Enhancing Knowledge Management Using ICT in Higher Education: An Empirical Assessment

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ABSTRACT:

The main purpose of this paper is to introduce and empirically assess the validity of a proposed conceptual framework for enhancing knowledge management (KM) using ICT in higher education in order to advance strategic goals and direction. The proposed framework delineates the relationships among the key factors that have been identified as integral in enhancing KM using ICT in higher education to arrive at a systematic and holistic framework for improved KM outcomes and consists of higher education process, KM enabling ICT, KM processes and higher education goals. The key dimensions of the proposed framework were tested using case studies of higher education institutions (HEI) in Uganda to examine relative use and effectiveness of the current existing KM enabling ICT tools and technologies; identify key KM processes; and determine critical success factors. The findings provided a confirmatory test of the usefulness of the proposed framework, highlighted indicators which shows that use of KM enabling ICT does not necessarily mean effectiveness, identified key KM success factors, and provided tested inventories of KM enabling ICT and KM processes.

Keywords: *Knowledge management, ICT, Higher education, Uganda, Empirical study*

1. Introduction

Knowledge comes from information that are processed from available data and includes experience, values, insights, and contextual information. The key difference between information and knowledge is that information is much more easily identified, organized and distributed while knowledge cannot be easily managed because it resides in one's mind (Terra and Angeloni, 2003). According to Miller and Shamsie (1996), knowledge has long been recognized as a valuable resource for organizational growth and sustained competitive advantage, especially for organizations competing in an uncertain environment. With the emergence of the knowledge-based economy where knowledge, competence and related intangibles are the key drivers of competitive advantage in achieving goals, many changes are being witnessed in the delivery of higher education as well as on the demands placed on HEI so that they become storehouses of innovation where wellsprings of talents are nourished and sustained (Seleim et al., 2004). Effective management of knowledge plays an important role in the improvement of organizational competitive advantage through sharing of best practices, achieving better decision making, faster response to key institutional issues, better process handling, and improved people skills; and is essential to long-term organizational effectiveness. To ensure effective management of knowledge and information in higher education, there is need for putting in place a common, standardized framework, procedures, programs or processes for the creation, capturing, acquisition, and use of available knowledge and intellectual capital in the organization to support and advance their goals. This is because an institution that has no common standardized framework, procedures, programs, or processes for KM will be inefficient and unable to gain a competitive edge with other competitors (European Commission, 2003).

Higher education in Uganda has been expanding rapidly to meet increasing demand (Kasozi, 2008). In 1986, Uganda had only one public University with a small population of students but today there

are approximately 28 public and private Universities with a population of around 84000 students. There are also currently some 127 non-university tertiary institutions with a total enrollment of about 45000 students (Kasozi, 2008). This development coupled with the advent of the ICT era and the potential of the Internet to enhance learning and the learning process are resulting into new emerging challenges in information and KM that must be addressed. Tusubira et al. (2007) and Omona et al. (2009) for examples, note that HEI in Uganda face the challenges of how to effectively manage their knowledge resources using ICT to advance the goals of higher education. This is because a lot of data, information and knowledge are being generated through teaching, learning, research and outreach services without any clear framework and standards for management. There is need to access, share and exchange this knowledge through the use of appropriate ICT-based KM framework if efficient and effective KM is to be achieved. The current ways of managing knowledge lack features to integrate the vast amount of knowledge available (Garwood et al. 2004; Omona et al. 2011). There are no common, standardized frameworks, procedures or programs for management of knowledge and information resulting into disintegration and under-utilization of available knowledge (Hawkins, 2000; Steyn, 2004). New approaches and frameworks are required for enhancing KM using ICT in higher education.

The main purpose of this paper is to introduce and empirically assess the validity of a proposed conceptual framework for enhancing KM using ICT in higher education (Omona et al. 2010) in order to advance strategic goals and direction. To achieve this, the paper examines relevant theoretical concepts and gives a brief description of the proposed framework. The empirical evidence gathered using case studies in higher education in Uganda is then analyzed to examine relative use and effectiveness of the current existing KM enabling ICT tools and technologies; identify key KM processes; and determine critical success factors for KM using ICT. Finally, the findings and discussions of the study will be presented followed by the recommendations for areas for further research.

