Increasing Role of Computer-Based Information Systems in the Management of Higher Education Institutions

By
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Abstract

Trends across the world show a growing demand for information systems for educational institutions. Many of them have been running manual systems, pushing paperwork, for ages. They have had cumbersome working procedures and this has led to low productivity occasioned by highly inept manual systems. Many of the higher educational instructions (HEIs) have implemented one form of computer-based information system (CIS) or other to manage their academic and management needs.

But why are our HEIs turning to computerised information systems? There is a general demand on institutional managers to deliver high quality service; there is increasing need for management productivity; efficiency brought about by the systems; there is the increased recognition of information as an important corporate resource that is key to good decision making in a competitive and ever dynamic environment; and technology- hardware, software, telecommunications and related technologies- is now fairly priced and therefore more affordable to many institutions.

However, as the HEIs quest for information systems implementation, they face a number of challenges to overcome which include lack of awareness and mindset among staff; lack of top level management commitment thus bringing forth bureaucracies and red-tape in system implementation; lack of appreciation of ICT as a tool and not panacea for organizational transformation; poor strategy in making ICT responsive to the organizational vision and mission; lack of a systematic method of system implementation; lack of project ownership- all employees and users must be involved in system implementation; inhibiting initial costs of hardware and software and funding for sustainability and continuity in maintenance, replacement of equipment and emolument of ICT staff who maintain the systems, among others.

This paper identifies strategic management of organizations, strategic ICT planning, and integration of ICT in the management of HEIs as key ways of overcoming some of the challenges that HEIs face in their effort to implement systems in the institutions.

1. Introduction

Higher educational institutions (HEIs) across the world are facing new challenges ranging from management, staffing, finances, and now increasingly technology. Chacha, (2004) while discussing emerging issues in higher education in Africa indicates that trends show that the rise of new stakeholders, internal factors, globalisation and the rapid pace at which new knowledge is created and utilized provide major challenges to higher education institutions across the world and Africa in particular. He further identifies the key challenges of higher educational institutions as being, the drop in research and publication by faculty due to heavy teaching responsibility; poor leadership and management practices; poor remuneration of staff; diminishing financing; lack of quality standards to measure performance of the HEIs with their counterparts elsewhere; lack of jobs for graduates from the HEIs; gender inequality in favour of men; lack of further training opportunities; and lack of ICT capacity and utilisation in the running of the institutions.

As noted by Chacha, ICT utilisation in HEIs has been key concern with many of the institutions having implemented various systems to help them manage information resources for better management of the institutions. He however notes that with the swiftness of ICT developments, their increasing spread and availability, there is need to tap the ICT potential to enhance data collection and analysis, and to strengthen management information systems in HEIs in Kenya (and by extension Africa).

This paper analyses the emerging trend of implementation of information systems in HEIs, appreciating the role ICTs playing in HEIs management, strategies for implementation of the systems, challenges HEIs face in the implementation of the systems, the way forward to successful implementation and management of the systems.

2. Why ICTs in HEIs management?

Since the 1980s the business environment has changed dramatically. Information and communications technology has revolutionised business organisations bringing forth new ways of doing business that are innovative, efficient and more effective. Organisations today confront new markets, new competition and increasing customer expectations hence the need to efficiently manage the information about competitors, their products, market trends, customer demands and technological developments (Laudon, 2000).

Through the emergence of fast and powerful computers, networks and infrastructure, delivery of immediate and relevant information enables policy-makers in an organisation to make quick and accurate decisions (Newmann, 1994). Laudon (2003) while commenting on the role of information systems in organisations indicates that ICTs provide tools for data collection, analysis, storage and dissemination to support decision making in organisation.

University environments are equally changing in the technology front. Arising from his studies of Universities in Philippines (Asia), Acosta (2004) notes that quick and accurate decisions of HEIs managers require readily available and relevant information thus making ICT a vital tool in today's business world providing tools for information collection, storage, and management to facilitate communication and decision making processes. He points out that HEIs too, must cope with the emerging trends of competing on the ICT platform, thus they need to continually assess their current status, and that of their competitors to formulate and manage their own strategies if only to stay abreast with the latest challenges of the information age.

