A Collaborative E-learning Approach

Exploring a Peer Assignment Review Process at the University Level in Uganda

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"...in all these things we are more than conquerors through him who loved us." **Romans 8:37**

Abstract

There is an increasing need, driven by the job market, for quality education and that requires expertise which is continuously being developed. The integration of e-learning into the education system is viewed as one way to meet this growing need for high-quality education. In developing country contexts, however, where there is a genuine need to join the knowledge society there is limited knowledge about the use of e-learning to facilitate learning. In fact, the actualization of e-learning for this purpose is very limited and in some cases lacking altogether.

This thesis is about how collaborative e-learning can be integrated in the teaching and learning process to support learning at the university level in a developing country context. The main research question to be answered is *how collaborative e-learning support can student learning at the university level in Uganda.* In an effort to answer this research question three exploratory case studies were carried out at Makerere University, Uganda. A mixed-methods approach was adopted to collect data and analyse the findings. The thesis explores an approach to supporting students' learning, a peer assignment review process model for collaborative e-learning employing development research. The model uses students to support each other's learning through four process stages: familiarization, assignment, review and feedback.

Initial findings indicate that the current learning and teaching environment challenges the adoption and effective use of collaborative e-learning to support student learning. This is mainly attributed to the pedagogical culture and curriculum which is predominantly traditional, lecturers' ability to use ICT pedagogy effectively, and the readiness of the environment to support collaborative e-learning. Notwithstanding the challenges, it was established that the peer assignment review process model for collaborative e-learning facilitated the students' learning. Students were able to participate actively in the course, gain experience in critical reading and evaluating peers' work, and reflect on their own work.

This thesis provides a practical approach for designing and implementing collaborative e-learning approaches to support student learning at the university level in a developing country context. It further highlights factors that are pertinent to supporting and sustaining student learning in a collaborative e-learning environment under the following categories: Institutional Readiness (44 factors), Technology/Infrastructure Readiness (40 factors) and Pedagogical Change (45 factors).

Sammanfattning

Det finns ett ökande behov av utbildning av hög kvalitet som drivs av arbetsmarknadens behov av högt utbildad, kunnig och ständigt vidareutbildad personal. Integrationen av e-lärande i utbildningssystemet ses som ett av svaren för att möta detta växande behov av utbildning av hög kvalitet. Men i utvecklingsländer, där det finns ett stort behov av att utveckla ett kunskapssamhälle, finns begränsad kunskap om användning av e-lärande för att underlätta inlärning. I själva verket är användandet av e-lärande för detta ändamål mycket begränsat och saknas i vissa fall helt.

Denna avhandling handlar om hur kollaborativt e-lärande kan integreras i undervisningen för att stödja lärande på universitetsnivå i utvecklingsländer. Den viktigaste frågeställningen som besvaras i denna avhandling är: *Hur kan kollaborativt e-lärande stödja studenternas inlärning på universitetsnivå i Uganda?* I ett försök att besvara denna frågeställning utfördes tre förberedande fallstudier vid Makerere-universitetet i Uganda. En tillvägagångssätt involverande flera metoder användes för att samla in data och analysera resultaten. Avhandlingen undersöker en metod för att stödja studenters inlärning − en studentdriven granskningsprocess för samarbete genom e-lärande. Modellen bygger på att studenterna stödjer varandras lärande genom fyra processteg: invänjning, inlämningsuppgifter, gransking och återkoppling.

De inledande resultaten tyder på att den nuvarande lärande- och undervisningsmiljön utgör ett hinder för effektiv användning av kollaborativt e-lärande för att stödja studenternas lärande. Detta beror främst på a) den pedagogiska kulturen och på läroplanerna som huvudsakligen är traditionella, b) föreläsarnas kompetens för att effektivt använda IKT-pedagogik och c) undervisningsmiljöns beredskap för att stödja kollaborativt e-lärande. Trots dessa utmaningar konstateras att en process för studentdrivna granskningar av inlämningsuppgifter underlättas av kollaborativt e-lärande. Studenterna kunde aktivt delta i kursen, få erfarenheter av kritisk läsning och utvärdering av kurskamraters arbete samtidigt reflektera över sitt eget arbete.

Denna avhandling anvisar en praktisk metod för att utforma och genomföra kollaborativt e-lärande i syfte att stödja studenter på universitetsnivå i ett utvecklingsland. Den belyser dessutom faktorer som är relevanta för att stödja och bibehålla studenters lärande i en kollaborativ e-lärandemiljö indelat i följande kategorier: institutionell beredskap (44 faktorer), teknik/infrastruktur-beredskap (40 faktorer) och pedagogisk förändring (45 faktorer).

Ekifunze

Waliwo obwetaavu obugenda bweyongera obw'ebyenjigiriza ebiri ku mutindo nga buleeteeddwawo akatale k'emirimu akeetaaga abantu abasomye ennyo, abakugu ennyo era n'okuba nga bakyeyongera okukuguka. Okutobeka enjigiso y'omutimbagano mu byenjigiriza kitunuulirwa ng'ekimu ku by'okuddamu ebisobola okumatiza obwetaavu buno obw'ebyenjigiriza eby'omutindo ogwa waggulu obugenda bweyongera. Wabula, mu mbeera y'amawanga agakyakula ewali obwetaavu obwannamaddala obw'okwegatta ku mbeerabantu eyeebyekigezi yo waliyo obumanyi butono obukwata ku nkozesa y'enjigiso ey'omutimbagano mu kuyiga. Mu butuufu okussa mu nkola enjigiso y'omutimbagano olw'ekyo nnafu nnyo so ng'ate awalala terinayo.

Alipoota y'okunoonyereza eno ekwata ku ngeri enjigiso y'omutimbagano ey'okukwasiza awamu gy'eyinza okutobekebwa mu misoso gy'ebyenjiga n'ensomesa okusobola okuwanirira eby'enjiga ku ddaala lya yunivasite mu mbeera y'amawanga agakyakula. Ekibuuzo ky'okunoonyereza ekikulu ekyokuddamu mu alipoota y'okunoonyereza eno kiri nti *Enjigiso y'omutimbagano ey'okukwasiza awamu esobola etya okuyamba enjiga y'abayizi ku ddaala lya yunivaasite mu Uganda*? Mu kulafuubana okwanukula ekibuuzo ky'okunoonyereza kino, okunoonyereza nakatu okuvumbuzi kwa mirundi esatu kwakolebwa mu Yunivasite y'e Makerere (Uganda). Enkola y'empenda entabike ye yakozesebwa mu kukuŋŋaanya ebiwe n'okwekenneenya ebyazuulibwa. Alipoota y'okunoonyereza eno yeetegereza enkola ey'okuwagira enjiga y'abayizi: omutetenkanyo gw'abayizi okwekenneenyera emirimu gyabwe mu bubinja ku lw'enjigiso y'omutimbagano ey'okukwasiza awamu eyeesigamye ku kunoonyereza okw'ebyenkulaakulana. Omutetenkanyo guno gwesigamiziddwa ku bayizi okukwasiza awamu mu kusoma nga bayita mu mitendera egisosowaziddwa ena: okumanyiirigana, eby'okukola, okwekennenya n'okuddibwamu.

Ebyasooka okuzuulibwa biraga nti embeera eyigirwamu n'esomesebwamu eriwo kati esoomooza okutongoza n'okweyambisa obulungi enjigiso y'omutimbagano ey'okukwasiza awamu mu kuyamba abayizi okuyiga. Kino okusingira ddala kiva ku nkola eŋŋundiivu ey'ebyensomesa n'entegeka ebisomesebwa ate nga byesigamye nnyo ku bulombolombo, obusobozi bw'abasomesa ba yunivaasite okukozesa obulungi ebya tekinologiya w'ebyuma bikalimagezi mu byensomesa, n'obwetegefu bw'embeera eriwo okuwagira enjigiso y'omutimbagano ey'okukwasiza awamu. Ng'oggyeeko okusoomoozebwa, kyazuulibwa nti omutetenkanyo gw'abayizi okwekenneenyera emirimu gyabwe mu bubinja ku lw'enjigiso y'omutimbagano ey'okukwasiza awamu kyayamba ejiga y'abayizi. Abayizi baasobola okwetaba kinnakamwantette mu ssomo ne bafuna obumanyirivu mu kusoma okukolokosi n'okulamula emirimu gya bannaabwe, ate nga bwe beefuumiitiriza ne ku mirimu gyabwe gyennyini.

Alipoota y'okunoonyereza eno ewa enkola eyeeyambisika ey'okubagawo n'okuteeka mu nkola enkola z'enjigiso y'omutimbagano ey'okukwasiza awamu okusobola okutumbula eby'enjiga y'abayizi ku ddaala lya yunivaasite mu nsi ezikyakula. Egenda mu maaso n'okwoleka ensonga enkulu nu kuwagira n'okuyimirizaawo eby'enjiga y'abayizi mu mbeera y'enjigiso y'omutimbagano ey'okukwasiza awamu mu bibinja bino: obweteefuteefu bw'ekitongole (ensonga 44), obweteefuteefu ne tekinologiya/ebikozesebwa (ensonga 40) n'enkyukakyuka mu by'ensomesa (ensonga 45).

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A journey of a thousand miles must begin with a single step (Lao Tzu)

Tack så mycket

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List of Abbreviations

BOU	Bangladesh Open University
BIT	Bachelors of Information Technology
BMS	Bachelor of Medicine and Surgery
DBMS	Database Management Systems
HEFCE	Higher Education Funding Council for England
HEL	Higher Education Level
ICT	Information and Communication Technology
ICT4D	Information and Communication Technology for Development
ICT4E	Information and Communication Technology for Education
KeLC	Kenya E-learning Centre
MDG	Millennium Development Goals
MoE&S	Ministry of Education and Sports
MUELE	Makerere University E-learning Environment
NEPAD	New Partnerships for Africa's Development
OECD	Organisation for Economic Co-operation and Development
OUT	Open University of Tanzania
PDA	Personal Digital Assistant
RENU	Research and Education Network of Uganda
UConnect	Uganda Connectivity project
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPE	Universal Primary Education
USE	Universal Secondary Education

1. Introduction

Over the past decade, higher education institutions have experienced structural changes which can be partially attributed to the integration of information and communication Technology (ICT) in their education processes (Singh et al., 2005). The knowledge economy, the requirement for new skills and the need for lifelong learning are some of the factors that have increased expectations in higher education institutions. As a result, these institutions have moved to create flexible approaches to learning for students who in the past lacked opportunities to advance their education because of factors such as unaffordable costs, requirements for synchronous learning, distance, and time. To this end, ICT in general has not only supported knowledge creation, learning and teaching techniques but has also acted as a catalyst to combat the barriers of inflexible education structures. Inevitably, the competitiveness created by this paradigm shift implies that institutions that have not adapted to this education change risk losing out.

