 1 below.

Table 1: Main propriety software used and FOSS alternatives (Adapted from: Reijswoud & Mulo, 2006).

Task	Proprietary software	Open-Source alternative
Operating system	Windows 9x, 2000, XP	GNU/Linux
Office productivity suite	Microsoft Office	OpenOffice
Mail client	Microsoft Outlook Express	Kmail, Mozilla Mail
Internet browser	Internet Explorer	Konqueror, Mozilla
Database	Microsoft Access	MySQL/phpMyAdmin
Programming	Wordpad	Kate
	Borland Builder	Eclipse
	Microsoft C#	PHP
	Active Server Pages (ASP)	Java Server Pages (JSP)
Statistical analysis	SPSS	Open Office Calc
Web design	Microsoft Front Page	Bluefish/Nvu

FOSS as catalyst for planned and emergent change management

Some of the changes resulting from the adoption of FOSS would be intended or planned, other changes bring results which are unintended and require emergent change management initiatives. Bednar and Welch (2005) note that emergent change management should be in parallel with and subsequent to planned change like FOSS. The emergent change management relates to cognitive organizational change initiatives referring to the collective change processes in the organization that occur tacitly at a pre-awareness level and commonly described by the phrase "organizational learning" (Van Tonder, 2004:58). This could also embrace learning aimed at positively shaping organizational culture for effective change management.

Williams and Williams (2007) note that benefits from ICT are likely only when ICT investment is accompanied with appropriate change management skills. Therefore, it now seems imperative for organizational members to continuously learn to deal with change on day-to-day basis especially with the use of emerging technologies. However, Macredie and Sandom in Jackson and Philip (2005) observe that this is proving more challenging than initially expected, raising some fundamental questions regarding how to successfully manage this complex change process.

Planned versus emergent approaches in the management of change.

In the field of change management, Jackson and Philip (2005) observe that various theoretical insights have been used with regards to understanding changes within organizations and how change should be managed. These include planned versus emergent approaches. Planned approaches are based on two fundamental assumptions. Firstly, they assume that the major determinants of change can be planned in advance and secondly, technology is seen as the main enabler for successful change management. Planned models postulate a top-down approach, where senior management are the prime drivers in managing the change process. Despite the popularity of planned models over the past few decades, they are increasingly becoming obsolete, as reflected by the increased failure of many planned change interventions.

A major reason for planning failure is the increasingly more turbulent, complex and uncertain organizational conditions of today (Orlikowski and Hoffman, 1997 in Jackson and Philip, 2005). A major criticism, as frequently reported in the literature and highlighted by Jackson and Philip (2005), is that planned models fail to look beyond technological issues and understand the social and cultural factors influencing the change process. From research both theoretical and case based, Jackson and Philip (2005) note that the general conclusion would seem to be that technological change should be approached from an emergent perspective.

Emergent approaches recognize the importance of understanding the ongoing behavioural aspects of change. These approaches posit and share the view that change cannot be viewed as a linear sequential process planned within a given time period, by senior management. Instead, actors are expected to enact change as they respond to change arising in an ad hoc fashion. Change from this view is something, which is ongoing or continuous, enabling understanding the social and cultural factors influencing the change process. This would involve understanding the different actor's expectations, norms and perceptions within organizational contexts (Jackson & Philip, 2005). In understanding the cognitive and behavioural aspects of change for example, Wolff and Frank (2005) indicate

numerous approaches to study and foster processes of organizational change. These are mostly focused on social and psychological aspects. Dominant topics include management of change, organizational learning (for enhancing problem-solving capacity), enabling communication (across hierarchical and domain barriers), organizational culture as well as images or metaphors of organizations for creating an awareness of potential problems.

Theoretical perspectives of organizational culture in managing technological change

A recurring theme arising within the organizational culture literature is the need to move away from traditional/ hierarchical cultural modes of thinking to more organic, entrepreneurial ways of thinking, involving an instant shift in attitudes and beliefs towards cultural conformity (Hendry, 1999). However, in practice, researchers have highlighted that, within any organizational context, there are likely to be a number of competing beliefs and values. Consequently, Hendry (1999) notes that the recent failures in managing change suggest that a fresh theoretical perspective is needed for thinking about and perceiving change. For example, given the current upsurge in the use of e-services, Standing (2002) proposes the evolutionary nature of systems, effective management structures and the development of a conducive organizational culture to enhance the impact of the Internet and Web applications.