ICTs play and will continue playing an important role in HEIs management. Katz (2001) quotes EDUCAUSE president, Brian Hawkins, who in 1999, in his paper *Technology, Education, and the Very Foggy Crystal Ball* asserted three propositions about the impact of ICT on higher education, that is,

- that the new technology affords exciting opportunities for more effective teaching;
- that the new technology offers scalability that is greatly needed;
- that the new technology will transform higher education beyond what we know it to be today

Technology has provided exciting opportunities for teaching including the recent e-learning initiatives in addition to transforming HEIs operations.

ICTs in higher educational institutions have come about from developments in corporate businesses where ICTs have been incorporated into organisational functions to improve their performance. As Tusubira & Mulira (2005), having extensively studied operations of Makerere University (Uganda), argue that at the organisational level, the integration of ICT in organisational functions has been brought about by three main factors: **increased efficiency**, **cost effectiveness**, and **competitiveness**.

Increased efficiency

The efficiency brought about in universities can be realised in areas of easy access to student and staff records, data on assets of the institutions as well as efficiency in front office operations and management of key processes like admissions and examinations (Tusubira & Mulira, 2005).

Katz (2001) asserts that the information and communication technology (ICT) infrastructure is likely to influence and even shape the nature of higher education institutions and the practises of faculty and administrators. Faculty, parents, staff and students are demanding more information from the HEIs inform of grades, loan payment and tracking, class registration, and contract administration thus expecting information systems of HEIs to operate automatically, integrated and accessible to users 24 hours a day, 7 days a week, 365 days a year.

Katz also points out that information resources and tools can be invoked to help guide increasingly complex and consequential institutional decisions through tools provided by the systems. HEIs are investing in systems that make it relatively easy and cost effective to acquire, store and manage volumes of information about institution's stakeholders.

Strathmore University, Kenya, recently implemented an academic management system together with a library management system to facilitate management of academic processes. According to Martin Wanjohi, the ICT Director, the system has been designed to provide quick and easy access to management information. When fully operational, the academic management system will increase the productivity of staff involved in all academic departments. It will also improve the overall management of the university.

The ICT director summarises the rationale for the new systems at the University as the need for: increased administrative efficiency and academic processes; improved information management – better record keeping and availability of information; to automate manual processes –for example the library; to improve value delivery – e.g. extending interaction and access to information beyond the class using E-learning, also lecture room automation which would allow lecturers to use audiovisual aids conveniently and also pull any information from anywhere in the world to enhance class presentations; and provision of management information – improved availability of information for management, information on the desktops of managers.

Florida Agricultural and Mechanical University (USA) has an enterprise which integrates the business processes in all departments and functions as a single computer system. All students, faculty and staff are affected by the system. The university's website lists the following as benefits from the system: replaced aged

campus systems with one system for all; automated steps from start to finish; provided greater access to data and better reporting tools; reduced errors in transactions; provided easier and faster response to changes in federal and state regulations; refined policies and procedures; facilitated information sharing across departments; and has provided opportunity for implementation of self service features. The system assists students to apply for admission via the web, view application status, register for classes, make direct payments, monitor degree progress, view grades, view account balances, among others.

Cost effectiveness

Technology- hardware, software, telecommunications and related technologies are now fairly priced and therefore more affordable to many institutions. Wanyembi (2002), in his doctoral thesis entitled *improving ICT management in public universities in Kenya* points out that the strong interest in the adoption of ICT emerged in sub-Saharan Africa for three reasons: one, the revolution in ICT that has resulted in computer systems- hardware and software- becoming cheaper, and therefore, more widely affordable. Two, the substantial value added utility of ICT in the provision of, and access to, information services for improved planning and organisational management becoming more widely recognised. Three, international development agencies and donor countries have exerted significant pressure upon many governments, institutions of higher learning and other recipients of their aid to adapt extensive use of ICT to improve their work performance and organisational management.