1.1. Background

The integration of e-learning into education systems has been acknowledged and embraced worldwide as a tool to enhance teaching and learning processes. In developing country contexts, e-learning has been adopted as one of the approaches through which students acquire the skills needed to join the knowledge society and become competitive in the job market within and outside their countries. Although e-learning is viewed as a new paradigm in knowledge acquisition and transfer, its adoption and use in developing countries has been characterized by high incidence of failed and under/unutilized initiatives (Iahad et al., 2004; Usoro & Abid, 2007). Research into reasons for such occurrences reveals several challenges and constraints such as poor and inadequate ICT infrastructure, lack of funding, inadequate ICT skills, negative attitude towards ICT, absence of policies for ICT development, and poor administrative support (Gunga & Ricketts, 2007; Kahiigi et al., 2009a). Tenekeci (2011) on the other hand asserts that ICT diffusion in developing country contexts is still in the development stage. This diffusion is characterized by diversity in implementation strategies that have a negative impact on the adoption of ICT initiatives such as e-learning. These strategies have in many cases been too dependent on external factors and have been adopted from developed country contexts without consideration of societal needs (Kemppainen et al., 2012; Sunden & Wicander, 2006). The inherent limitations of such implementations are that they are largely costly, impractical, consume a lot of time and do not address context specific problems (Wanyembi & Looijen, 2000). This is as a result of implementing ICT initiatives that are not part and parcel of organizational reform or business re-engineering in the developing countries (Bakari, 2005). As a result very little or no attention is placed on how to use ICT, leading to user frustration owing to the unfulfilled expectations which the innovations raise.

Nevertheless, many education institutions in developing countries are gradually moving towards the integration of e-learning in their curricula. The drive towards this education intervention has been motivated by several factors: the need to support student learning, access to information, accommodating high student enrolment and competition among institutions (Kahiigi et al., 2009b). Recently, teaching has moved from traditional methods and adopted new and innovative approaches that incorporate twenty-first-century skills which require students to engage in critical thinking, problem-solving and effective

communication (Trilling & Fadel, 2009). As a result, this ICT evolution, initially seen in radio and television and later in current technologies (mobile phones, tablet computers), has been seen as a potentially powerful enabling tool for educational change and reform.

1.1.1. Examining ICT4D

Information and Communication Technology for Development (ICT4D) relates to adopting and using ICT to deliver a specific development goal. The adoption and use of ICT in development has progressed through various phases over time. Initially ICT4D was viewed as a needless luxury, with priorities set on provision of basic needs (Gomez & Pather, 2012). Nonetheless, Heeks (2009) asserts that although provision of basic needs is of paramount importance, ICT is equally important in facilitating the process of planning and management for the attainment of the basic needs, thus leading to development. In this regard, ICT is seen as a facilitator of development.

During the 1990s, the availability of the Internet and the introduction of the Millennium Development Goals (MDGs) created an increased interest in ICT4D (Heeks, 2009). As a result, various ICT initiatives have been implemented which particularly focus on poverty reduction, improved health, education and gender equality. Telecentres with Internet-connected computers were the models for many of these initiatives, with the aim of delivering information, communication and services to poor communities (Andersson, 2010). Despite the high level of investment in ICT4D, the earlier high expectations and enthusiasm were dampened by the many stories of failed ICT4D initiatives (Brunello, 2010; Gomez & Pather, 2012). With the realization of the failed promise to deliver services to the poor communities through Internet connected computers, there has been increased interest in the use of low cost and low power consumption access devices, wireless connectivity, and alternative sources of power (Heeks, 2009). Furthermore, adoption and use of available technologies such as mobile phones, tablet computers (i.e. iPads), televisions and radios to achieve development have also been emphasized as efficient tools for ICT4D (Andersson, 2010).

Albeit the growing potential for ICT4D has been researched (c.f Harindranath & Sein, 2007; Heeks, 2009; Unwin, 2009) there is still a need to extend the theoretical grounding of information systems research to draw from the intended development goals. Recent years have seen ICT and development initiatives abandoned or mainstreamed into broader sector development themes (Gomez & Pather, 2012). This can be attributed to the difficulty of linking ICT inventions to development benefits (Andersson, 2010), or the lack of maturity of ICT4D. Notwithstanding these challenges, the current ICT4D paradigm has shifted from merely measuring tangible and quantifiable economic benefits to adopting a comprehensive approach to determining how ICT should be perceived and used for development (Gomez & Pather, 2012; Harindranath & Sein, 2007).

1.1.2. Perspective on ICT for Education (ICT4E)

The adoption of ICT in education became popular during educational policy-making in the early 1980s amid high expectations that it would make education more effective and motivating (Pelgrum & Law, 2003). The general approach was to increase levels of educational attainment by introducing changes in teaching and learning processes and strategies (Rodríguez et al., 2010). Unwin (2009) contends that ICT can be a catalyst for educational development by: (1) providing tools which teachers use to support and improve teaching; and (2) giving learners access to electronic media that make concepts clearer and more

accessible. Consequently, Zhang and Martinovic (2008) report that ICT can improve student conceptual understanding, problem-solving and teamwork skills. Kim (2009) on the other hand captures the essence of ICT in education as a comprehensive approach to innovating education systems, methods and management. Accordingly, ICT in education aims to enhance education efficiency, effectiveness, productivity impact and sustainability (Vesisenaho, 2007). Indeed Kozma (2008a) justifies investment in educational ICT as a means to: support economic growth, promote social development, advance educational reform and support educational management. This justification, however, is still not backed by sufficient evidence of ICT impact on student attainment of knowledge, understanding and development (Rodríguez et al., 2010). As a result, research concerning the effectiveness of ICT in education remains an open issue.

From a developing country perspective the use of ICT in education revolves around improving and suggesting alternative solutions to challenges faced in the education sector. Although ICT is at the centre of education reform efforts, however, not all countries have attained benefits from its implementation. Several developing countries have been constrained in managing and sustaining significant strategies aimed at integrating ICT in education (Mikre, 2012). Expectations of ICT in education within developing countries mainly focus on improving access to education and the quality of education (Andersson, 2010). Improved access to education relates to overcoming problems associated with geographical isolation and reaching out to more students, especially in remote and rural areas. The digital divide[1] is largely a rural-urban divide, the urban areas having the advantage (Mutula & Mostert, 2010). Although ICT has potential to create educational opportunities in more remote and rural areas, the integration of ICT in education is limited in developing country contexts owing to the shortage of qualified teachers, poor instructional material and inadequate physical infrastructure (Grönlund et al., 2010; Mnyanyi et al., 2010). This has continuously widened the educational gap between urban and rural areas.

Improved quality in education relates to adopting ICT to change learning practices (Andersson, 2010). Essentially, ICT transforms traditional authoritative learning into more transparent learning, with the teacher becoming a facilitator (Shabaya, 2009). Students become active rather than passive learners by getting involved in the learning activities and thus taking ownership of their learning process (Khan, 2005). ICT lends itself to a learner-centred approach to education that facilitates information flow and critical analysis between learners and teachers (Garrison, 2007). In many developing countries, however, teachers play a crucial role in the socio-dynamics and cultural aspects of education. A challenge relating to the use of ICT in education can be teachers' resistance to ICT as they may regard it as a substitute for themselves in the process (Kahiigi et al., 2009a).

Adopting ICT in education supports ICT-literate students and a versatile and adaptable workforce, consistently with the human capital theory of education (Wims & Lawler, 2007). Human capital theory relates to the production and utilization of technological knowledge relevant for economic development (Tezcan, 2006). Increasing economic and social changes have significant implications for human capital development and education policy. To participate in the knowledge economy and the information society, students need to acquire the skills necessary to respond to opportunity and uncertainty, think critically, collaborate, communicate, solve problems, create, and continue to learn (Kozma, 2008b). Human capital provides the necessary equipment for the creation of new employment opportunities for the labour force, and ensures a competitive edge in global markets. These effects facilitate and accelerate economic development (Unwin, 2009). From this perspective, Hollow (2012, p.24) points out that adoption of ICT

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[1] In this thesis, digital divide is defined as the disparity in ICT diffusion and use.

within education is an inherently positive trend and a causal factor in promoting growth, primarily defined through economic criteria. The increasing interest in the use of ICT in education can also be partly attributed to the fact that education systems need to prepare students for lifelong learning in the information society (Obadić & Jakšić, 2010). In this thesis, the focus is on how ICT can be used to achieve educational goals to support learning and teaching processes.

1.1.3. Research Context

The research presented in this thesis was carried out at Makerere University in Uganda. Uganda is categorized as a developing country, which in this thesis is defined as a country mainly exemplified by low living standards, high rates of population growth, low income per capita, and general economic and technological dependence on developed economies (Bakari, 2005).

Established in 1922, Makerere University is one of the oldest universities in Africa. The university offers full-time day, evening and external study programmes to over 30,000 undergraduate and 3,000 postgraduate students. In July 2011, Makerere University became a collegiate university, consisting of nine colleges and one school, which operate as semi-autonomous units of the university. Makerere University has a strong inclination, as evidenced in its general policy, towards leveraging academic units' effectiveness by using ICT in instruction, learning and research. This is aimed at (1) improving the quality of graduates by utilizing modern instructional materials and methods, including increased use of ICT in teaching and research; and (2) providing greater access to university education, by developing capacity for increased enrolment through non-conventional approaches in teaching and learning (Makerere University, 2008). It is from this perspective that an e-learning project was instituted at Makerere University in 2002. Through this project, ICT infrastructure and resources to support e-learning developments have been set up and several academic staff have been trained in online course authoring. To date, however, Makerere University is still struggling to attain minimal educational benefits from implementing e-learning. Albeit the ICT environment is to some extent conducive to supporting e-learning development, currently there are partially developed online courses that are redundant and the Makerere University E-learning Environment (MUELE) is mostly used as a course information repository by only a few lecturers (Makerere University, 2007).