2. Background

2.1. KM

The objectives of KM in organizations are to promote knowledge growth, knowledge communication and knowledge preservation (Steels, 1993) and entails managing knowledge resources in order to facilitate access and reuse of knowledge (O'Leary, 1998a). As a key progress factors in higher education, KM aims at capturing explicit and tacit knowledge in order to facilitate the access, sharing, and reuse of that knowledge as well as create new knowledge and facilitate organizational learning. To succeed, KM must be guided by a strategic vision to fulfill primary organizational objectives such as improving knowledge sharing and cooperative work, disseminating best practices, improving relationships with the external world, and preserving past knowledge for reuse (Omona et al. 2009).

Nonaka et al. (2000) have developed the SECI model which describes four main knowledge conversion modes: from tacit to tacit, tacit to explicit, explicit to explicit and explicit to tacit. *Socialization* presents a process of tacit knowledge sharing between individuals working in the same environment and understanding it. *Externalization* is the process of transforming tacit knowledge into forms (symbols, analogies and metaphors), which can be understood by other group members. As a result, individual's tacit knowledge become a group's asset. Then, through *combination,* knowledge is organized, edited and systemized; it is shared with other groups and finally becomes a "common property" in the organization. When it is put into practice and used by employees, then *internalization* is said to have taken place. Choenni et al. (2005) approaches KM from two perspectives: a cognitive approach and a community approach. According to the model, knowledge is captured, analyzed, developed, created, organized and shared by individuals with the use of ICT. Hansen, et al. (1999) divides approaches to KM into the codification approach and the personalization approach. The codification/people-to-document approach is centered on the computer. Organizations use ICT to capture, store, disseminate, and allow for the re-use of

knowledge. The personalization/people-to-people approach on the other hand is centered on the dialogue between individuals, not the knowledge objects in a database.

2.2. Enhancing KM Using ICT

To ensure the success of KM in higher education, numerous studies have identified ICT as one of the critical factors for enhancing KM (Ruggles, 1998; Skryme, 1999; Kim, 2001). ICT plays a crucial role in managing and organizing knowledge by providing the channels for acquiring, storing, sharing, collaboration, categorizing, dissemination and reuse of knowledge in a faster and more convenient ways both within and between organizations (Mathew, 2009). They have become an essential component for KM as they enable organizations to exploit knowledge from data and information generated and collected during the process of teaching and learning as well as carrying out researches and outreach services. In analyzing knowledge work, for examples, Skyrme (2004) points out that ICT support knowledge processes and workers through providing ready access to organized information, improved communications and interaction with fellow knowledge workers (either individually or in groups), and group decision support systems that facilitate learning and decision making processes. Dougherty (1999) further argues that ICT should be seen as a tool to assist the process of KM in organizations.

The use of the Internet and the World Wide Web has been expanding rapidly in higher education and a number of web-based technologies have been making significant impact on people's social, professional and academic lives because of their capabilities to support knowledge exchanges, sharing and collaboration between various parts of an organization or distinct organizations (Holsapple and Whinston, 1996). Because of this, many HEI have implemented one or a combination of these ICT tools/technologies to enhance KM within and between institutions, and examples of these ICT tools/technologies include Global Search Registries (Google, Yahoo, and Microsoft), Knowledge Repositories/Digital Libraries, Electronic Academic Publishing, Academic Content and Exchanges, Communities of Practice, Social Communities of Interest and Individual Knowledge Network.

2.3: KM And Higher Education

The introduction and use of computers, internet, intranet, and instructional software applications in higher education have brought many changes in the way academic services and learning activities are currently delivered. Furthermore, the huge amount of information and knowledge that exist in forms of digital contents and online resources; the changes in the teaching methods; the nature of curriculum; the size and composition of the student population; and the impact of ICT across every facet of higher education are challenging the historic models of what higher education is and how it is supposed to be effectively delivered. To cope up, HEI are being forced to make new changes in their activities and process management by introducing new approaches and methods in the way KM, teaching and learning processes are performed. According to Petrides and Nodine (2003), the use of KM method in higher education enables the encouragement of the greater intelligence, practical know-how, and effectiveness of HEI management.