Golola (2005) while writing on the role of the ICT unit at Inter-University Council of East Africa (IUCEA), points out that the swiftness of ICT developments, their increasing spread and availability, the nature of their content and their reducing prices, are major implications for teaching and learning, research, libraries and information services, and university management. The ICT Unit of IUCEA is currently involved in helping member universities from East Africa to implement various systems. In an attempt to enhance the quality of education in the region, the ICT unit has embarked on a number of initiatives, on behalf of it member universities, to tap the potential of ICT to enhance data collection and analysis, and to strengthen management systems in educational institutions; to improve access to education by remote and disadvantaged communities; to support initial and continuing professional development of stakeholders; and to provide opportunities to communicate across classrooms and cultures, Golola points out.

Competitiveness

Alter (2001) notes that organisations invest in information systems because they believe the systems will make a difference in the way the organisation conducts its business- processes and functions, basically giving the enterprise competitive advantage. Competition among various businesses is the main force behind strategic moves that each enterprise takes. Academic institutions, are not spared from competition and therefore need to make strategic moves, especially taking advantage of information technology.

Munguti (2001) points out that the changes in the business environment have made a demand on enterprises to be competitive in their supply chain; shorten throughput time; reduce stock to a minimum; improve product quality; provide more reliable delivery date and good service to customers; and to efficiently co-ordinate global demand, supply, and production in an effort to be competitive. While this may not necessarily apply to HEIs, the institutions have the challenge of ensuring that their processes are faster, less cumbersome and that the academic processes are designed in such a way to facilitate faster data collection and dissemination for management decision making.

For Wanjohi (2006) information systems bring about faster and better decision making given the unlimited access to high quality and well maintained information resources. He adds that competitiveness can also be seen in the return on investment (ROI). ROI though hard to quantify for many institutions could be seen from the cost savings in paperwork, loss of important documents always on transit in manual process, and the increased staff morale. Systems get the institution to a level of elegance and pride, which can be seen, for example, through online access to records such as examination grades for students, access to learning material through an electronic learning environment.

According to Acosta (2004), institutions of higher learning, like all other businesses, need to continually assess their current status, and that of their competitors in order to come up with a plan, formulate and manage their own strategies if only to stay abreast with the latest challenges and intense competition posted unto them especially in the information age.

For Glazer (1993), successful firms have invested in ICT like everyone else but have differentiated themselves by viewing the management of information produced by these systems as being of paramount importance. As these organizations identify the relationship between corporate and ICT strategies, they use information to integrate and manage links between the two- the corporate and ICT. Such organizations succeed because of their ability to differentiate themselves from their competitors, especially on the ICT platform. Supporting this viewpoint, Parker *et al.* (1988) maintain that justification for an

ICT application links to one of two conditions: either it improves the performance of the current organization or it improves the outlook for new business opportunities and strategies of the enterprise.

Hammer (1990) points out that the best rationale for acquiring ICT is strategic alignment of the business and the resultant benefits. Alter (2001) adds that ICT is worthless unless it is used in business processes.

Wanyembi (2002) notes that colleges and universities in Kenya, like other business organisations, have felt the pressure to invest in computer-based information systems to manage their business processes and more so manage the vast amounts of data they handle. Accordingly, information and communications technology (ICT) resources in Kenya continue to increase in numbers, value and sophistication as more and more institutions invest in new technology.

HEIs are also turning to computer-based systems as tools to differentiate themselves in the education market place. Some of the HEIs are increasingly turning to ICT as a differentiating, and marketing tool, to provide quality services. Strathmore University, for example, is a private university with aspirations to offer quality education in an environment of freedom and responsibility. The university aspires to offer an all round education supported by highly developed information technology infrastructure. Thus having a good university information management system is a key indicator of quality service provision (unpublished Strathmore University Statutes, 2004).

3. Taxonomy of HEI Information Systems

Information management in HEIs, like many other institutions, is shaped by the demands of various entities that interact with the institutions both from within and from outside. Tusubira & Mulira (2005) indicate that in a university, the core business processes are learning and research, while finance and human resource management are support functions.

Wanjohi (2006) notes that information management within HEIs focuses on staff, students and resources management. The information products include student details, that is, personal information of students; personnel (staff) information which includes records of employees in various cadres; and academic details of courses on offer in various academic departments, curriculum, examination details, professors taking various courses, relevant books and journals and all relevant academic information necessary to enhance the core business of a university- teaching and research. There is also financial information relating to fees payments, expenditures, and donations.