Practical advice on effectively changing an organization into a learning organization

Using various theoretical perspectives from the literature, Dehinbo (2011b) compiles a list of practical advices on effectively changing an organization into a learning organization These are:

Create avenue and mechanisms for learning from past mistakes, adapting or discarding particular features which have been unsuccessful (Harris, 2002).

Avoid reliance only on established routines but be open to new ideas from outside the organization (Harris, 2002).

Close the gulf between technical and business areas by encouraging “hybrid expertise” (Harris, 2002; Satzinger et al, 2005).

Manage learning effectively (Harris, 2002).

Avoid complacency and the culture of blame (Harris, 2002).

Effect structural change where and when necessary (Harris, 2002).

Provide supportive cultures as an aid to learning (Harris, 2002).

Be on the lookout for the IT paradox in which despite the huge amount of money spent on technology, the benefits seem elusive (Harris, 2002).

Communicate vision to all the stakeholders (Kotter, 2001).

When necessary, create counter-structure that could facilitate the change to the learning organization (Hirschhorn, 2002).

Practical advice on sustaining learning within organizations

It is not enough to only effectively change an organization into a learning organization. Since learning is continuous in nature, learning within organizations needs to be sustained in other to keep the momentum and remain a learning organization (Dehinbo, 2011a). Therefore, Dehinbo (2011a) also gives practical advice towards sustaining learning within organizations and these are given below.

Create and maintain credibility by seeking improved expertise and quality (Markus & Benjamin, 2001).

Anchor changes in the corporation’s culture (Kotter, 2000).

Adaptive learning should be joined with “generative learning” that enhances capacity to create (Senge, 1990, p.14 in Smith, 2001b).

Encourage training as part of IS efforts (Markus & Benjamin, 2001).

Avoid over-reliance on technical expertise and encourage IS specialist to adopt the facilitator approach to change agentry (Benjamin & Markus, 2001).

Encourage individuals who are willing to learn (Smith, 2001b), employees who step forward to try new practices (Hirschhorn, 2002) and the people who have the power to act (Boyle, 2002).

Encourage team learning.

Invest in the flow of know-how that will sustain the organization (Smith, 2001a).

Facilitate the continuous learning of all members of the organization (Smith, 2001a).

Recognize the pervasiveness of change (Van Tonder, 2004, p.1) and institute adaptive and continuous changes to survive in the current knowledge economy.

As a step towards understanding the issues relating to the study of technological change, it is important to examine the situation in typical organizations. The next section then presents the methodology used to empirically confirm the case at TUT with respect to the assertions in the body of literature.

Research Approach, Design and Methodology

The overall research approach

The overall research approach adopted is an interpretive research approach which is qualitative in nature and aimed at developing sound explanations of the phenomenon of interest. Ngwenyama and Lee (1997) note that interpretivism focus on the development of sound explanations and understandings of the study of interest. Interpretivism contends that "either reality itself is a social construct or that at least our knowledge of reality is socially constructed or gained through social constructions (Stahl, 2005)". A limitation of interpretive studies is that it is inter-subjective. Orlikowski and Baroudi (1991) state that "Interpretive studies assume that people create and associate their own subjective and inter-subjective meanings as they interact with world around them" thereby rejecting the possibility of an "objective" or "factual" account of events and situations as well as generalization to a population. Rather, it seeks a relativistic and shared understanding of phenomena. However, Leedy and Omrod (2005:133) indicate that qualitative research assumes that the researcher's ability to interpret and make sense of what is observed is critical for understanding any social phenomenon. Therefore, the research orientation of this topic assumes that the reality for different situation could differ. So, being an insider in the field of IT and in the TUT case being studied, qualitative research design is deemed appropriate for understanding the change situation.

Methodology

The method involves elements of descriptive case study. As observed by Leedy and Omrod (2005), a case study may be especially suitable for learning more about a little or poorly understood situation. The management of change in organizations is an example of such little known or poorly understood situations. Therefore, an interpretive form of case study (Walsham, 2006) is used in the light of social relativism for understanding from the viewpoint of organizational agents who directly take part in the social process of reality construction (Hirschheim & Klein, 1989).

Population representation: The representation for the case study consists of respondents responsible for using and making decisions on the use and implementation of computing and information technologies at TUT. These involve a range of different practitioners such as Information Services managers; ICT laboratory managers; Head of Departments responsible for system implementations in the academic computing laboratories; Lecturers teaching with Information application systems and programming languages; and specific IT users. This range of users is aimed at giving different perspectives.

Sampling method: Purposive sampling and snowballing sampling were used in the case study to select the respondents. In purposive sampling, people or other units are chosen for a particular purpose (Leedy & Omrod, 2005:206) while in snowballing sampling, a chosen unit will lead the researcher to other respondents. Purposive sampling is combined with snowballing sampling to target known members of the population and yet allow such people to point the researcher to other people for more information.