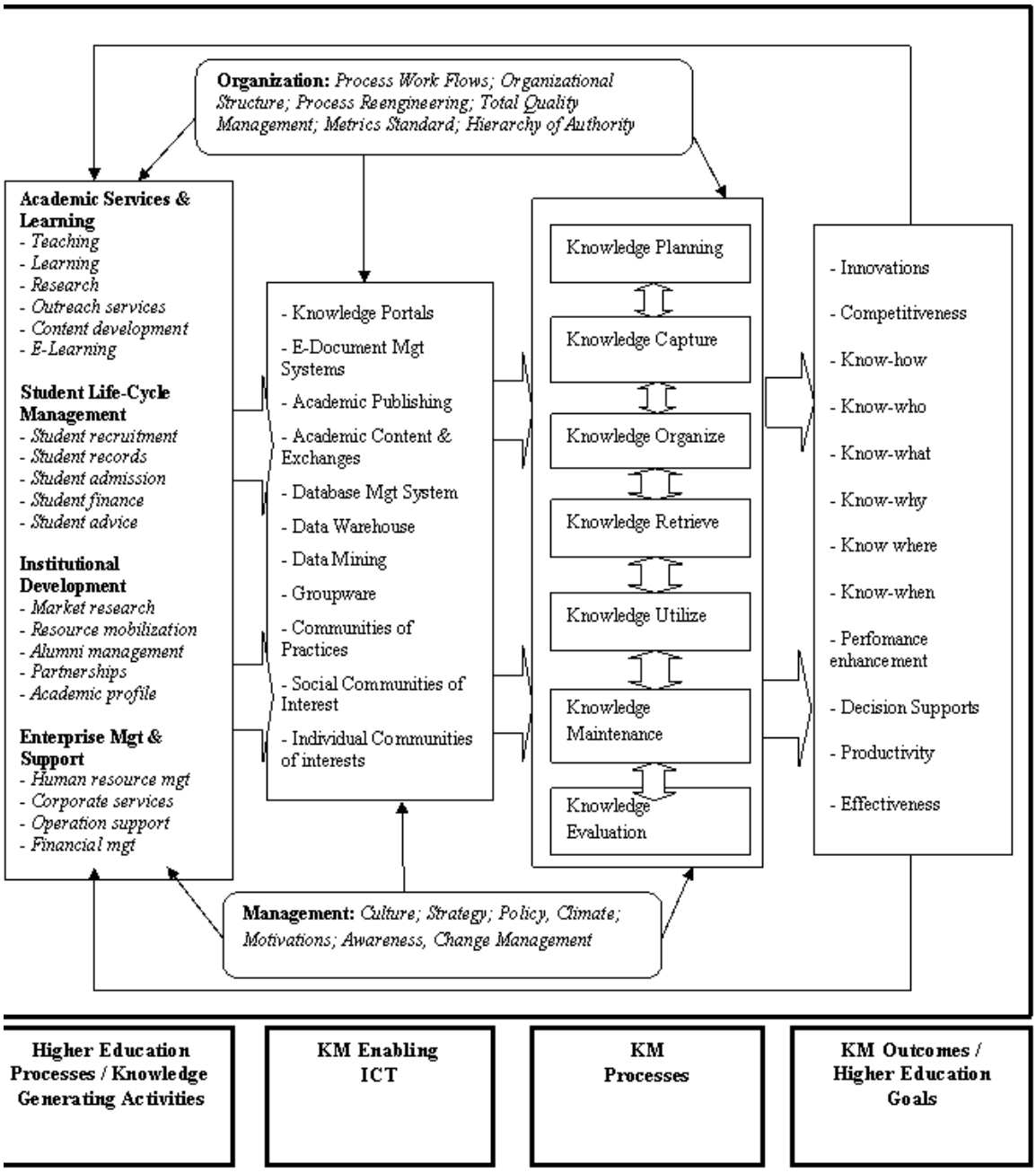
Because HEI are made up of a number of components and levels consisting of faculty, students, administration, academics and researchers, each of these components or levels generate as well as consumes knowledge. To ensure success in higher education, it is important that the knowledge that each level/component requires and contributes to the system to perform its functions are identified and appropriate methodology developed using relevant KM enabling ICT so that available knowledge are exploited to achieve organizational goals and vision. Appropriate KM methodology in higher education should aim at integrating the knowledge produced at all levels and using it towards achieving organizational goals and targets. This will assist in improving the operational quality, capacity development, and effectiveness of the organization leading to enhanced productivity and performance. To succeed in KM initiatives in higher education, therefore, managers and all the other relevant stakeholders need to consciously and explicitly manage the processes

associated with the generation and use of their knowledge assets, and to recognize the value of their intellectual capital to their continuing role in society (Rowley, 2000).