HEIs that have or are implementing computer-based systems take different strategies, but the most common is a combination of strategies. There are those that internally develop their applications. This assumes the institution has enough capacity- finances and staff to undertake computerization projects. The demerit for this is usually poorly developed and implemented systems. If institutions want to guarantee quality, many go for off-the-shelf packages while others contract specialist developers to implement the systems. In the last few years too, we have seen institutions go for freeware or what are commonly called open source applications. They customize these systems to their needs and where it is done well, there are no regrets. For example, Strathmore University has successfully implemented a freeware library system this year.

Ayoo (2006) in his report on the East African VarsityNet, a project of the Inter-University Council of East Africa (IUCEA), indicates that a number of universities already have information systems handling students' data/ records, some based on open source systems, others on proprietary software bought off-the-shelf, others donated by international partners. He further notes that many of the systems donated by international donors are experiencing support problems especially after donors left the scene perhaps due to lack of local expertise to continue with maintenance of the systems.

4. Challenges to Implementation and Use of CISs

Many of the HEIs face a number of challenges in their quest to implement information systems to manage processes in their institutions: Using the case of Makerere University (Uganda) Tusubira & Mulira (2005) capture the challenges of ICT integration in HEIs thus:

- lack of awareness and mindset among staff leading to unqualified resistance and wanting to be stuck to the old ways of working;
- lack of top level management commitment thus bringing forth bureaucracies and red-tape in system implementation;
- lack of appreciation of ICT as a tool and not panacea for organizational transformation;
- poor strategy in making ICT responsive to the organizational vision and mission, with the thinking that ICT can set direction for an organization;
- lack of a systematic method of system implementation- integration of ICT in HEIs needs to be fully conceptualized and defined before implementation;
- lack of project ownership- all employees and users must be involved in system implementation;

- Inhibiting initial costs of hardware and software and funding for sustainability and continuity in maintenance, replacement of equipment and emolument of ICT staff who maintain the systems.

On his part, Chacha (2005) while commenting on ICT training in higher educational institutions in Africa notes that there has been insufficient training and re-skilling of end users as well as technical staff that support the systems in HEIs. This is coupled with the inability of many institutions to recruit and retain qualified information systems staff.

For some institutions, technological complexity is a challenge with the real challenge being the security concerns for the data and the systems, especially where students have to access the institutional systems. Wanjohi (2006) points out that without proper controls, students can hack into the system and a change on examination grades, fees balance status or other modification can have serious ramifications on the institution.

O'Brien (1999) notes that system implementation is not just a software project, but also an organisational change project. The projects call for co-operation, teamwork, and planning for organisational change and are difficult to do when senior management is too busy to give the project adequate attention. The projects bring about massive organisational changes as they consist of many functional modules that can span the whole organisation and yet share a database.

Laudon (2000) introduces the staff layoff challenge that could lead to morale problems. The integration of departments leads to reduced need for many staff to man operations hence leading to staff layoffs. The institution may lack resources to compensate employees over their job lose and it is a painful experience to have to let go some staff that have worked with the institution for many years. Therefore, managers must anticipate resistance to information systems, especially when business process reengineering has to be undertaken.

5. Successful implementation & management of Information Systems in HEIs

From the challenges identified above, it emerges that information systems and ICTs implementation in HEIs if not well handled can lead to heavy investment without corresponding organisational benefits. As Tusubira & Mulira (2005) would point out, HEIs in Africa should have mechanisms of implementing information systems by optimising scarce resources- funds, skills and technology- to implement and sustain robust infrastructure that supports education and training.