A review of the academic sphere at Makerere University (Makerere University E-learning progress report, 2007) indicates that the issue is not access but attitude towards adopting e-learning in the teaching and learning processes. For instance, although a number of lecturers attended the training courses and appreciated e-learning as an alternative approach to support student learning, they were concerned about the increasing workload caused by large student numbers and increased course preparation time, among other issues. Current e-learning developments have mostly been in terms of acquisition and setting up supporting ICT infrastructure with very limited use. This can be attributed to the limited will to adopt and effectively use e-learning. The inconsistencies in understanding the integration of e-learning into teaching and learning processes have also had too negative an impact on the effective use of e-learning for the benefits to be visible even of the scarce resources. The research context illustrates some challenges impacting on the development and implementation of e-learning initiatives in a developing country context.

1.1.4. Research Focus and Motivation

This thesis is about the adoption and use of collaborative e-learning in teaching and learning as an alternative approach to supporting student learning in a developing country context, with a particular focus on university education in Uganda. The underlying phenomenon of collaborative e-learning involves students working in groups to achieve through mutual interaction common learning goals in an online environment. Collaborative e-learning is increasingly appealing to students and educational institutions as an alternative learning approach (Lambropoulos et al., 2012; Luchoomun et al., 2010). Collaborative e-learning supports a faster learning curve, since students can interactively customize their learning and have more control of their learning process (Torrisi, 2010). The belief that shared understanding through interaction is a natural way for students to learn (Nicolaides, 2012), implies that collaboration and interaction coexist and are dependent on each other in any learning environment.

Whereas e-learning has become an issue of discussion as an avenue to support learning and facilitate students to leapfrog into the competitive knowledge society, its adoption and effective utilization is still lacking in developing country contexts. This provided the motivation for a series of studies in Uganda to obtain a general perspective of pertinent issues that impact on the adoption and effective use of e-learning; to explore the current state of e-learning development in the Uganda education system; and to investigate the students' general perception of e-learning and identify factors which students perceive to be important in relation to the integration of e-learning into their learning process (Kahiigi et al., 2009a, 2009b). These studies reveal opportunities and challenges relating to e-learning implementation and development. The underlying motivation to carry out the research presented in this thesis was based on the studies and on observations on the extent to which e-learning has been adopted and used at the university level in Uganda. Evidently, e-learning is a timely innovation that enhances and supports teaching and learning. At the university level, learning and teaching methods are predominantly traditional, with very limited/no integration of e-learning. The increasing student numbers with classes ranging from 50 up to 1000 with a maximum of two lecturers (Makerere University, 2010) has created challenges in supporting the learning process. It is impossible for lecturers to provide timely feedback to so many students, yet the students rely on such feedback to support their learning process. The prolonged timeframe for the feedback to students disables the objective of shaping and supporting learning and in most cases the students forget what the assignment was all about. Ertmer et al. (2007) also assert that the feedback process between the student and lecturer prevents students from accessing other students' submissions, thus missing out on an opportunity to learn from each other and look at different perspectives to improve the quality of their work and enhance their understanding of the course concepts. These issues provide a unique picture of e-learning implementation and development in the research context (Kahiigi et al., 2008b; Kahiigi et al., 2009b).

As an alternative approach to effective adoption and use of e-learning at the university level in Uganda, this thesis focuses on a collaborative e-learning concept as a means to positively impact on student learning. The idea is to use students to support each other's learning pedagogically. More specifically the thesis explores a peer assignment review process in a collaborative e-learning environment in order to explore how it impacts on the student learning process.

1.1.5. Defining E-learning

E-learning is seen as supporting and enhancing the traditional teaching methods as well as creating learning opportunities for students on and off the campus. A common definition of e-learning is, however, lacking (Oblinger & Hawkins, 2005). This can be attributed to different contexts in which e-learning is implemented and meanings different people attach to it as exemplified in the definitions presented herewith.

According to Narasimhulu et al. (2010, p. 3886), e-learning "is the delivery of a learning, training or education program by electronic means". For Driscoll (2010, p.1), e-learning "is the process of designing, delivering and managing instructions using computers". Clark and Mayer (2011 p. 7) define e-learning "as training delivered on a digital device such as a smart phone or laptop computer that is designed to support individual learning or organisational performance goals". Garrison (2011, p.2) views e-learning as "electronically mediated asynchronous and synchronous communication for [the] purpose of constructing and confirming knowledge". On the other hand Alkhattabi et al. (2011, p.2) define e-learning as "the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchange and collaborations".

From the discussion above, it is evidently difficult to provide a generalized definition of e-learning as various perspectives are adopted by different individuals depending on the context in which e-learning is implemented. It should, however, be noted that the definitions focus on the intersection of education, teaching, and learning with ICT (Friesen, 2009). In relation to the study presented in this thesis, it is worth noting that the context (i.e. a developing country context) in which e-learning adoption and use aspects are explored is characterized by inadequate and unreliable ICT infrastructure among other challenges. It is therefore not applicable to view e-learning from a fully online course perspective, but rather from a broader perspective that combines traditional approaches to learning that facilitate face-to-face contact with students; and the application of various ICT tools (i.e. mobile phones, PDAs, computer/Internet, PowerPoint projectors, televisions, radios, etc.) to equip students with learning materials and to coordinate their learning activities (Ellis et al., 2007; Usoro & Abid, 2007).

In this thesis, e-learning is defined as ***any learning method that uses ICT[2] to support students in achieving their learning outcomes.*** This takes into consideration "on-campus students" using e-mail or a learning management system to access lecture notes online, to "off-campus students" who access programs offered entirely online or with a blended learning approach.[3]

1.1.6. E-learning Changing the Higher Education Process

Technology advancement in recent years has precipitated transformation in the higher education sector. Several factors make e-learning appealing to education institution and learners. For instance, the availability of the Internet means that e-learning eliminates learning barriers of time and distance, while at the same time allowing students to take charge of their learning (Mills & Fadel, 2012). Students are now presented with opportunities to join the knowledge society and knowledge-based economy as they have access to and benefit from a variety of learning resources and expert advice. E-learning has created opportunities to meet the increasing student learning needs. For instance, course materials can be delivered in a timely manner and at a reduced cost, making e-learning an economically viable option

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[2] In this thesis, ICT is referred to as "computer/Internet".
[3] Blended learning approach - learning that combines face-to-face and online learning.

(Usoro & Abid, 2007). The collaborative research and learning opportunities presented through e-learning are desirable attributes required to facilitate the growing demand for knowledgeable and skilled personnel in the global labour market. E-learning is essential for providing avenues for human development, bridges the digital divide and enables students to fit into the global economy (Hollow & ICWE, 2009).

Although e-learning offers numerous opportunities to support learning, Garrison (2007) notes that we have yet to experience fully the transformative effect of e-learning. Creating an e-learning experience involves "serious commitment to understanding the different features of this medium and the ways it can be used most advantageously to impart learning" (Garrison & Anderson, 2003, p.53). Friesen and Lock (2010) further affirm that there is no quantifiable correlation between the application of technology and improved learning outcomes. It is for this reason, and it is particularly interesting to note, that even in supposedly mature contexts, such as university education, there are wide discrepancies. Whereas some universities have derived considerable benefits from the adoption of e-learning (Meredith & Newton, 2003), others are still struggling to realize minimal educational value (Marshall & Mitchell, 2002). Such is the case because skilled and interested staff as well as increasing number of students in many cases force universities to embrace this educational venture.

On the other hand, the adoption of e-learning has been reported to have created new educational issues for teachers and increased the cost of teaching. Mapuva (2009) points out that teaching methods used in traditional courses may need to be reviewed if they are not transferable to e-learning environments. Changing work patterns have translated into more course preparation time and skills to run online courses. As a result, the perceived increasing workload, mindset and the lack of skills in some cases has resulted in the reluctance to adopt and use e-learning (Hennessy et al., 2010; Huan & McKay, 2011). Additionally, the paradigm shift from teacher-centredness to student-centredness has greatly impacted on the adoption and use of e-learning (Kahiigi et al., 2008a). In this case, the teacher takes on a facilitator role while the students take ownership of their learning and personal development. The effect of this role change continues to make teachers apprehensive about adopting and using e-learning as they fear losing control over their students.

Furthermore, the adoption and use of e-learning has resulted from the rush to embrace the opportunities e-learning presents while some important issues have been overlooked. Alexander (2001) affirms that achieving the desired learning outcome is more than the mere integration of technology into the teaching and learning process; it emanates from a complex system, composed of many inter-related parts, where the failure of only one part of that system can cause the entire initiative to fail. Indeed Alexander (2001) reports that in 104 e-learning projects in Australia the use of technology did not in itself result in improved quality of learning. With substantive funding, technology acquisition is the easiest part. There is, however, a need to consider aspects such as pedagogy, curriculum, institutional readiness, ICT skills and teacher competencies (Chaudhary & Sharma, 2012). This clearly indicates that successful e-learning implementation should move beyond the ideology of simply integrating technology to include external aspects that influence its effective adoption and use.

1.1.7. E-learning Initiatives in Developing Country Contexts

As one of the strategies for bridging the knowledge gap developing countries have been driven to implement e-learning as a means of increasing access to and improving the relevance and quality of education, prerequisites for the knowledge society and the economy. In fact, Gulati (2008) asserts that since the 1990s support for open and distance learning within the developing country context has gained

increasing legitimacy. This is evidenced in the policy statements by governments and the main international agencies such as UNESCO, the European Commission, and the World Bank. This has led to the development of numerous e-learning initiatives within the developing country context. This section presents and discusses a cross-section of e-learning initiatives from various developing countries across the world.