3. Conceptual Framework

he proposed conceptual framework (Omona et al. 2010) is based on the study and review of existing literature on KM approaches and frameworks and extends the earlier conceptual work of Stankosky's (2005) KM pillar to enterprise learning, in combination with the task-technology fit theory (Goodhue and Thompson, 1995) to form the basis for defining the framework development approach. The framework links higher education processes involved in generating knowledge to enabling ICT and KM processes to arrive at a systematic and holistic framework for improved KM outcomes to achieve higher education goals. Stankosky's (2005) KM pillars to enterprise learning consist of leadership, organization, technology and learning in support of enterprise-wide KM initiatives and each of these pillars represent critical success factors for KM implementation. The task/technology fit theory on the other hand holds that the use of information technology is more likely to have a positive impact on individual performance and should be used if the capabilities of the information technology match the tasks that the user must perform (Goodhue and Thompson, 1995). In the proposed framework, organization and leadership are subsumed to form a constituent part of higher education processes, KM enabling ICT, and KM processes which form the three key elements of the framework while the resulting output is represented by the KM outcomes/higher education goals. Figure 2 shows the diagrammatic representation of the proposed conceptual framework.

Figure 1: Framework For Enhancing KM Using ICT In Higher Education (Omona et al., 2010)


Organization: Process Work Flows; Organizational Structure; Process Reengineering; Total Quality Management; Metrics Standard; Hierarchy of Authority
Academic Services & Learning
- Teaching
- Learning
- Research
- Outreach services
- Content development
- E-Learning
Student Life-Cycle Management
- Student recruitment
- Student records
- Student admission
- Student finance
- Student advice
Institutional Development
- Market research
- Resource mobilization
- Alumni management
- Partnerships
- Academic profile
Enterprise Mgt & Support
- Human resource mgt
- Corporate services
- Operation support
- Financial mgt
- Knowledge Portals
- E-Document Mgt Systems
- Academic Publishing
- Academic Content & Exchanges
- Database Mgt System
- Data Warehouse
- Data Mining
- Groupware
- Communities of Practices
- Social Communities of Interest
- Individual Communities of interests
Knowledge Planning
Knowledge Capture
Knowledge Organize
Knowledge Retrieve
Knowledge Utilize
Knowledge Maintenance
Knowledge Evaluation
- Innovations
- Competitiveness
- Know-how
- Know-who
- Know-what
- Know-why
- Know where
- Know-when
- Perfomance enhancement
- Decision Supports
- Productivity
- Effectiveness
Management: Culture; Strategy; Policy, Climate; Motivations; Awareness, Change Management
Higher Education Processes / Knowledge Generating Activities
KM Enabling ICT
KM Processes
KM Outcomes / Higher Education Goals

The proposed framework envisages that to achieve success, higher education processes must be aligned and linked with respect to new KM methods, existing KM enabling ICT tools/technologies and KM processes to be able to achieve the goals of delivering academic services and learning, student life-cycle management, institutional development and enterprise management and support, in more productive ways (Systems Analysis and Programme Development, 2005). Delivering *Academic Services and Learning* includes teaching, learning, research, content development, e-learning and outreach services; *Student Life-cycle Management* includes managing student recruitment, student admission, student records, student finances, and academic advises; *Institutional Development* includes market research and analysis, resource mobilization, alumni management, partnerships, and academic profile; while *Enterprise Management and Support* includes human capital management, corporate services, operation support, and finance. For the purpose of this study and taking into consideration resource and time constraint, this study was limited to academic services and learning as the core activities of higher education.

In this study, the framework is modified such that KM factors (organization and management), KM enabling ICTs, and KM processes become the main inputs (independent variables), while KM outputs/higher education goals and higher education processes are the main outputs (dependent variable). Knowledge management factors refer to the critical issues that influence the effective implementation of KM using ICT in higher education, KM enabling ICT refers to the entire infrastructure and tools to support KM processes within an enterprise; KM processes refer to a systematic approach to the identification, capturing, organization and dissemination of the intellectual assets that are critical to HEI long term performance; higher education processes consist of a set of logically interconnected knowledge generating activities through which actors converts inputs into outputs to achieve higher education goals; and higher education goals refer to knowledge behaviors of individuals or groups of individuals that contribute to improve learning/work related outcomes. Higher education process is considered here as a dependants variable based on the fact

that an enabling KM environment combined with appropriate KM enabling ICT and KM processes contributes to effective higher education processes which are usually reflected in improved academic services and learning to advance higher education goals. The framework further suggests that the availability and use of appropriate KM enabling ICT should have a positive impact on KM processes since they are perceived as an enabling tool in facilitating knowledge sharing, representation and transformation, as well as improving people's ability to store, search and acquire knowledge (Denning, 2002).