Research instruments: Semi-structured questionnaires were initially used to obtain responses from the respondents and interviews were scheduled to explain further and to clarify information. Documents such as policies, webpages were also reviewed to confirm information and as a form of triangulation to enhance reliability. Assumptions and limitations: While it is assumed that respondents give truthful information, it is however recognized that some respondents may shy away from some sensitive information. An example relates to the cost of certain software which some respondents may not want to reveal in order to hide possible inefficiencies in not seeking cheaper alternatives despite such huge costs. Such information is substantiated with data from literature and practice.

Validity and reliability: In terms of validity and reliability, interpretive IS research employs defensible knowledge claims in which implications are recognized and addressed (Weber, 2004). The validity and reliability implications of

this situation are recognized. We thus acknowledge that this is a subjective view, and we give detailed and clear context of the view. Also, the generalization of the study cannot be guaranteed. The study is specific to TUT. The detailed and clear context of the view presented could guide readers towards desired generalizations and replications of the study.

Ethical considerations: Ethical approval was granted by the Ethics Committee of the institution. Research participants were not exposed to undue physical or psychological harm (Leedy & Omrod, 2005:101) as there were no questions asked that would cause such harms. Their rights to privacy are protected as confidentiality is maintained (Leedy & Omrod, 2005:102) as anonymity protects their identity. Informed consent is sought as the research participants are required by the Ethics Committee of the institution to be briefed on the nature of the study to be conducted and to be given the choice to either participate or not (Leedy & Omrod, 2005:101). Furthermore, the findings of the study are reported in a complete and honest fashion without misrepresentation (Leedy & Omrod, 2005:102).

Results and Discussion

Introduction

The search for answers in this study is begun by obtaining the participants' backgrounds. These are given in the next sub section below:

Participants' backgrounds and their motivation for having interests in using FOSS

The first participant has been working as a System support specialist for the past five years. He provides support to staff members in the use of PC-based systems including connections to the Web using Internet explorer, web-based applications like MIS, ITS, and other Microsoft-based applications. When asked about his motivation for having interests in using FOSS, he mentioned that he longs to belong to user groups on major FOSS products such that he can easily get tips and contribute his experience to others.

The second participant has been working as a System support Manager for the past seven years. He manages the provision of support to staff members in the use of PC-based systems including connections to the Web using Internet explorer, web-based applications like MIS, ITS, and other Microsoft-bases applications. His motivation for having interests in using FOSS is due to the need to take advantage of the free or cheaper cost of FOSS products. He indicated that most of their requests to management for the purchase of materials to assist in their jobs were turned down due to insufficient funding. He therefore beliefs that the use of FOSS could free some funding constraints to enable management have more funds for relevant materials.

The third participant has been working as a lecturer teaching IT for the past 12 years. He lectures programming like C++, web-based application development using PHP, Java, and Microsoft-based development programs like ASP. His motivation for having interests in using FOSS is that he has been able to appreciate the benefits of using FOSS such as being able to freely give the software to students, availability of teaching materials on the web without stringent copyright and reducing funding for the computer labs.

The fourth participant has been working as an acting Head of Department for about two years, but has been lecturing IT in TUT for the past 14 years. He manages the provision of software for teaching various IT practical. His motivation for having interests in using FOSS stems from the national government's challenge to the country to adopt and use FOSS. He explained that since the various government departments are now using FOSS and most of students typically find jobs and in-service training in the government departments, it is our duty to adequately prepare these students for the use of FOSS before they start working.

The fifth participant has been working as a parttime lecturer in IT for the past 6 years and has also been a post-graduate student at TUT for the past 8 years. He lectures programming subjects with software like C++, PHP, Java, as well as with Microsoft-based ASP.NET. He has also been using other Microsoft-based applications for his postgraduate studies. His motivation for having interests in using FOSS is that during his post-graduate studies and part-time lecturing, he has used some FOSS as well as proprietary software and realize the importance of the availability of free downloadable software and learning materials for teaching and learning. Also, he mentioned that useful with FOSS is the communal support on the web. Sometimes when he is stuck on some programming techniques, he usually just posts it on the web, and within days, he gets tips from other users and some also send him code snippets for solving such tasks.

The next section discusses the extent to which organizational learning is being employed in the management of technological changes at TUT. The aim is to establish ways that organizations, and TUT specifically, can learn from previous problems and continuously develop new ways of effectively carrying out daily tasks, especially when the introduction of new IT systems including FOSS is becoming the norm in organizations.