In Kenya, the government realizes the importance of ICT in education, and has created an environment for the use and application of ICT to enhance learning, increase efficiency and improve service delivery. As a result several e-learning initiatives have been developed. The Kenya E-learning Centre[4] (KeLC) was conceived in response to the need for a coordination mechanism for e-learning development in the public sector. KeLC activities include development, review, evaluation and sharing of e-learning materials; ICT integration in capacity building activities among stakeholder institutions and local, regional and international; and collaboration in e-learning including the exchange of expertise and good practices. The e-learning consortium, a collaborative initiative of various partners such as SNV, Oracle, Microsoft, Safaricom and the Ministry of Education has facilitated the training of 270 teachers in the Kenya North Rift to adopt new teaching approaches and develop digital content, and has provided subsidies for Internet connectivity and setting up computer facilities. This has enabled students to gain access to learning materials through computers and the Internet and to use power projectors and digital cameras to enhance the learning material. Teachers are able to download teaching materials from the Internet as well as create their own teaching resources. The consortium also provides advisory services to schools in relation to ICT procurement and services (Kituu, 2007). In addition, the New Partnerships for Africa's Development (NEPAD) is working closely with the Kenyan government through the Ministry of Education to introduce e-learning in primary and secondary school. Through this initiative six secondary schools have been selected initially to serve as demo schools for the implementation of the e-school project. The inherent challenges facing these projects include understaffing, lack of resources, ICT skills, connectivity and adequate infrastructure (Farrell et al., 2007).

SchoolNet Ethiopia, a joint initiative by the Ministry of Education of Ethiopia and UNDP, has set up networked computers in over 500 schools. Through this initiative classrooms have been equipped with plasma screens with which students are able to access educational programs via video and audio streaming. Bitew (2008) points out some of the challenges created by the initiative which include the teacher's role being reduced to lesson introduction and summarizing, with limited involvement in the planning. English language was also a challenge as students could not understand the learning materials and the transmission speed was fast, which prevented most students from understanding the subject matter. In addition, earlier studies Hare (2007) and Kinde (2007) also reported challenges such as limited connectivity hindering students from easily downloading the educational material, low literacy rate, low ICT skills among the students and lecturers have negatively impacted on plasma screen initiative.

The Open University of Tanzania (OUT) has been growing since its establishment in 1993. Starting with only 776 students, it saw the number of enrolled students rise to 33,000 in 2007. OUT adapted e-learning as a mode of delivery to: encourage the development and sharing of knowledge through open learning/distance education resources and technologies; help students and staff improve access to quality education and training through the use of e-learning technologies; support and promote the benefits of the Internet for learning, education and training in Tanzania; and to provide pedagogic and technical e-learning solutions (Mbwete, 2009). Adoption and use of e-learning at OUT has increased access to learning resources and expertise on demand. A number of challenges like other e-learning initiatives in

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[4] Kenya E-learning Centre: http://kelc.org/

the developing country context have also been realized. These include: lack of ICT skills, mindset in adopting and using ICT, technophobia, and intellectual property awareness (Mbwete, 2009).

Conversely, the Malaysian Smart School project has had an impact on students and teachers in Malaysia (Chan, 2002). This initiative was launched by the Malaysian government in 1997 as one of the strategies to revamp the country's educational system and develop human resources and knowledge workers. The pilot project concluded in December 2002, with several networked schools throughout the country and courseware material developed for Bahasa Melayu (Malay), English, science, and mathematics. Albeit success has been registered in terms of reaching students even in the rural areas in Malaysia, several challenges such as limitations of the infrastructure, Internet access, and teachers' unwillingness to adopt and use technology continue to hamper the effectiveness of technology-supported teaching and learning in Malaysia (Ya'acob et al., 2005).

Established in 1992 as the first university in Bangladesh to introduce higher education through distance mode, the Bangladesh Open University (BOU), focuses on: meeting student learning needs in higher education; increasing access to education, especially in rural areas through the provision of basic, secondary and vocational education; raising the quality of education through instructional technology; and strengthening informal and non-formal programmes (Islam & Selim, 2006). Student enrolment at BOU in different programmes has dramatically increased since its opening in 1995, with approximately four hundred thousand students enrolled, more than at the traditional universities in the country. As a way of imparting knowledge to a wider community of learners, BOU broadcasts some of its non-formal programmes on national radio and TV. Despite several challenges such as inadequate infrastructure and connectivity, recent developments and the Bangladeshi government's interest in ICT have provided an opportunity to adopt e-learning as a means to deliver distance education for both the uneducated and those with low levels of education (Islam & Selim, 2006).

Notwithstanding the several challenges facing developing countries, some e-learning initiatives in this context have had some success. For instance, as a cost-effective strategy for extending lower secondary education to rural and remote communities, Mexico launched the Telesecundaria initiative in 1968. Telesecundaria systems use a combination of televised lessons with other resources such as classroom teachers and textbooks to cover the same curriculum as that offered in ordinary schools (Mayo et al., 1975). By 1998, a total of 800,000 students in grades 7 to 9 had enrolled in Telesecundaria. The students were located in 12,700 rural communities, with over 100 televised programs using satellite technologies. The Telesecundaria initiative further developed a community-based methodology that relates classroom activities to understanding and solving community issues (Calderoni, 1998). As a result the initiative has realized a low dropout rate compared with the ordinary secondary and technical schools (Perraton, 2000).

1.1.8. E-learning in the Education System of Uganda

The formal education system in Uganda is based on the 7-6-3 system, i.e. seven years of primary school followed by six years of secondary school (divided into the ordinary level which takes four years and two years of advanced level). After the advanced level, students can apply to join the higher education level (HEL) for three years. Some degree courses require up to five years on the programme, however. The higher education sub-sector is composed of tertiary institutions such as universities and vocational training colleges. Students at the primary and secondary levels are subjected to national examinations as a means of gaining entry points for the HEL.

The education sector in Uganda has undergone evolution in the past decade, creating new opportunities for students. One such was the introduction and adoption of universal primary education (UPE) in 1997. Universal primary education is in line with the global commitment to universal primary education by 2015 under the Millennium Development Goals adopted by the United Nations General Assembly (World Bank Group, 2004). As a result of UPE, primary school enrolment in Uganda rose from 2.9 million in 1996 to 5.3 million in 1997, and to 8,324,615 in 2010 (MoE&S, 2010). In order to ensure continuity of education to the secondary school level, the government of Uganda implemented Universal Secondary Education (USE) in 2007. The introduction of USE has improved school enrolment at secondary level, increasing it by 32% from 814,087 in 2007 to 1,194,454 in 2010 (MoE&S, 2007, 2010).

As much as these education schemes have created opportunities for students who otherwise could not have furthered their education because of insufficient funding, they have also created several problems that threaten to weaken the Ugandan education system. Aguti (2002) cites problems which include lack of infrastructure, lack of teachers and provision for special needs students, and poor performance in schools resulting from very low teacher-student ratios. The MoE&S (2010) reports challenges such as inadequate budgets, low community participation in education activities, inadequate district capacity for effective delivery of services, and inadequate infrastructure and sanitation facilities. As a means of addressing some of these challenges several stakeholders including government agencies have proposed the use of ICT in education.

In Uganda, the ICT infrastructure expansion has created different avenues through which ICT can be applied to various sectors like health, agriculture and education. At the university level, policies that recognize the integration of e-learning in teaching and research activities have been developed, for example the Makerere University e-learning policy.[5] Despite the recognition e-learning has received at all education levels its adoption and effective utilization are still very limited, however. Current e-learning initiatives at the lower education levels, for instance, have concentrated on putting into place ICT infrastructure that supports e-learning with very limited emphasis on content development and pedagogical aspects. In partnership with MoE&S, SchoolNet Uganda[6] has set up ICT facilities in over 42 secondary schools. The ICT facilities can be used by the local communities outside school hours. The Uganda Connectivity project[7] (UConnect) has provided several secondary and primary schools in rural areas with refurbished computers and Internet facilities. The UConnect project aims at facilitating computer literacy in rural schools and communities but the ICT facilities have been used for administrative computing and computer skills development with no activity related to e-learning. In addition, the intermittent electricity supply has challenged the effective use of the ICT facilities.

Whereas e-learning at the university level is ideal for supporting flexible approaches to learning for a diverse population that includes students in the workplace and students on the move, its level of adoption does not differ significantly from that at the lower level. E-learning developments at the higher level have also mostly focused on the acquisition and setting up of ICT infrastructure. An example of such e-learning developments at the university level has been realized by Makerere University, which adopted a blended learning approach with a high percentage of face-to-face engagement. Progress to date includes setting up ICT infrastructure and services, although still limited, access to online library resources and training of lecturers in online course authoring. Makerere University has transitioned from Blackboard to KEWL and now adopted Moodle (open source) as its learning management system (LMS). The Moodle

[5] Makerere University E-learning Policy : http://dicts.mak.ac.ug/policies/Elearning%20Addition%20Master%20Plan%20(2000-2004).pdf
[6] http://schoolnetuganda.sc.ug
[7] www.uconnect.org

environment has approximately 1,326 online courses which are not fully developed. Challenges such as resistance by university staff, lack of management support, limited staff competencies as well as technical issues (Makerere University, 2007, 2012) have affected e-learning developments at Makerere University.

Findings in Kahiigi et al. (2009b) on e-learning implementation in Uganda at the university level indicate that the adoption of e-learning has been limited to sending notes via email or using PowerPoint presentations to teach and post notes to the LMS. The learning functionalities provided by the LMS have not been exploited. The inherent challenge here is the notion that posting notes or using technology tools to disseminate learning content equates to e-learning. It can be noted, however, that "informal e-learning" which encompasses the use of the Internet, access to e-content, and communication through mailing lists has created an environment through which significant learning has been realized.

Research related to the adoption and use of ICT in education and e-learning in Uganda includes Basaza (2006), who explored the impact of a realistic teacher education pedagogy-oriented learning environment supported by ICT. The research focused on ICT efficiency in terms of flexibility, improving perceptions about instructional approaches and efficacy in terms of levels of cognitive processing and meta-cognition in distance teacher education in Uganda. Lating (2009) aimed to improve performance in physics and mathematics at advanced level examinations in two rural secondary schools through the application of e-learning. Muyinda (2010) on the other hand explored the use of mobile phones in higher education institutions to support student learning.

There is clearly growing interest and awareness in relation to the potential adoption and use of e-learning in Uganda at all educational levels. Although the challenges are many and mainly focused on technology infrastructure and access, issues of acceptance, effective use and deriving educational benefits are also major concerns, especially at the University level.