4. Methodology

The study which was mainly quantitative was conducted through a survey-based field study with the help of a questionnaire using case studies in higher education in Uganda to review the current situation (organizational, management and technical factors) in KM using ICT, the relative use and effectiveness of the current existing KM enabling ICT, and the relative importance of key KM processes using ICT in higher education. The survey design approach was chosen based on a range of insights from theoretical KM literature as well as the reviews of prior related survey research (Zhou and Fink, 2003; Pillania, 2006). The questionnaire was designed to test the KM factors; use and effectiveness of KM enabling ICT; and the significances of KM processes using the set of items that constituted the indicators identified in the framework, and consisted of close-ended questions using a five-point Likert scale.

4.1. Data Collection

The sampled population for the quantitative study was got from 3 public and 2 private universities in Uganda. A total of 600 questionnaires were distributed randomly to staff and students in the sampled universities with 200 questionnaires being given to Makerere University as the largest public university in Uganda, and the other remaining universities getting 100 questionnaires each. Out of the 600 questionnaires that were distributed, 168 were recovered showing a response rate of 28% of the population that was chosen. Table 1 gives a summary of the profile of the respondents of the effective questionnaires.

Table 1: Profile Of Respondents

Profile characteristics	No. of respondents	Percentage responds	Cumulative percent
University			
Makerere University	56	33.3	33.3
Kyambogo University	36	21.4	54.8
Kampala International University	29	17.3	72.0
Gulu University	25	14.9	86.9
Uganda Christian University	22	13.1	100.0
Position			
Academic staff	48	28.6	28.6
Administrative staff	30	17.9	46.4
Postgraduate student	42	25.0	71.4
Undergraduate student	48	28.6	100.0
Sex			
Female	73	43.5	43.5
Male	95	56.5	100.0
Age			
20-29 years	82	48.8	48.8
30-39 years	63	37.5	86.3
40-49 years	14	8.3	94.6
50-59 years	9	5.4	100.0
Qualification			
PhD	9	5.4	5.4
Master	35	20.8	26.2
Bachelor	79	47.0	73.2
Diploma	30	17.9	91.1

Certificate	15	8.9	100.0

4.2. Reliability Of Data

To ensure reliability of the quantitative data that were collected, a reliability test was conducted to determine the degree of internal consistency. The analysis were performed on the 28 items that measured the current KM environment, on the 16 items that measure KM enabling ICT, and on the 7 items that constituted the key KM processes. Note that in this study, the variables for KM enabling ICT has been modified from 11 as appear in the proposed framework to 16 including video-conferencing, personal digital assistants, learning management systems, help-desk technologies, and electronic publishing. Table 2 shows the values of Cronbach's Alpha for each of the variable that was used in this study. The results suggest that the instrument used as well as the data that was collected in this study was highly reliable as the reliability statistics for each of the KM component category fall well above 0.7 (Hair et al. 1998).

Table 2: Reliability Tests

Knowledge Management Components	No. of Items	Cronbach's Alpha
KM Factors	28	0.8874
KM Enabling ICT	16	0.8664
KM Processes	7	0.8827

4.3. Data Analysis

Data analysis for this study included the use of descriptive statistics and factor analysis using the SPSS statistical software package. Descriptive analysis involves the transformation of raw data into a form that will make them easy to understand and interpret using a precise statistical summary to characterize observations and variables. In this study, the analysis was used to describe the profiles of respondents, determine use and effectiveness of KM enabling ICT, and analyze the significances of key KM processes. Factor analysis on the other hand was used to determine interrelationships among a large number of variables that were tested to determine KM factors and their common underlying characteristics. To carry out factor analysis for this study, the correlations matrix of all KM factors were computed, factors were then extracted, and the factors were then rotated to create a more understandable factor structure for interpretation (George and Mallery, 2001).

5. Findings And Discussion

To determine the use and effectiveness of ICT in enhancing KM in higher education, respondents were asked to rate from 1 to 5 the level of use and effectiveness that the identified KM enabling ICT were having in achieving their academic goals. For "use", the ratings were based on the scale: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Very Often, and 5 = Always; while for effectiveness, the scale were 1 = Of no effect, 2 = Of little effect, 3 = Of some effect, 4 = Effective, and 5 = Highly effective. Table 3 present the mean score for the use and effectiveness of each identified KM enabling ICT in enhancing KM in higher education for the sampled respondents.