The extent to which organizational learning is employed in managing technological changes at TUT.

Given the high rate of change in the use of IT and new versions of IT systems, employees in organizations need to continually learn in order to effectively use the latest technologies in accomplishing their duties. It is beneficial for the whole organization to continually learn. This rate of corporate organizational learning will, however, be increased if individual learning and gained knowledge is effectively shared by and with the whole organization.

In the light of the above, it is important to ask: Does organizational learning culture in academic institutions foster knowledge sharing? From experience in academic institutions, the answer is possibly "no". This is in line with what is reported in current literature. Maponya (2005) explains that in higher institutions there is a competitive, 'publish or perish' culture in which academic staff members are promoted based on publications, thereby encouraging academic staff to conceal ideas in order to be perceived as more knowledgeable than colleagues. Confirming the above situation are the statements by the participants below indicating the apparent absence of participative, learning culture and culture of knowledge-sharing at TUT. Statements by participants are labelled P1, P2, P3, P4 and P5 for the first, second, third, fourth and fifth participants respectively.

"Participative culture seems missing. Most staff members seem not interested in participating in initiatives that do not come directly from their bosses. For example, a research group is creating the new ICT website project as a change initiative to improve our information dissemination. Respective departments are expected to write details about their departments. For almost a year now, some departments are yet to send in their information despite various reminders". P2

"Culture of knowledge sharing is missing. The organizational culture at TUT does not foster knowledge sharing. There are lesser forums with friendly atmosphere to facilitate knowledge sharing". P3

"More practically, unlike in other universities, the ICT faculty has no practical forum like web pages on the ICT website showing what professors, lecturers and postgraduate students have published. Even, the Library webpage on the institution's website has no database of postgraduate thesis and dissertations. So if a student or a lecturer had a 'revelation' or 'realization' on implementing FOSS and is so 'fired' about it and wrote these in a thesis or dissertation or published it in an article, other students and lecturers in the faculty have no forum to learn and share this knowledge, let alone think of emulating or taking the idea further". P3

"The learning culture is missing. Even when free courses are arranged, few staff members apply. When postgraduate presentation forums were arranged, few students and staff members attend" P4

Even if the ideal situation of knowledge sharing towards enhancing organizational learning is assumed, then a critical element for realizing such an ideal is clear articulation of the change initiative. This seems to be lacking according to the participants in the statements below.

"No. It's like the leaders themselves are not too clear about the change initiative. Sort of "let's 'try and see' attitude". P1

"No. We had to wallow in to the new systems and make it work". P3

"No. But various articulations by the National government and other interested bodies were used by us as a guide". P4

A change initiative that is commonly implemented in other organizations could enable easy learning by stakeholders. Some of the change initiatives experienced by the participants are commonly implemented in other organizations as exemplified by the statement below.

> "The impact of the change is profound, especially looking at it from the users' point of view. Some of our clients report that such change seems unanimous at least in academic institutions". "When I go to conferences, I see other conference participants also accessing their mail using Microsoft Outlook mail". P1

Similarly, very important for learning is the presence of a systematic process change process commencing with solid ("good") research that is clear in its objectives. In response to this, some participants gave the responses below.

> "Not a formal research. But then, we cannot blame the leaders too much. It's like driving on a road you've never passed before. You have the feeling that the road will lead you to where you are going, but you are not confident that an alternative road could equally take you there, or maybe even take you there faster." P2
>
> "Various related researches have been done by different organizations including national government and non-governmental organizations." P4

Another critical element for learning is a good communication strategy in the organization to enable information about change projects, other relevant information as well as knowledge to be passed around easily and effectively. In the light of this, a question to the participants checks whether there was a carefully crafted communication strategy ("policy") for regularly informing the staff on specific implementation milestones or progress or problems regarding the change experienced by participants. The general consensus is that there was none, but the explanations by the participant were given in the statements below.

> "No communication strategy. However, attempts were often made to inform employees on what needs to be done e.g. communicating the steps for archiving data."; P1
>
> "No communication strategy. After the initial communication, no further communication is received." P2
>
> "No specific communication strategy. However, any necessary documentation available is communicated to the employees concerned as the need arises."; P3
>
> "No careful crafted communication strategy, but communication to the staff members involved was very regular." P4
>
> "No communication strategy. But staff members that have problems would log a call to the help desk or service desk who will communicate it to the appropriate quarters." P5

On the question on whether the communication was done effectively without ambiguity (lack of specificity and clarity) so as to minimize room for variable interpretation, some participant said "yes" and others said "no" but recognition of the literacy level of the target group is reported as necessary for reducing perception of ambiguity by stakeholders. This is confirmed by a participant in the statement below.