1.1.9. Analysis of E-learning Implementation in Developing Country Contexts

The inherent debate within the developing country context on whether the implementation of ICT initiatives such as e-learning should supersede the provision of basic needs has taken centre stage. Although basic needs such as provision of clean water, food and shelter need to continue to form national priorities, technology innovations can also form part of the solution (Ashraf et al., 2008; Best & Maier, 2007) in as much as they can have a positive influence on the education of individuals who lack these basic living resources. Sehrt (2005, p.1) affirms that "If education and capacity-building are critical steps for entering into the new global economy, e-learning should be considered a critical facet of basic development, an alternative medium of capacity-building and a means to people's empowerment". E-learning has the potential to increase access to and improve the relevance and quality of education. Indeed, Berhanu (2010) points out that promoting e-learning provides a potential and comparative ladder for developing countries to leapfrog to the knowledge economy. Most higher education institutions in developing country contexts, however, still follow the traditional instruction approach owing to the lack of supporting ICT infrastructure, resources, and skills, mindset challenges, and the fact that adoption of e-learning has not yet penetrated the existing education institutions (Elango et al., 2008; Gamal & Aziz, 2011).

The introduction of e-learning without acknowledging the paradigm shift and setting up the required ICT infrastructure and efficient support mechanism threatens e-learning developments (Berhanu, 2010). Attempts to enhance and reform the education sector through the integration of e-learning in developing country contexts have been negatively affected by unreliable and inadequate ICT infrastructure and resources. Most areas in this context are without a reliable supply of electricity and the nearest Internet

points of presence are not readily accessible. Individuals have to travel long distances to access Internet services. Anecdotal evidence in developing country contexts points to the adoption of wireless technologies as a possible avenue for leapfrogging (Malisuwan & Sivaraks, 2008; Nyakudya, 2012), even though there are still issues that relate to affordability. In addition, the imbalance created by access to computers between the rural and urban communities has greatly impacted on the advancement of e-learning in the developing country context. Although there is access to computer and Internet facilities to some extent in the urban areas, the rural poor population, who have a genuine need for development, are still deprived of such facilities. In a sense the introduction of e-learning in developing countries seems to have done little to widen educational access by the rural poor, who also do not have easy access to conventional schools/colleges and adequate skilled teachers (Gulati, 2008).

It should be emphasized that, for e-learning to succeed in the developing country context, there is a need to have supporting infrastructure along with sufficient connectivity (Sehrt, 2005). Limited bandwidth and its high costs have had a negative impact on the advancement and utilization of e-learning in developing country contexts. The recurrent high bandwidth cost and slow connection restrict usage, thus limiting the amount of content downloaded and accessed by students and teachers (Hollow & ICWE, 2009). Efforts to reduce the bandwidth cost to almost a third of the current market price in Africa are being achieved through creating synergies among partners' research and education networks such as the UbuntuNet Alliance.[8] The bandwidth obtained from such subsidies is still not affordable, adequate or sustainable at the university level. In Uganda, the Research and Education Network of Uganda[9] (RENU) a collaboration of public and private higher education institutions, has been established. RENU aims to provide better education and research environments geared towards the development of the country. Among the activities emphasized by RENU is the acquisition of affordable bandwidth and its effective utilization, which is a precursor to enabling education and research environments, including e-learning. To date RENU has persuaded various ICT stakeholders and government agencies to increase Internet connectivity and access at reduced cost. More than 50% Internet bandwidth cost cuts to different member universities have been realized through Uganda Telecom.

Another critical perspective that has a negative impact on the adoption and effective use of e-learning within the developing country context is the lack of qualified and skilled teachers. Tinio (2003) contends that teachers' professional development should focus on five aspects that are prerequisites in teacher training: (1) skills with particular applications; (2) integration into existing curricula: (3) curricular changes related to the use of ICT, which include changes in instructional design; (4) changes in teaching roles; and (5) underpinning educational theories. These aspects are crucial in the advancement of e-learning in the developing country context. The inherent challenge, however, is that teachers do not understand the integration of ICT in their teaching process and are still apprehensive about its adoption because of the perception that technology is going to replace them (Sharma et al., 2011). This perception could be eliminated if teachers were made to understand and appreciate their changing role through training and involvement in the implementation process in order to change their mindset and create a "buy in" of the innovation. This, however, requires time and effort.

Students' perceptions of e-learning systems have been attested to by several studies as one of the crucial elements in providing management with better understanding of what is required for effective e-learning development and use (Yaghoubi et al., 2008). Within the developing country context, however, where e-learning has failed to transfer effectively and its benefits have not been realized, there are hardly

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[8] UbuntuNet Alliance: http://www.ubuntunet.net/node/1
[9] www.renu.ac.ug

any studies that focus on students' perception in relation to adoption and use of e-learning. Garrison and Anderson (2007) affirm the importance of a deeper understanding of how people learn and how new tools support and access the learning gains. This alludes to the importance of involving students in the implementation as their perceptions are crucial to success.

The lack of management support is another aspect that has had a negative impact on e-learning implementation in developing country contexts. Ndume et al. (2008) assert that many e-learning initiatives have been undermined by lack of management support. Successful and sustainable e-learning implementation strongly depends on management having a broad understanding of the technical, curricular, administrative, financial and social dimensions of e-learning (Kahiigi et al., 2008a).

Furthermore, most e-learning initiatives in developing country contexts have been adapted from existing approaches. It should be noted, however, that there are variations in different contexts, making the one-size-fits-all approach unrealistic because it does not address all contextual needs. Badre et al. (2007) point out that students who learn and then recall material in the same learning environment with specific contextual cues will perform better than those made to recall it in a different learning environment. It is therefore imperative to provide e-learning content and tools that invoke the unique cultural cues of multiple localized and potentially conflicting contexts, while at the same time allowing for a common virtual learning environment, where learners share content and experience (Vesisenaho, 2007; Wicander, 2011). Worth noting is that a large proportion of education resources available on the Internet are in English. For developing countries with ethnic origins in Asia-Pacific or Anglo-Franc nations where proficiency in English is not high, access to these educational resources becomes a challenge.

The changing pedagogical paradigm that shifts from teacher-centred to student-centred learning has impacted on e-learning developments in developing country contexts. Teachers are viewed as providers of knowledge, and students as receivers of knowledge. The change to a student-centred learning approach requires to be structured in a way that deepens students' content knowledge, engages students in constructing their own knowledge and supports the development of complex thinking skills (Light, 2009). The change in pedagogical approach requires effort, however, since the teaching and learning norm is mainly based on a teacher-centred approach.

Although learning in the developing country context has become imperative and efforts to integrate e-learning into the teaching and learning process are in progress, surprisingly little is known about the use of e-learning to facilitate learning. Current e-learning developments mainly focus on ICT infrastructure acquisition and set-up with no or limited ICT integration in the teaching and learning processes. Taking into consideration the ambiguity of e-learning and the benefits and risks it presents for higher education, there is a need to move beyond fragmented approaches to studying and understanding e-learning implementation processes in the developing country context. In most cases lecturers possess the skills required to manipulate ICT tools for social and administrative purposes such as word processing, emailing, chatting, blogging, etc: these skills do not equate to the digital literacy adequate for teaching and learning (Pegrum, 2010). E-learning initiatives need to be focused on facilitating users to become fully trained and conversant with the ICT environment in order to apply the skills obtained to their teaching and learning processes, a precursor for e-learning adoption and advancement.

1.1.10. Factors Affecting E-learning Implementation in Developing Country Contexts

Many researchers have identified important factors that impact on e-learning implementation in developing country contexts over the past years; this section presents some of them. The methodology undertaken explored and reviewed articles related to e-learning in developing countries between 2010 and 2012. It was also envisaged that citations featured in these articles would have captured factors in studies carried out in earlier years, and thus it was not necessary to review the latter. The aim was to identify current factors impacting on e-learning development. Studies carried between 2010 and 2012 were regarded as representing the current state of factors impacting on e-learning in this thesis. That being so, it was assumed that these studies presented factors that could be sensibly compared with those identified in this thesis. The review mainly focused on studies relating to integration of e-learning in a blended learning approach in a university setting. This was motivated by the fact that major implementations of e-learning are supposedly designed to enhance the traditional face-to-face learning environment, especially in a university setting.

The articles were searched for on Google (https://www.google.com/) and Google scholar (http://scholar.google.com/). The search terms specifically used were e-learning in developing countries, factors affecting e-learning in developing countries, and benefits and challenges of e-learning in developing countries. The articles selected were peer reviewed journal articles and conference proceedings with representations of various developing countries across the world. An avalanche effect was used to select and review articles generated by the search engines; references in a given article led to other articles. Saturation was used as the stop criterion when new articles did not yield new factors (Andersson & Grönlund, 2009).

Mahmud (2010) carried out a study that illustrated technological, psychological, socio-cultural and economic factors affecting successful implementation of e-learning for higher education in Bangladesh. Unwillingness to change the learning atmosphere, poor level of competence in English, lack of funds and technical resources in universities, lack of confidence to practice computer applications and absence of infrastructures such as electricity and telephone lines are some of the factors that were identified as affecting e-learning implementation in Bangladesh.

Tedre et al. (2010) present a study of e-learning implementation at Tumaini University, Iringa University College in Tanzania. The study provides a holistic review of an e-learning implementation process that captures experiences over an 11-year period. Tedre et al. (2010) presented and discussed six aspects that impact on e-learning implementation. The aspects were: staff training, equipment, funding, pedagogical issues, networks and system administration. These have since been elaborated as: tools and equipment; connectivity; pedagogical framework; economic environment; staff recruitment and training (replacing system administration), motivation and country's educational context and content (Tedre, 2012). Details of each aspect are presented in Table 4.

On the other hand, Hogan and Kedrayate (2010) describe an innovative, blended learning approach for delivering science training throughout the Pacific. The blended learning approach consisted of virtual and face-to-face laboratories, blogs, tweets, chats, and web-based synchronous communication to create a supportive virtual classroom that encourages student success and satisfaction. The course was delivered from Fiji to Tonga, Vanuatu, the Solomon Islands, Kiribati and Tuvalu. Hogan and Kedrayate (2010) highlight the faculty and administrative barriers to e-learning implementation which were categorized as:

- Academic (Course quality, Separation from students, Student-centred teaching, Acceptance of online degrees);
- Technology (Poor computer skills, Online luddite, Fear that students have better tech skills);
- Professional (Class size, Recognition and remuneration, Time: Course development teaching, Teaching load, Time from research, Policies and procedures).

Oye et al. (2011) present a review of the challenges of e-learning in Nigerian university education based on the experience of four developed countries, the UK, Australia, Korea and France. These four had (1) vision and action plans for e-learning, (2) good government policies and financial support, (3) earmarked action programmes and set committees with sufficient funds to pursue their goals, (4) belief in research as a fundamental part of e-learning strategy, and lastly (5) awareness, training and motivational programmes. This was not the case for Nigeria. Oye et al. (2011) point out that aspects such as electricity, awareness and training of staff on the use of ICTs, motivation, bandwidth and Internet connectivity impacted on e-learning development at the university level in Nigeria.