Table 3: Use And Effectiveness Of KM Enabling ICT

KM Enabling ICT	Description	Mean Ratings	
		Use	Effectiveness
Social Communities of Interests	Social networks drawn together through use of ICT to share knowledge and build relationships, eg., facebook	4.61	2.37
Knowledge Portal	Searching & accessing web-based knowledge, egs. Yahoo, google	4.35	4.24
Groupware	A platform designed to help people involved in a common task achieve their goals, eg., wikipedia	4.17	3.99

Academic Contents and Exchanges	E-collections of course materials and learning objects	4.13	4.20
Academic Publishing	Paid subscriptions for e-access to academic publishing, egs., EBSCO Host, Blackwells	3.95	3.82
Communities of Practices	Practitioners networking in a particular field using ICT to define a practice and knowledge domain, eg., consortia	3.80	3.99
E-Document Management Systems	Knowledge repositories created by individual institutions, eg., Digital Library	3.31	3.58
Electronic Publishing	Digital publications of e-books and electronic articles, eg., newspapers	3.07	3.46
Help Desk Technology	An integrated ICT-based end-to-end approach to providing users with timely knowledge requests	2.96	3.12
Learning Management Systems	Software application for the administration of training programs and e-learning	2.93	3.20
Database Management Systems	Computer programs that control the creation, access, maintenance, and use of data	2.84	2.10
Individual Communities of Interests	ICT tools for individuals to manage personal knowledge and networks, eg., twitter, blogs	2.42	3.12
Video Conferencing	A set of ICTs that allows interactions between different locations via audio/videos, eg., webcams	2.28	2.90
Personal Digital Assistants	Mobile devices that serves as a personal information manager	2.18	1.91
Data Mining	The process of extracting patterns from data, eg., academic profiling	2.13	1.98
Data Warehouse	A repository that facilitates analysis and reporting of data, eg., budgeting	2.01	1.91

5.1. Use And Effectiveness Of KM Enabling ICT

The results show that the most frequently used KM enabling ICT is the Social Communities of Interest at a rating of 4.61, followed by Knowledge Portal at 4.35, Groupware at 4.17, and Academic Contents and Exchanges at 4.13 respectively. The findings also suggest that the frequency of use does not necessarily translate into effectiveness with Social Communities of Interest showing the highest differences of ratings at 4.61 for use and 2.37 for effectiveness. The main reasons that were given for the low rating for the effectiveness of Social Communities of Interest included the respondents concerns relating to privacy, ensuring online safety, and the anxiety of exposing their academic activities in this environment. To the respondents, and as the name suggest, Social Medias are only use for communication and sharing of information and knowledge on social activities and not academic activities. The heavy use of Social Communities of Interest, however, suggest the needs by HEI to start considering ways through which they can harness the informal learning setting of Social Medias so that they can be integrated into higher education processes since the different activities that take place in the different Social Medias can provide diverse avenues for learning, teaching, research, creative expression, civic engagement, political empowerment, and economic advancement. Selwyn (2007) points out that Facebook has quickly become the social network site of choice for use by college students and an integral part of the “behind-the-scene” higher education experience and this finding further confirms the point. Arrington (2005) findings that the adoption rate of Facebook in universities stand at 85% for students that have a university network within Facebook further substantiate this finding.

With respect to Knowledge Portal, Groupware, Academic Contents and Exchanges, and Academic Publishing, the evidence from the findings on use and effectiveness confirms them as useful and quite effective KM enabling ICT. The findings further suggest that Knowledge Portal and Groupware usually provide the first link for those who want to access information and knowledge from the Internet both in terms of ease of use, access and down loads through reduction of the time required to acquire knowledge or information. Academic Contents and Exchanges, Academic Publishing, and Communities of Practices are also rated highly both in term of use and effectiveness because of their contents relevance and as reference points for teaching, learning and research activities by lecturers. The use and effectiveness that are attached to Knowledge Portals, Groupware,

Academic Contents and Exchanges, Academic Publishing, and Communities of Practices although moderate are in agreement with modern constructivist educational theory which emphasizes critical thinking, problem solving, "authentic" learning experiences, social negotiation of knowledge, and collaboration, by making students learn how to learn, not just what to learn (Newman et al., 1989; Strauss, 1994).

Although the ratings for the use and effectiveness of E-Document Management Systems, Electronic Publishing, Help Desk Technology, Learning Management Systems, Database Management Systems, and Individual Communities of Interest were rated as moderate, further probing indicated that their ratings would be higher if it were not for the challenges that are faced in the application and use of KM enabling ICT in higher education. The challenges highlighted include slow speed of the Internet connections due to narrow bandwidth, erratic power supply, lack of ICT skills, and poor and underdeveloped ICT infrastructure and support. As for video-conferencing, the finding points out that deliberate effort are being put in promoting its use in faculties/departments that are involved in e-learning. Personal digital assistants, data mining and data warehousing have not been used by most respondents and are thus not having any effect in promoting academic services and learning.