> "Yes. There was no ambiguity but to the less computer literate employees, it seems the communication was not effective due to lack of comprehension of some computer jargons and concepts e.g. many people were asking 'what is Active Directory (AD)?'" P2
>
> "Yes. The communication seems to be without ambiguity" P4
>
> "Yes. The specific nature of the change leaves no room for any ambiguity" P5

Closely related to the above is the question on whether the change initiative implementation steps are presented in terminology appropriate to the level and language of the target population. The responses here vary but the emphasis again is placed on education and literacy to enable understanding of presentations in appropriate terminologies.

> "No. The only way that the change initiative implementation steps can be presented in terminology appropriate to the level and language of the target population is if the target population is given adequate training to understand the 'language' of the implementation steps. Most users in the target population simply neglect or delay acting on the implementation steps mailed to them, until a day when a support staff comes to their aid." P1
>
> "No. Many employees are not computer literate and even those that are computer literate may not really understand 'platform specific jargons' and concepts such as 'Active Directory (AD)' " P2
>
> "Yes. Given that the target population for this change initiative are all lecturing programming subjects, the terminology for the implementation steps seem appropriate to them" P3

Also, on consulting records of decisions at TUT, it was clear that the lack of communication between the management of TUT and the representative Unions is decried (TUT commission, 2009:50). Therefore, as communication is enhanced, the literacy and education of the recipients of the communication should also be enhanced, while at the same time, the specificity and clarity in communication deserves attention. In line with van Tonder (2004:187), specificity and clarity in communication is necessary to avoid differential perception of organizational change and place fewer demands on employee to make sense of the change initiative.

If the change implementation was introduced slowly, step by step by the change leaders or top management and the organization moved through small, gradual and logical change steps, there is possibility of enhancing learning as people take time to get used to the new change. Interestingly, the participants are all in agreement that the changes should be done quickly.

> "No. One would have expected that small, gradual and logical change steps would further trigger the desire for full implementation of the change initiative." P2
>
> "No. There is really a need for an urgent change into using the open-source systems if one considers the savings and benefits possible." P3
>
> "No. The faster we make the changes, the quicker the benefits are derived." P4
>
> "No. Major parts of the whole world have already implemented such change and we are already behind. So we need faster change steps." P5

On whether there were interventions designed to bring further clarity regarding the nature of change at the cognitive change level, and to clarify management's approach to dealing with the change, all the participants replied negatively except one.

> "Yes. Various documents of the national drive to use FOSS were shared with staff members"; P3

On the question of whether there were any formal education and training to facilitate adaptation to the change, the responses from the first and second participants indicate that there were none in the more technical change initiatives experienced while the participants acknowledged that this could have helped a lot. Formal education and training were provided to facilitate adaptation to the change into the use of FOSS. Staff members and students were formally trained in the use of the different open-source software in the lab. Also, in the change to the latest office systems, the staff and students were formally trained in the useful but less-used features such as automatic table of content generation.

> "Yes. Formal education and training were incorporated to facilitate adaptation to the change"; P3
>
> "Yes. The staff and students were formally trained in the use of the different open-source software in the lab." P4
>
> "Yes. The staff and students were formally trained in using the useful but less-used features such as automatic table of content generation". P5

With regard to the possible incorporation of any informal forms of education and training to facilitate adaptation to the change, the responses from the first and second participants indicate that there were none in the more technical change initiatives experienced. However, a participant explained that staff members are free to consult one another. Again, there was informal education and training incorporated to facilitate adaptation to the change into the use of FOSS. A participant explained that informal newsgroups have been established to share ideas and that students are also advised to subscribe to external online support groups. Similarly, a participant explained that senior student assistants were used to informally train new students. Lastly, in the change to latest office systems, a participant explained that colleagues usually assist one another.

> "Yes. Informal newsgroups have been established to share ideas. Students are also advised to subscribe to external online support groups"; P3
>
> "Yes. Senior student assistants were used to informally train new students"; P4

It can then be inferred that if the low-scale education and training on FOSS at the department level is extended to the faculty level and possibly to the rest of the institution, the likelihood of enhancing the change to the adoption and use of FOSS at the institution would be high. To facilitate this, we should take note of the statement by Harris (2002) that highlights how much realistic learning involves developing a more flexible IT literate workforce equipped with a skills base that is relevant and useful to the current needs of the industry. Current trends indicate that the use of FOSS could become a skills base that is relevant to the current needs of the industry especially given the freedoms afforded by FOSS.