Successful implementation of systems for HEIs should focus on three key areas- **strategic management**, **ICT strategic planning**, and **ICT integration in HEIs.** The author uses Figure 1 below (his own creation) to show the relationship between the three concepts:

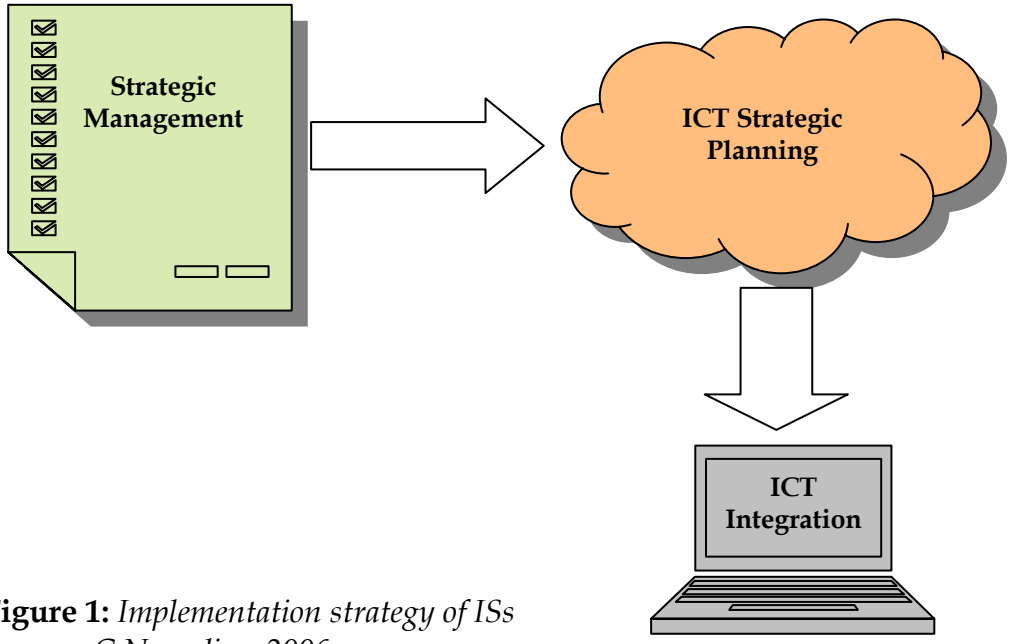

Figure 1: *Implementation strategy of ISs*
Source: *C Nyandiere,2006*

Strategic Management

Laudon (2003) notes that ICT is a strategic investment for any organisation. Strategic management of organisations implies a conscious and coordinated management of organisational activities, processes and resources for greater returns. This requires strategic planning to develop long-term objectives for the entire organisation and business units and to specify strategies for acquisition of resources needed to accomplish objectives. Robson, W. & David, F (2004) point out that strategic planning establishes broad, long-term objectives of the firm and assesses the institution's current position relative to these objectives, considering opportunities and threats presented by the environment. This entails analysis of

strengths, weaknesses, opportunities and threats (SWOT analysis). Strategic planning also outlines the organisational structure and total resources needed to implement the plan, and plans for the implementation process.

With strategic planning at organisational level, top level management commitment to ICT implementation and definition of the appreciation of the role of ICT as a tool rather than panacea for organisational transformation is explained and understood, Tusubira & Mulira (2005). The two argue that with strategic planning, it is possible to create ownership of ICT projects by getting stakeholder groups to think through the shortcomings of the organisation and recommend where ICT can be taken on board as part of a complete package of organisational transformation and thus providing for ICT strategic planning.

ICT Strategic Planning

Newmann (1994) argues that to enhance strategic management, businesses do implement strategic information systems. These systems, which are an outcome of information technology strategic planning, support or shape a business unit's competitive strategy. ICT strategic planning, whose outcome is an ICT policy and master plan, makes ICT responsive to the organisational vision and mission, providing systematic methods of implementation through organisational ICT policies, and creating ownership of projects hence leading to sustainability and long term returns from ICTs (Tusubira & Mulira, 2005). The authors further argue that a well defined and owned ICT policy and master plan is a prerequisite to successful mobilisation of funds, both internally and externally, for system implementation.

ICT Integration

ICT today is one of the most critical tools in higher education. Acosta (2004) points out that ICTs permeate every aspect of the HEIs from the first contact a student has with its website (or admissions office) through the myriad systems that manage and provide access to its information; to the desktop computer — now such a fundamental part of the daily life of nearly every faculty and staff member; the intricate web of fibre optic cables that link these computers together and connect them to the world of digital information; the supercomputers that carry out the massive computations that underpin simulation and modelling; and the wired classrooms, dormitories and student laboratories, which are now such fundamental components of the educational process.