Nawaz et al. (2011) provide a review of the current e-learning implementation trends at the university level in Pakistan. The study identifies the following factors as having an impact on e-learning development: teachers' ability to integrate technology into teaching and learning activities, development approaches and attitudes, project management techniques, user participation, user training, change management.

Bhuasiri et al. (2012) carried out a study in four developing countries, i.e. Indonesia, Laos, Thailand, and the Philippines, with the aim of identifying factors that influence the acceptance of e-learning. The study derived six dimensions (learner characteristics, instructor characteristics, institution and service quality, infrastructure and systems quality, course and information quality, extrinsic motivation) with over 20 critical success factors for e-learning implementation, as presented in Table 1.

Table 1. *Related studies about factors affecting e-learning in developing country contexts*

No.	Author(s)	Context of Study	Factors
1.	Mahmud (2010)	Bangladesh	Lack of computers and Internet connectivity, Inadequate bandwidth, lack of students' self-motivation, lack of confidence in using computers, poor competence in English, difficulty in engaging learners online, lack of awareness of e-learning, unwillingness to change learning environment, ethically harmful Internet contents, load shedding of electricity, lack of training material, software piracy, plagiarism
2.	Hogan & Kedrayate (2010)	Tonga, Vanuatu, Solomon Islands Kiribati Tuvalu	**Academic** (course quality, separation from students, student-centred teaching, acceptance of online degrees); **Technology** (poor computer skills, online luddite, fear that students have better tech skills); **Professional** (class size, recognition and remuneration, **Time** (course development, teaching, teaching load, time from research, policies and procedures)
3.	Tedre et al. (2010); Tedre (2012)	Tanzania	**[Technical Context] Tools and Equipment** (equipment robustness, spare parts, import equipment, local manufacturing, local procurement, maintenance costs, environmental protection, counterfeits, logistics, warranty terms, power stability, high-tech vs. low-tech, technical support, available stock, guaranteed access hours); **Connectivity** (environmental effects, Internet penetration, mobile networks, government monopolies, bandwidth, stability, technical support, cost); **System Administration** (system robustness, malware, remote management, centralized updates, security, support model, access and use policy, password secrecy, practical experience, basic infrastructure, compatibility); **[Educational Context] Pedagogical Framework** (active/passive learning, group work, exposure to technology, contract vs. individual, ICT literacy, value system, communication patterns, class size, open courseware, pedagogical models, parental involvement, grading models); **Motivation** (gender, income, attitude towards e-learning, language, immaterial rights cognitive development, confidence, learning style, intrinsic vs. extrinsic, workload, mental models, socioeconomic status); **Country's Educational Context** (investment incentives, aims of education, funding sources, NGO initiatives, ratio of 1/2/3ary education, government initiatives, job market, vocational needs); **Content** (modalities, languages, adaptivity/adaptability, size, interactivity, authenticity, cultural appropriateness, contextual relevance); **[Socioeconomic Context] Economic Environment** (online

			purchases, operational costs, equipment pricing, initial investment, secure income, shipping, exchange rates); **Staff Recruitment and training** (work ethic, recruitment channels, generic IT knowledge, availability, commitment, training plan, language skills, practical experience, hiring policies, accountability); **Organization and Politics** (bureaucracy, sustainability, political support, research permits, monitoring and evaluation, administrative support, openness & flexibility, long-term planning)
4.	Oye et al. (2011)	Nigeria	Mass unawareness, low computer literacy level and cost, lack of financial support to build the required infrastructure, non-availability of Internet access, recurrent cost of bandwidth, unable to afford computers, Internet connectivity, irregular and frequent interrupted power supply, lack of or inadequate trained technical personnel
5.	Nawaz et al. (2011)	Pakistan	Teachers' ability to integrate technology into teaching and learning activities, development approaches and attitudes, project management techniques, user participation, user training, change management and the context
6.	Bhuasiri et al. (2012)	Indonesia Laos Thailand Philippines	**Learner characteristics** (computer self-efficacy, Internet self-efficacy, attitude towards e-learning), **Instructor characteristics** (time response, self efficacy, technology control, attitude towards students, interaction fairness), **Institution and service quality** (computer training, program flexibility), **Infrastructure and systems quality** (Internet access quality, reliability, ease of use, system functionality, system interactivity, system response), **Course and information quality** (course quality, relevant content, course flexibility), **Extrinsic motivation** (perceived usefulness, clear direction)

1.2. Research Problem

Collaborative e-learning is one of many approaches that can positively impact on student learning in developing countries (Nihuka & Voogt, 2012). However, the significance of factors influencing students' opportunities or willingness to learn collaboratively remains under-researched (Östlund, 2008). Indeed, there is limited empirical evidence on the effectiveness of collaborative e-learning in higher education in Uganda. This present situation calls for strategies that facilitate the understanding and creation of effective learning environments. This will enhance students' critical thinking and self-directed learning abilities, aspects that are crucial in this knowledge age. Consequently, the gap is investigated in this thesis.

1.3. Research Aim, Objectives and Questions

The research described in this thesis is a continuation of a licentiate thesis (Kahiigi, 2009). The licentiate thesis aimed to explore e-learning integration in teaching and learning processes at the university level in a developing country context. This mainly focused on answering three research questions:

a) What is the current state of e-learning implementation from a developing country perspective?
b) What are the students' perceptions and experiences of the adopting and using e-learning in their learning activities in Uganda?
c) What are the factors that influence students' use of e-learning in their learning activities in Uganda?

In an effort to answer the research questions, two studies were carried out and presented in three papers: Paper 2 (Kahiigi et al., 2008b); Paper 3 (Kahiigi, et al., 2009a); Paper 4 (Kahiigi et al., 2009b). It should be mentioned that whereas Paper 1 (Kahiigi et al., 2008a) was part of the research study, providing a holistic state of art of e-learning, it was not formally included in the licentiate thesis.

The findings derived from the studies carried out at six universities in Uganda (Makerere University, Kyambogo University, Mbarara University, Uganda Christian University, Nkumba University and Kampala International University) indicated that e-learning advancement at the university level in Uganda has been affected by two key aspects which are: (1) apprehension about adopting e-learning; (2) ineffective use of e-learning to support student learning. In addition, several factors which included: inadequate and unreliable ICT infrastructure, lack of ICT skills, traditional pedagogical culture, ICT support and management support affected e-learning development. Although the students were aware of the challenges in adopting and using e-learning, they also had strong beliefs in its viability as an option to support their learning. E-learning was seen as a means for students to identify new methods of learning through which they could access resources as well as share their knowledge and experiences with their peers. The positive perception towards e-learning presented in the findings pointed to the need to conceptualize and develop an e-learning environment that can facilitate the attainment of the students' learning goals. The assumptions made in the licentiate thesis were that: (1) acceptance and effective use of e-learning within the teaching and learning processes will support student learning; and that (2) effective learning occurs when students and teachers engage collaboratively to construct meaningful and worthwhile knowledge.

Consequently, this led to a quest to explore how student learning can be supported by e-learning. Specific focus was placed on examining the assumption that effective learning occurs when students and teachers engage collaboratively to construct meaningful and worthwhile knowledge. This thesis therefore aims to explore and discuss a collaborative e-learning approach based on a peer assignment review process, responding to the main research question: ***How can collaborative e-learning support student learning in Uganda?*** The approach taken to answer the main research question was based on three objectives: (1) carrying out a focused analysis of the context in order to explore and understand the current practices of collaborative e-learning adoption and use in Uganda; (2) understanding and developing a collaborative e-learning approach based on a peer assignment review process; (3) applying and testing the peer assignment review process within a university context in Uganda.

In an effort to gain a deeper understanding of the research domain as well as provide a coherent approach to achieving the research aim three research questions emanating from the research objectives were:

1. What are the students' perception and experience of adopting and using collaborative e-learning in their learning activities in Uganda?
2. How can collaborative e-learning practices using a peer assignment review process be implemented from a developing country perspective?
3. Does collaborative e-learning using the peer assignment review process support student learning? If so, how has the learning process changed?

Three interrelated studies derived from the research process were formulated to answer the research questions.

Study 1 empirically investigated students' general perception of collaborative e-learning and identifying factors students perceive as valuable and challenging in relation to integrating collaborative e-learning in their learning process. This aimed to answer Research Question 1 above. The data collected for study 1 were derived from a survey questionnaire and discussions with students between September 2010 and January 2011. The results derived in Study 1 are presented in "Collaborative E-learning in a Developing Country: A University Case Study in Uganda" (Kahiigi et al., 2011).

Study 2 adopted a contextualized approach that involved lecturers at Makerere University, Uganda and was supported by previous work in the field. This resulted in the paper "Modelling a Peer Assignment Review Process for Collaborative E-learning" (Kahiigi et al., 2012) which discussed and modelled a peer assignment review process for collaborative e-learning suitable for developing countries as an alternative approach to supporting student learning. The paper further suggested four interrelated stages for the peer assignment review process: familiarization, assignment, review and feedback. Study 2 provided answers to Research Question 2 above.

Study 3 set out to test and validate the peer assignment review process. Focus was placed on analysing the students' experience and perception of using the peer assignment review process as part of their learning activities and to evaluate the change in the learning process. Study 3 provided answers to Research Question 3 above. The results and conclusions drawn from Study 3 are presented in the paper; "Peer Assignment Review Process for Collaborative E-learning at Makerere University: Is the Student Learning Process Changing?" (Kahiigi et al., submitted).