Furthermore, Harris (2002) describes situations where learning in organizations involves generally broadening people's experiences even in areas that may not directly lead to promotions. In such situation, a supportive culture is needed to aid the learning by paying people for knowing more, moving sideways within their grades and learning new skills rather than simply aiming for promotions, which sometimes reflect individual manager's personal preferences instead of people's ability. But even in the absence of rewards, certain incentives could motivate learning on new change initiatives as indicated by some participants.

> "Yes. The major benefits of open-source software such as free or low cost, no license fees, freedom to modify and extend code etc., as well as the national support for the use of FOSS could serve as catalyst to motivate the change to the use of FOSS" P3
>
> "Yes. The availability of open study materials, possibility of making copies for students' home use, and the availability of online support groups motivate the change to the use of FOSS" P4

To create and maintain credibility by seeking to improve expertise and quality (Markus and Benjamin, 1996), the IT lecturing staff members and the IT Services department are practitioners who can be encouraged, supported and adequately trained to become trainers. This in part means investing in the flow of know-how that will sustain the organization (Smith, 2001a).

Therefore, the IT lecturing staff members and the IT Services department should be at the forefront of the provision of these education and training services. This would be in line with the caution by De Geus (1998) in Boyle (2002) that the only relevant learning done in an organization is the learning done by those people having the power to act. This however is not currently the case at TUT as the responses from a participant indicates as given below.

> "ICT Support Services support Proprietary Software use. They prefer and support only Microsoft Windows-based systems, saying that is where they have expertise on. Consequently, ICT Support Services still lack expertise on open-source software and instead of taking initiatives to develop such expertise, they indirectly refuse to allow us to use some open-source-based equipment or machines e.g. Linux-based systems." P2
>
> "Why don't they train their technicians to be able to support other reasonable systems? The money for the training will probably be less than the money that could be saved using open-source-based systems given the various benefits of open-source systems". P2

IT experts, in the lecturing field and IT Services department staff members are example of such people with the power to act. The institution should invest heavily in training such staff members. Thus, their knowledge could easily be diffused to the whole organization. It is in this regard that Van Tonder (2004:72) emphasizes that:

"ongoing learning, not only at an individual level but certainly also at an organizational level, constitutes the best and probably the only preparation for an uncertain future".

But for the whole organization to learn and thereby facilitate the continuous learning of all members of the organization (Smith, 2001a), this would involve encouraging individuals who are willing to learn (Smith, 2001b), employees who step forward to try new practices (Hirschhorn, 2002) and the people who have the power to act (Boyle, 2002). Dehinbo (2010) recommends the use of rewards in motivating staff members. Team learning should also be encouraged. These efforts should continue until the changes are anchored in the organization's corporate culture (Kotter, 1995).

Conclusion

This study seeks reflection on organisational learning towards attaining development and sustainability. From all above, it is thus clear that attaining development and sustainability involves many processes and steps among which are: learning from others, doing the little one can do step by step, communicating and encouraging teamwork, knowledge sharing and knowledge management, change management, enhancing organizational culture and continuous organizations learning etc. This reinforces the synergy between actions, reflection and continuous learning as strategy for effective learning in organizations towards ensuring effectiveness.

Jashapara (2011) explains that organisational learning can be broken down into two aspects which is the cognitive and the behavioral aspects. Behavioral is considered as single loop learning. This aspect promotes "doing things better" perspective. Jashapara (2011) also explains the cognitive aspect regarded as double loop learning. This aspect promotes "doing things differently" perspective. Developing countries has to embrace this cognitive part regarded as double loop learning, promoting "doing things differently" perspective due to their level of funding as compared to developed countries. An example is encouraging and utilizing in-house developed systems to save cost and enhance expertise in the society. Another example involves encouraging and utilizing FOSS to save cost and enhance expertise especially in academic institutions due to the ability of inspect codes and learning from them as well as enhancing the codes thereby also further contributing to the society. The fact that proprietary software such as Microsoft products dominates software use in developed countries does not mean developing countries should just follow such and neglect the prospects of utilizing FOSS to save cost and enhance expertise thereby freeing limited resources for other uses and maximizing human capital development.

Given the low financial situations, proactive actions and decisions need to be taken for developing countries not to be left out of sustainable development. Secondly, developing countries need to adopt both single double loop learning that promotes "doing things better" perspective as well as double loop learning that promotes "doing things differently" perspective. This will include seriously striving to benefit from the FOSS initiatives saving costs and enabling learning through the openness of software programming codes, thus encouraging in-house development of information systems. Central to this is that individuals, groups, organizations, and society continually learn and adapt new learning to ensure sustainability.