Integration of ICT in an organisation's functions is a complex process which needs to be fully conceptualised and defined before implementation to avoid

dissipation of resources through implementation of unrelated or uncoordinated projects (Tusubira & Mulira, 2005). With their experiences of Makerere University, the authors argue that there is need to quantify the requirements of the institution starting from number of students and staff, the extent of physical infrastructure, ICT resources and systems already in use. This sets the direction, functions and boundaries as well as targets of ICT in the organisation, providing a framework for the development of specific projects aimed at increasing efficiency and cost effectiveness. The authors further argue that, the ICT policy and master plan alluded to above should reassure employees, fearing job loss, by catering for training and retraining and opening up new opportunities for them. They need to recognise that they are part of the information system and therefore major stakeholders.

6. CASE: X University

X University (XU) is a private university in the outskirts of Nairobi with a student population of 1,000 and a work force of about 100

Among the technical problems being experienced at the time of study included:

- Accounting and registration/ records were incompatible and therefore not integrated;
- Registrar's system was old and unadaptable thus academic and financial record keeping and billing was inefficient, and information therein inaccurate;
- There was lack of quality management information and lack of sufficient technical and ICT management capacity;
- Lack of clear policies and management framework for acquisition and replacement of hardware, software purchases and licensing, security of ICT resources, ongoing assessments of new technology;
- Investments in ICT had not been coordinated or guided by clear plans linked with the achievement of College goals.

Findings from the study

Following the study to identify the ICT needs of X University, the findings below emerged:

A total of 17 managers were surveyed. From their responses, they saw ICT as a tool which should be at the service of all basic functions of the University. ICT should help organize and improve on XU's efficiency especially management of admissions, finance, examinations and library resources.

Table 1. Justification of Implementation of Computerized Systems (N=17)

Indicators	n	(%)
Need to better manage information resource	15	(88)
Innovative ways of doing business	3	(18)
Competitors had implemented similar system	1	(6)
Industry/World trends in education	11	(65)
User demands	6	(35)
Critical to University's operations	16	(94)
Overwhelming benefits from the system	6	(35)

Source: X University Survey 2006

Table 2. Benefits of computer-based systems as Perceived by Management (N=17)

Benefit	Mean/ 5
Integration of functions hence improved management	4.64
Improved information management	4.64
Access to information from all departments	4.35
Reduced costs of operation	4.17
Increased worker productivity	4.23
Competitive advantage over other Universities	3.52
Good customer care	4.29
Improved processes management and control	4.52
Overall Mean	**4.30**

Source: X University Survey 2006

Conclusions and recommendations from the survey

From the study, it was concluded thus,

1. ICT was a tool for management and teaching as opposed to a source of competitive advantage for XU. ICT will therefore remain at the operational and support level.

2. User departments were not convinced about the quality, reliability and accuracy of information provided by the current systems. They assessed most of the systems as being poor in the areas of integration, security features, and strategic advantage.

3. There was inadequate exposure for staff and students on what ICT could do for them and by extension the University.

4. ICT activities needed to be addressed through laid down guidelines. It emerged that XU did not have an ICT policy to take care of among other aspects purchases, replacement, back-up, access and security of data and equipment.

It was thus recommended that the university invests in an integrated academic management system to facilitate management of academic processes- student admission and registration, lecturer management, fees payments management and examinations processing.

By the time of writing this paper, XU was in the processes of implementing an academic management system. Managers of XU were keen on ensuring good implementation of the system and were looking forward to a well run university

7. Conclusion

Looking forward to the future, many HEIs will automate and integrate most of their processes- they will be more paperless, more efficient, and competitive. Key stakeholders will be able to obtain all information from the set of systems implemented and accessible from institutions.

Demand on institutions to give quality service is likely to continue escalating for both public and private academic institutions. More and more institutions will see the need to invest in a good information management system, even primary and secondary schools.

There is likely to be a collaborative approach, such as the VarsityNet Project (Ayoo, 2006), to the acquisition and implementation of the systems, especially to help mitigate costs. It is the author's opinion that costs are likely to continue in downward trend. The end result of investment on computer-based information systems in HEIs will be better management of these institutions as any other corporate business.

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