5.2. Significances Of KM Processes

To determine key KM processes, respondents were asked to rate the significances of the proposed KM processes based on the scale of 1 = Insignificant, 2 = Little significant, 3 = Moderately significant, 4 = Quite significant, and 5 = Very significant. Table 4 shows the mean score for each of the proposed KM processes.

Table 4: Significances Of KM Processes

KM Processes	Description	Mean Values	Standard Deviation
Knowledge planning	Matching the context that knowledge is used in and setting knowledge normative, strategic and operational goals	4.31	0.717
Knowledge capture	The extraction of useful knowledge from vast and diverse sources of information as well as its acquisition directly from users	4.27	0.793
Knowledge organize	Providing clear and efficient ways of storing, retrieving and processing of acquired knowledge and information	4.35	0.774
Knowledge retrieve	Process by which stored/retained information is selected or reconstructed to satisfy the user's request	4.24	0.872
Knowledge utilize	Transformation of knowledge to products and services	4.27	0.779
Knowledge maintenance	The process of ensuring that knowledge is accessible, correct and updated	4.25	0.832
Knowledge evaluation	Coordinating knowledge strategy with operational practices so as to get a better control over knowledge resources and knowledge reuse	4.18	0.905

As shown in Table 4, each of the proposed KM processes received a rating of over 4.00 with 'knowledge organizing' receiving the highest rating of 4.35 while 'knowledge evaluation' received the lowest rating of 4.18. Thus all the KM processes are rated as quite significant and these are consistent with what is proposed in the conceptual framework. Respondents, however, recommended that "knowledge dissemination" should be included as a sub-component of the KM processes. Knowledge dissemination here refers to the transfer of knowledge within and across organizational settings for use conceptually in learning, enlightenment, or the acquisition of new perspectives or attitudes; instrumentally in the form of modified or new practices; or as legitimate outcomes in the forms of increased awareness and making informed choices among alternatives. The overall results as well as the recommendation that was made here are in line with the system thinking approach to KM from which the proposed framework was derived. This is because systems thinking encourages consideration of the entire KM processes in organizations and facilitates the linkage between KM initiatives and the strategic goals and objectives of the organization so as to maintain a clear vision of what is being done and why it is being done (Gao et al. 2002).

5.3. Key KM Factors

To determine the measure of the sampling adequacy for the key KM factors of the collected data, a Kaiser-Meyer-Olkin (KMO) sampling adequacy test was carried out. The findings indicate that the sampling adequacy is 0.805 (80.5%) implying that factor analysis is appropriate for these data. Table 5 shows the result of the Bartlett's Test of Sphericity which indicates that the test is highly significant as it is less than 0.005 (p = 0.000). This means that factor analysis is relevant for carrying out this study.

Table 5: KMO And Bartlett's Test

Kaiser-Meyer-Olkin of Sampling Adequacy	0.805
Bartlett's Test of Sphericity	1901.042
Significant	0.000

As shown in Table 6, the total cumulative variance explained by the factor analysis is 65.121%. From the rotated component matrix, using Varimax with Kaiser Normalization, the analysis extracted eight factors as having eigen values of greater than one out of the twenty eight sub-variables that were tested, and these have been identified as key factors that are critical for enhancing KM using ICT in higher education in Uganda so as to achieve improvement in performances. The results show that leadership and strategy is the most important KM factor with eigen value of 3.273, followed by ICT infrastructure and support with 2.847, Process reengineering with 2.649, Learning culture with 2.520, Organizational culture with 2.414, Performance measurement at 1.585, Resource allocation with 1.526, and KM framework/system with 1.420 respectively.

Table 6: Key Factors For Enhancing KM Using ICT in Higher Education

KM Factors	**% of Variance Explained**	**Eigenvalues**
1. Leadership and strategy	11.690	3.273
2. ICT infrastructure and support	10.170	2.847
3. Process reengineering	9.460	2.649
4. Learning culture	9.000	2.520
5. Organizational culture	8.621	2.414
6. Performance measurement	5.660	1.585
7. Resources allocation	5.451	1.526
8. KM framework/system	5.070	1.420
Total of variance explained	**65.121**	

Leadership and strategy: Leadership and strategy plays a key role in influencing the success of KM using ICT through the development of appropriate strategies and provision of the foundation on how an organization can deploy its capabilities and resources to achieve KM goals. The sub-variables for this factor were six and included having a well defined strategic direction, appropriate ICT policy, management of change, promoting knowledge sharing culture, human resource development plan, and staff motivation and job security.