The study therefore concludes that the benefits of the organization could be enabled with properly managed change initiative enhanced by a conducive organizational learning and culture at the University in which the management, staff members and students have various roles to play. The Tshwane University of Technology and universities in developing countries need to take proactive actions and decisions for them not to be left out of sustainable development. This will include seriously striving to benefit from the open-source initiatives saving costs and enabling learning through the openness of software programming codes, thus encouraging in-house development of information systems. And critical to this is continuous "learning and doing" leading to effect "small wins" towards enabling sustainable development.

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Johnson Dehinbo is currently a senior lecturer in the Department of Computer Science, Faculty of Information and Communications Technology, Tshwane University of Technology, Soshanguve, Pretoria, South Africa. Mr Dehinbo joined the university (previously named Technikon Northern Gauteng) as a lecturer in 1997. Mr Dehinbo has previously worked as a Computer Programmer/Analyst at the International Institute of Tropical Agriculture, Ibadan, Nigeria from 1991 to 1996, and as a Graduate Assistant at the Ogun State University, Ago-Iwoye, Nigeria from 1990 to 1991.

He obtained B.Sc. degree in Computer Science & Statistics from Ogun State University, Ago-Iwoye, Nigeria in 1989, and B.Sc. Honours degree in Information Systems from University of South Africa (UNISA) in 2000. He then obtained two Masters' degree namely, an M.Sc. degree in Information Systems from UNISA in 2006 and also an M.Phil. Informatics degree from the University of Pretoria (UP) in 2011. He is currently busy with his doctoral studies.

His area of research interests includes Information systems and web-based application development, software engineering, e-learning, e-commerce and their impact on educational systems and on the society. He is currently lecturing the following courses or subjects such as: Web Applications development with ASP.NET using C# and VB; Web Applications development using PHP, Java servlet and Java Server Pages (JSP); Developing Client-Server Applications using Borland C++ Builder; Graphical User Interface Design, Development and Implementation; Research Methodology & Research Project 4; Client applications using HTML5, Cascading Style Sheets (CSS) and Javascript as well mathematical subjects like Discrete structures.

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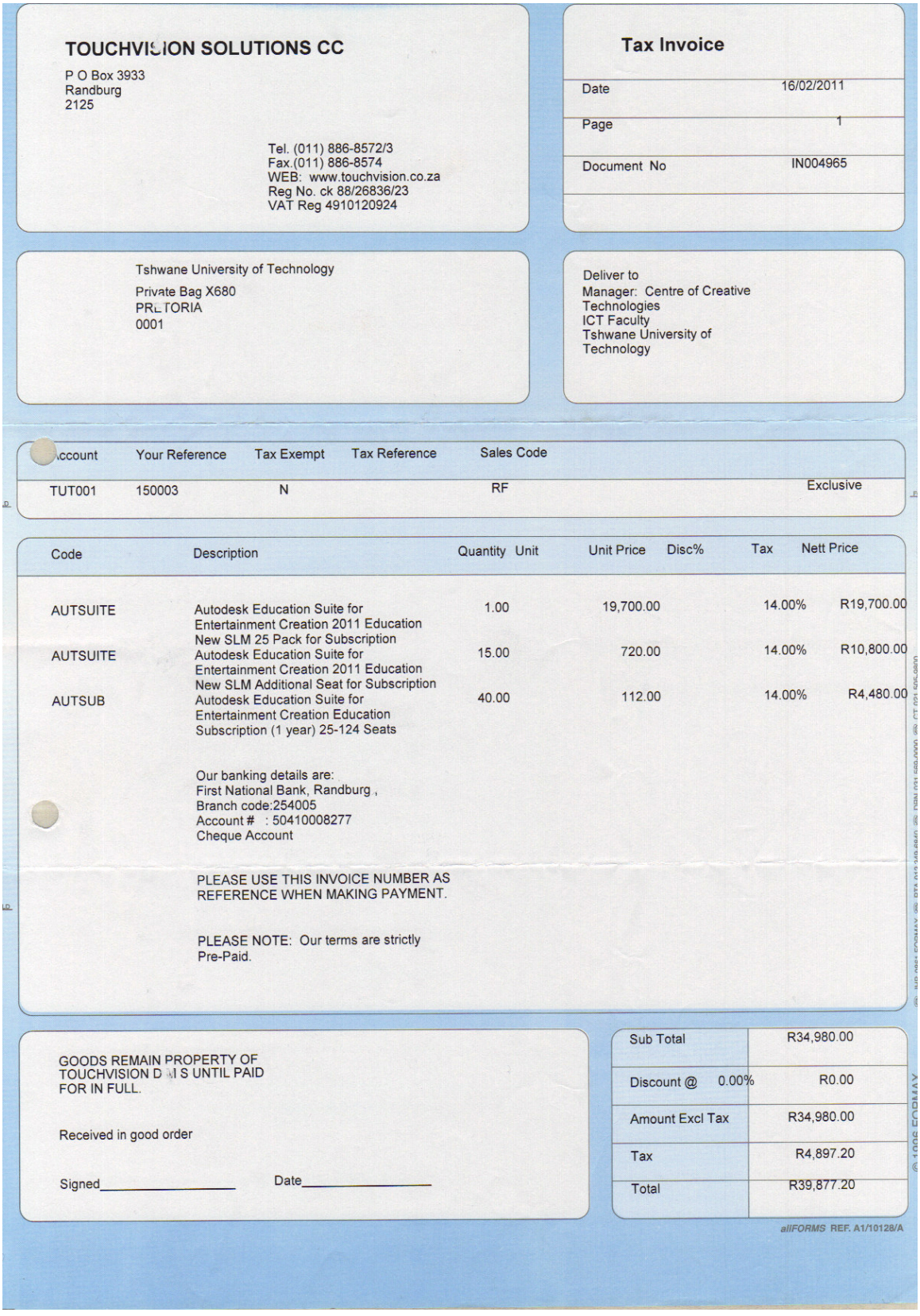
Appendix 1: Some quotations of proprietary software showing expensive costs (at the rate of about $=R18) that could be replaced by Free and Open-Source Software (FOSS) alternatives