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│ Licentiate Thesis                            │
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│   │   Stage 1: Broad Analysis        │       │
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│ Doctoral Thesis                              │
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│   │   Stage 2: Focused Analysis      │       │
│   │  Collaborative e-learning as an  │       │
│   │       alternative approach       │ ──────► Paper 5
│   │  Study 1: Research Question 1    │       │
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│   │ Stage 3: Understanding the process│      │
│   │ Modelling a collaborative approach based │──► Paper 6
│   │  on a peer assignment review process │   │
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│   │    Stage 4: Evaluation           │       │
│   │ Testing and validating  the peer │ ──────► Paper 7
│   │   assignment review process      │       │
│   │  Study 3: Research Question 3    │       │
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Figure 1. Relationship between research questions and studies of the thesis

1.4. Research Contribution

This thesis focuses on the adoption and use of a collaborative e-learning approach based on a peer review assignment process in a developing country context, specifically focusing on higher education in Uganda. The significance of the research mainly lies in its effort to identify and suggest how collaborative e-learning can be adopted and effectively used to support student learning. This is considered as part of an answer to the call from researchers for a holistic approach to adopting and using ICT to empower students, promote change and foster the development of twenty-first-century skills (Hamel, 2010). The results of this thesis contribute generally to the field of education that relates to e-learning and computer supported collaborative learning as follows:

- The research presented in this thesis provides a theoretical and practical approach for designing and implementing collaborative e-learning activities in a university setting in a developing country context.
- The research further establishes factors that are pertinent to supporting and sustaining students' interactions in a collaborative e-learning environment. The findings provide insight to lecturers in prioritizing relationships between student learning and key factors that may influence the learning process and outcome.

The findings presented in this thesis support alternative learning strategies that act as a knowledge base for researchers and practitioners for continual improvement of strategies that facilitate student learning. The conclusions drawn from the studies that evolved in this exploratory investigation relate to two phenomena: the ways in which the peer assignment review process facilitates collaborative e-learning among students; and the role which the peer assignment review process plays in supporting student learning. The research also contributes through its reflection on a methodology based on a contextualized approach that involved concrete observations and involvement of stakeholders (students and staff) to identify their needs in order to model the collaborative e-learning approach.

1.5. Structure of the Thesis

Chapter 1 provides insights with specific emphasis on the background, research focus and motivation. This is followed by the research aim and questions, contribution of the research, overall organization and structure of the thesis and a list of associated publications.

Chapter 2 presents the theoretical background on which the research presented in this thesis is based. It focuses on key concerns relating to the learning process and various aspects relevant for understanding e-learning and collaborative e-learning as an alternative approach to learning. This chapter further introduces the peer review process in collaborative e-learning.

Chapter 3 describes the research approach and design. It describes the research setting, site selection criteria, the research philosophy and methods underpinning the data collection and design used in the studies presented in this thesis as well as the reliability and validity measures undertaken.

Chapter 4 provides a brief summary and discussion of the main findings derived from the studies undertaken in the research. The empirical data is also described

Chapter 5 concludes with a discussion of the research conducted, the research limitations and recommendations for further research.

1.6. List of Publications

Paper 1: Kahiigi, K. E., Ekenberg, L., Hansson, H., Tusubira, F. F., & Danielson, M. (2008a). Exploring the e-learning state of art. *The Electronic Journal of e-Learning 6*(2), 77-88.

Paper 2: Kahiigi, K. E., Ekenberg, L., Hansson, H., Tusubira, F. F., & Danielson, M. (2008b). Explorative study of e-learning in developing countries: A case of the Uganda education system. In IADIS International Conference e-Learning 2008, Amsterdam, Netherlands.

Paper 3: Kahiigi, K. E., Danielson, M., Hansson, H., Ekenberg L., & Tusubira, F. F. (2009a). Criticism of e-learning adoption and use in developing country contexts. In IADIS International Conference e-Learning 2009, Algarve, Portugal.

Paper 4: Kahiigi, K. E., Danielson, M., Hansson, H., Ekenberg L., & Tusubira, F. F. (2009b). An empirical investigation of students' perceptions of e-learning in Uganda. In IST-Africa 2009 Conference Proceedings, Kampala, Uganda.

Paper 5: Kahiigi, K. E., Hansson, H., Danielson, M., Tusubira, F. F., & Vesisenaho, M. (2011). Collaborative E-learning in a developing country: a university case study in Uganda, 10th European Conference on e-Learning, Brighton Business School, University of Brighton, UK.

Paper 6: Kahiigi, K. E., Vesisenaho, M., Hansson, H., Danielson, M., & Tusubira, F. F. (2012). Modelling a peer assignment review process for collaborative e-learning. *Journal of Interactive Online Learning, 11*(2), 67-79.

Paper 7: Kahiigi, K. E., Vesisenaho, M., Tusubira, F. F., Hansson, H., & Danielson, M. (submitted). Peer Assignment Review Process For Collaborative E-learning:Is the Student Learning Process Changing? *(IJACSA) International Journal of Advanced Computer Science and Applications, 3*(12).

2. Theoretical Background

Chapter 2 presents the theoretical background and analytical foundation that underscores the research framework for this thesis. The theoretical aspects highlight issues that relate to conceptualizing the learning process, learning theories and education methods in use. Further discussion on collaborative e-learning and modelling of the collaborative approach based on a peer assignment review process is presented.

2.1. Conceptualizing the Learning Process

Education is becoming increasingly vital in the knowledge society, creating societal demands for improved higher education. This has resulted in new ideas within the area of learning and teaching (Bleimann, 2004; Webster & Sudweeks, 2006). Needless to say, many approaches to learning have been suggested over the years, but most people tend to agree that learning is a process through which learners achieve their learning goals by carrying out a number of learning activities and participating in interactions to reflect their understanding (Sun et al., 2004). Thus, learning seems to result from a change in students' perception of reality related to the problem area under study as discussed in, e.g., Rekkedal and Dye (2007). Learning is concerned with how people acquire new knowledge and skills and the way in which existing knowledge and skills are modified to solve problems (Shuell, 1986). It does not involve some kind of obscure transfer of knowledge from one source to another, but rather consists of the active role played by the learner in processing the information for use (Barnard, 2006). In this vein, Shuell (1986) defines three criteria of learning: (1) a change in an individual's behaviour or ability to do something; (2) a stipulation that this change must result from some sort of practice or experience; and (3) a stipulation that the change is an enduring one.

Frankel (2009) observes that the amount of knowledge students possess substantially impacts on their learning processes and learning styles. Students learn in differing ways and the manner in which information is presented to them affects their ability to learn. Consequently, the learning style must be differentiated. In this regard, Sun et al. (2003) identify three learning styles to support students in their learning process:

- *Visual learners* learn best through seeing things such as images, demonstrations, facial expressions, and the body language of the instructor, which enable them fully to understand the content of the lesson;
- *Auditory learners* learn best by hearing things through verbal lectures, discussions, talking things through and listening to what others have to say;
- *Tactile/kinaesthetic learners* learn best through experiencing, reflecting, interacting, and doing things. These learners prefer actively to explore the physical world around them and would benefit from manipulating real objects and/or acting on them in a simulated environment.

For an effective learning experience, students need to utilize the different learning styles interchangeably during the learning process.

2.1.1. Learning Theories

Learning theories are concerned with the actual process of learning, not with the value of what is being learned. The central ideology of learning theories is that learning occurs inside a person (Kelly, 2007). Over the years, learning theories have been extensively studied and debated by pedagogical experts and educational psychologists, but detailed discussions regarding learning theories are beyond the scope of this thesis, which provides only a brief summary of the seven perspectives of learning theories. These are behaviourism, cognitive, constructivism, student approaches to learning, self-regulated learning, self-determination theory and transformative learning theory. The learning theories exemplify a learning process through which learners construct knowledge within a particular environment and thus relate to the research described in this thesis.

The behaviourism theory has been extensively studied by prominent educational psychologists such as Skinner, Pavlov, Thorndike, and Watson. Behaviourism posits that learning is an observable change in behaviour. Consequently, behaviourists assume that behaviours are observable and can be correlated with other observable events. The learning focuses on stimuli, i.e. what has an impact, and response, i.e. how the behaviour of organisms changes. Belkin and Gray (1977) emphasize the significance of conditioning in behaviourism theories. They indicate that learning occurs as a result of positive reinforcement leading to old patterns being abandoned as a result of negative reinforcement. The learning activities carried out are arranged contingencies of reinforcement under which learners construct knowledge. Although, however, behaviourism facilitates stability and certainty with respect to knowledge acquisition and learning outcomes, it also presents few opportunities for learners to express their own ideas (Hadjerrouit, 2007). The inherent challenge of behaviourism is that it does not engage the mind appropriately, thus encouraging surface learning and knowledge reproduction. Hadjerrouit (2007) asserts that behaviourism is suitable for novice learners, as they need transferable knowledge from the instructor. With respect to e-learning, behaviourism can be applied from two perspectives: (1) through a structured, deductive approach to designing an online course, so that basic concepts, skills, and factual information can rapidly be acquired by learners; (2) applying the concept of drill and practice, apportioning materials, assessing learners' achievement levels and giving external feedback (Mödritscher, 2006).

The cognitive theory depicts learning as involving the attainment of the cognitive structures through which human beings process and store information (Good & Brophy, 1990). The underlying concept reflect on learning as an internal process that involves memory, thinking, reflection, abstraction, motivation, and meta-cognition (Ally, 2004) which are mainly concerned with the changes in a student's understanding that results from learning. Shuell (1986) emphasizes that a cognitive approach stresses learning as an active, constructive, and goal-oriented process that is dependent upon the mental activities of the learner. The relevance of the cognitive learning theory to e-learning is based on the premise that learning is a process that requires learners actively to construct new knowledge. Therefore, learning environments should support learners' leverage of cognitive processes by focusing on aspects in their environment that are relevant to their learning (Clark & Harrelson, 2002). Teaching strategies in this case should force learners to use their meta-cognitive skills by reflecting on what they learn, collaborating with peers and examining their progress (Meyer, 1998). Meta-cognition serves as the operating mechanism for learners to set their learning goals and strategies, and monitor and evaluate the learning process (Clark & Harrelson, 2002).