ICT infrastructure and support: To succeed in KM, ICT infrastructure and support must be robust and reliable to enable the provision of a multiplicity of KM applications and services to meet the needs of delivering academic services and learning activities in higher education, especially with respect to efficiencies and timeliness. Sub-variables here included availability of hardware, availability of application software, availability of network infrastructure, availability of people with technical support skills, and effective content management systems.

Process reengineering: Process reengineering refers to the use of the power of modern ICT to radically redesign higher education processes in order to achieve dramatic improvements

in organizational performance. It involves re-designing and configuring of the features and functionalities of the ICT infrastructures and support services such as learning processes, management environment and KM processes. Sub-variables here included total quality management, process redesign, and putting in place process work flows.

Learning culture: To become a learning organization is to accept a set of attitudes, values and practices that support the processes of continuous learning and knowledge access and use using appropriate KM enabling ICT within the organization. Training and continuous education on KM and KM enabling ICT use and applications in higher education is supposed to be a key element in the business strategy of an organization dedicated to continuous learning and knowledge access and use like HEI. A true learning culture continuously challenges its own methods and ways of doing things using emerging KM enabling ICT. This ensures continuous improvement and the capacity to change. Sub-variables here included continuous ICT training and awareness services, pedagogical training in ICT, and integrating ICT in the teaching, learning and research activities of higher education.

Organizational culture: Organizational culture defines the core beliefs, values, norms and social customs that govern the way individuals act and behave in an organization. A good organizational culture should be one that highly values knowledge and encourages its creation, sharing and application. Organizational culture is therefore, essentially the building block to creating a knowledge friendly culture, which leads to positive outcomes such as more innovation and improvement of organizational performance in higher education. Sub-variables here included collaborations and networking, rewarding success and innovations, and having a shared visions and goals.

Performance measurements: Performance measurements enable organizations to track the progress of KM using ICT, determine its benefits and effectiveness, and provide the basis for evaluation, comparison, control and improvement on its KM outputs. Sub-variables here included use of best practices in KM and availability of KM metric standards.

Resources allocations: Successful KM implementation using ICT in higher education is dependent on enough resource allocations in financial and human terms. Enough financial support is required if an investment in a technological system such as KM enabling ICTs are to be made, while a well facilitated skilled human resources are needed to coordinate and manage the implementation process as well as to take up knowledge-related supporting roles.

KM framework/systems: A KM framework/system is very important for the organizations that intend to implement KM using ICT in their organization because it acts as the guidelines for the creation of knowledge repositories, improvement of knowledge access and sharing as well as communication through collaboration, enhancing the knowledge environment and managing knowledge as an asset for advancing academic goals.

6. Conclusion And Future Directions

This study presented and empirically tested a proposed framework for enhancing KM using ICT with the help of case studies of HEI in Uganda through validations of the linkages between KM factors, KM enabling ICT, and KM processes as key KM framework components. The insights from the findings extend our understanding of the linkages between KM factors, KM enabling ICT, and KM processes in achieving performance improvement in higher education, and allow us, firstly, to confirm the usefulness of the proposed framework in enhancing KM using ICT in higher education; secondly, the findings highlight the dichotomy between the rankings of use and effectiveness of KM enabling ICT and provide indicators which show that use does not necessarily means effectiveness; thirdly, the findings identify key KM success factors and provide tested inventories of KM enabling ICT and KM processes and their contributions in enhancing KM in higher education; fourthly, the findings should provide managers and all the other stakeholders in the higher education sector with a first understanding and a useful guidelines for the successful implementation of KM using ICT

within their organizations; finally, based on the findings, this study recommend a modified framework for enhancing KM using ICT in higher education consisting of 8 KM factors; 13 KM enabling ICT excluding personal digital assistants, data mining, and data warehouse; and 8 KM processes including knowledge dissemination as the key components (independent variables); and academic services and learning activities as the main output (dependent variable).

Although the study has implications for research and practice, its main limitation is due to the specific context in which the study was carried out as the findings are based solely on enhancing KM using ICT in HEI in Uganda. Given that KM strategies generally vary depending on organizational surrounding environment and strategic intents, further research is required involving other contexts and research groups. Firstly, further study is recommended that can extend the current research towards exploring the relationships between KM enabling ICT and KM processes as well as its consequences for organizational performance in higher education; secondly, further research is required on developing appropriate collaborative KM methodologies using ICT in higher education; and finally, further research is required to determine organizational processes using ICT in higher education and their knowledge needs to ensure that knowledge and evidence of what works are contextualized, enriched, interpreted, and debated among the different stakeholders.

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