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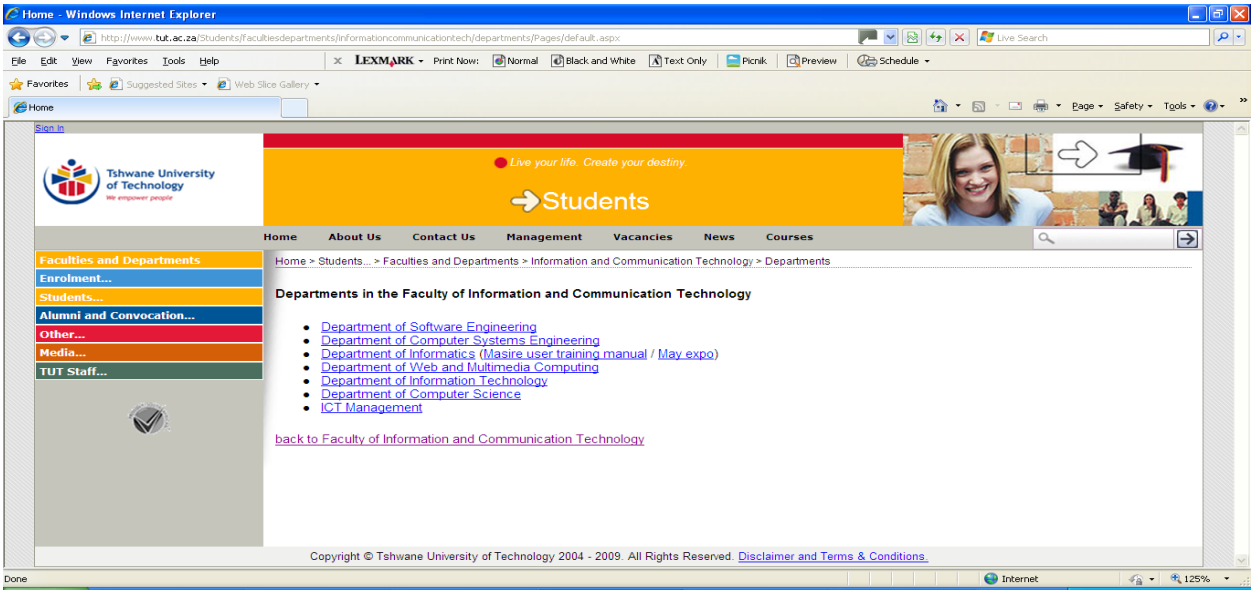
Appendix 2: Part of the New ICT Faculty webpage to enhance organizational learning with relevant information dissemination on the institution's website (Adapted from: Dehinbo & Ojo, 2011).



NB: Figure's webpages developed using PHP Free and Open-Source Software (FOSS).