Constructivism, a classical theory, has been studied by educationist and psychologist like John Dewey, Von Glasersfeld and David Kolb among others. John Dewey advocates for a learning process of experimental learning through real-life experience to construct and conditionalize knowledge. In this

respect, learners actively construct or build new ideas using previous knowledge and experience attained. According to Mödritscher (2006), learning can be seen as an active process and knowledge cannot be received from outside or from someone else. This learning theory has guided many educationists in providing hands-on education for learners (Gregson, 1997). Constructivism can be described from two perspectives. The first perspective relates to radical constructivism (cf. Von Glasersfeld,1996) that revolves around the idea that each individual constructs reality for him or herself. The learning process allows learners to experience an environment first-hand by providing reliable, trustworthy knowledge. Radical constructivism is based on two claims: (1) knowledge is not passively received but actively built up by the cognizing subject; and (2) the function of cognition is adaptive and serves the organization of the experiential world, not the discovery of ontological reality (Von Glasersfeld, 1996). The second perspective is based on social constructivism, which emphasizes the importance of culture and context in understanding and interpreting reality. According to Piaget (1926) and Vygotsky (1978), social constructivism view knowledge as a social product and learning as a social process. In this regard, Vygotsky's (1978) zone of proximal development theory relates the learner's level of understanding and cognitive development to social interaction and collaboration with expert guidance and capable peers. The way in which learners construct knowledge, think, reason, and reflect is uniquely shaped by their relationships with others, allowing them to engage in levels of activity that could not be managed alone (Hadjerrouit, 2007). In this context, Koohang and Harman (2005) affirm that in a constructivist environment, learning situations represent the normal complexities of the real world, allowing learners to acquire and test new knowledge. As a result, multiple perspectives and representations that promote cooperative and collaborative learning are encouraged. This type of learning facilitates critical thinking and problem-solving. The application of constructivism in e-learning relates to the teacher taking on a facilitator role and focusing on making corrections, fostering new understandings, and creating social disclosure. The learners on the other hand take on the responsibility of learning by actively participating in the learning activities placed at the centre of the learning process.

Student approaches to learning (Marton & Säljö, 1976) is the theory that looks at how students take on different approaches to study depending on the perceived objectives of their particular course. Students approach learning with either a surface (instrumental, reproductive and minimalist) or deep (striving for meaning and understanding) orientation (Marton & Säljö, 1976; Wilson & Fowler, 2005). Students with a deep approach tend to conceive of learning as transforming information, to be intrinsically motivated and to use strategies focusing on the meaning of the material to be learned. On the other hand students with a surface approach conceive learning as reproducing knowledge, are extrinsically motivated and use strategies focusing on the reproduction of those materials (Biggs, 2001; Entwistle et al., 2001). This implies that surface learning is associated with the idea that learning is about acquiring facts whereas deep learning relates to understanding the subject matter and personal development. Rodríguez and Cano (2006) affirm that students adopting deep approaches tend to have higher-quality learning outcomes.

Self-regulated learning is an active constructive process through which learners set their learning goals and engage in a process of monitoring, regulating and controlling their cognition, motivation and behavior, guided and constrained by their goals and contextual environment (Nicol & Macfarlane-Dick, 2006; Pintrich & Zusho, 2002). Learners select and use learning strategies to achieve the desired learning outcome on the basis of feedback about learning effectiveness and skills (Zimmerman, 2002). This implies that teachers need to create activities that will facilitate self-motivation and monitor the attainment of the learning goals to enable students to reflect on their learning process. Nicol and Macfarlane-Dick (2006) point out that self-assessment and feedback can lead to significant enhancement of the learning process and attainment of the desired learning outcome. The underlying notion of self-

regulated learning is the autonomy and responsibility of students in terms of taking charge of their own learning, but it should be noted that effective self-regulated learning and assessment require students to possess the necessary skills.

Self-determination theory represents the study of human motivation and personality. The theory postulates that autonomous and controlled motivations differ in terms of both their underlying regulatory processes and their accompanying experiences (Gagne & Deci, 2005). Autonomous motivation comprises both intrinsic motivation and the types of extrinsic motivation in which people identify and value a given activity and integrate it in their sense of self. Autonomous motivation creates desire and endorsement of one's actions. Controlled motivation consists of both external regulation, that encompasses one's behaviour as a function of external contingencies of reward or punishment, and interjected regulation, where action has been partially internalized and is energized by factors such as an approval motive, avoidance of shame, contingent self-esteem, and ego-involvements (Deci & Ryan, 2008). In this respect the self-determination theory offers a comprehensive approach to understanding students' learning behaviour through conceptualization and measurement of autonomy, perceived competence, relations between students, and emphasis on the role of the social context in supporting optimal or poor motivation. The self-determination theory propositions also focus on how social and culture factors facilitate or undermine people's sense of volition and initiative in addition to their well-being and the quality of their performance (Patrick & Williams, 2012).

The theory of transformative learning (Freire, 1970), also referred to as conscientization or consciousness-raising, originated from work relating to literacy education in developing countries. The process of becoming aware of our existence as historical beings in relationship to the world and to others is combined with our consciousness of the dialectical nature of this existence in the Freirean concept of conscientization. The transformative learning theory aims to foster critical consciousness among individuals and groups which facilitates development of skills that help them understand how society influences and shapes their lives. A core component of transformative learning theory is that learning begins with action, and is then shaped by reflection, which gives rise to further action. Learning is thus a continuous process, directed at enhancing the learners' capacity to act in the world and change it. Because of the historical perspective embedded in the transformative learning theory it is more concrete and applicable in developing country contexts than other learning theories which are more general and abstract.

As discussed, learning theories explain the learning process through which learners are able to acquire knowledge, but there is no single learning theory that can fully explain all types of learning. Consequently, several theories coexist and complement each other during a learning process. It should be noted that the attainment of learning concepts varies from one learner to another and the learning methods dictate the level of knowledge to be attained.

2.1.2. Methods of Education

Methods of education relate to ways through which instructors deliver instructions and learners access these instructions. As a result several learning methods have been described in the literature with a paradigm shift from traditional learning to personalized learning methods implemented by the various strategies described in this section.

Traditional learning, or face-to-face education, that involves an instructor teaching a number of learners in a class is still the standard method of teaching in most educational institutions (Fujiwara et al.,

2009). In this method the teacher delivers course material to students in the same place and at the same time. The learning method is teacher-centred, whereby the teacher focuses on providing the learning information to the students. The teacher adopts different instructional styles to cater for the students' different levels of understanding and proficiency. Traditional learning promotes human interaction between students and teachers and students and students (Arisanti, 2012).

E-learning, on the other hand, refers to the use of electronic media to support the learning process ubiquitously. Garrison (2011, p.2) defines e-learning as electronically mediated asynchronous and synchronous communication for the purpose of constructing and confirming knowledge. E-learning can be considered a natural evolution of distance learning, which has always taken advantage of the latest tools to emerge in the context of technologies for structuring education (Sangrà et al., 2012). E-learning facilitates an environment where the students take ownership of their learning. Given the various forms of learning styles, however, and the unavailability of e-learning technologies and skills, a blended approach is often adopted.

Blended learning makes use of a combination of methods that include face-to-face and online learning (Azizan, 2010). This learning method encompasses a variety of tools for stimulating and maximizing the learner's learning potential. Tayebinik (2012) affirms that utilization of technology in physical classrooms offers extra resources for the students and can be expected to enhance learners' confidence and competence as well as improve the quality of learning. This has resulted in the adoption of this learning method in various higher education institutions.

Mobile learning is defined as a form of e-learning which can take place anytime, anywhere, with the help of a mobile communication device such as a mobile phone, a personal digital assistant (PDA), iPod or any such small portable device (Kadirire, 2009). As mobile devices are becoming increasingly ubiquitous, many researchers and practitioners have incorporated the technology into their teaching and learning environments (Park, 2011).

Personalized learning is an approach that facilitates and supports individualized learning (Halim et al., 2011) and as a result personalized learning has also played an active role in improving the effectiveness of learning. Each learner has a learning path that caters for their learning needs and interests in a productive and meaningful way. This creates opportunities for students to interact with learning objects/materials that best fit their learning needs (Sahabudin & Ali, 2012). Through this process students are able to create their own learning space and take responsibility of their learning (Attwell, 2007).

2.2. Collaborative Learning Perspective

Collaborative learning is based on the notion that knowledge construction is a social event and adequate interaction is particularly important for learning and attainment of higher-order cognitive skills (Lehtinen et al., 1999). This view builds on Vygotsky's (1978) and Piaget's (1926) frameworks that emphasize social interaction as a means of individual cognitive development and learning. In fact Miyake (1986) established that individuals with different perception of a given problem tend to improve their understanding through social interaction. Lehtinen et al. (1999) further argue that deep conceptual understanding is fostered through explaining a problem to others during the process of inquiry. The resultant effect is that individual's level of understanding of concepts tends to improve in a collaborative environment.

Collaborative learning can be explained by the social constructivism that relates to individuals constructing their knowledge through the process of negotiating meanings with others within the learning community (So & Brush, 2008). The constructivist view of learning is associated with Vygotsky's (1978)

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zone of proximal development that proposes that learners' level of understanding and cognitive development is dependent on social interaction and collaboration with expert guidance and peers. This implies that collaborative learning can allow learners to derive understanding and master various aspects in a course more effectively and efficiently than when working alone. Conversely, social interaction is crucial in cognitive development facilitated through critical thinking and a process of inquiry (Arbaugh, 2007).

Notwithstanding the potential of collaborative learning in supporting student learning, there is still no common definition of collaborative learning. As exemplified by Lipponen et al. (2004), from a theoretical perspective the variation can be reflected through three metaphors of learning: acquisition, participation and knowledge creation. From their perspective, acquisition implies individual knowledge gain; participation emphasizes interaction; knowledge creation relates to continued advancement of shared knowledge.

Emanating from these metaphors various definitions have been presented in research. For example, Roschelle and Teasley (1995, p.70) define collaboration as "a coordinated synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem". Dillenbourg (1999, p.5) views "collaborative learning as a situation in which particular forms of interaction among people are expected to occur, which triggers a learning mechanism". Laister and Kober (2002, p.1) define collaborative learning as "any kind of group learning in which there are some meaningful learning interactions between learners". Liaw and Huang (2006, p.1) cite collaborative learning as "a social activity involving a community of learners and teachers through which information is acquired and knowledge shared through social constructivism approaches". It is evidently difficult to provide a generalized definition of collaborative learning as various perspectives are adopted by the different disciplines and contexts in which collaborative learning is implemented and studied, yet these definitions seem to infer joint participation and social interaction as common aspects that are required to facilitate collaborative learning situations. This thesis defines collaborative learning *as a learning method that involves students working interactively in a group to achieve their learning outcomes.*

The distinction between collaboration and cooperation is another crucial aspect that has created numerous debates. Some researchers have used and referred to these terms interchangeably, others have used counter-arguments to distinguish them. Dillenbourg et al. (1996) argue that the difference between the two terms is based on the division of tasks. In cooperation a task is split into independent subtasks and coordination occurs when results are collated, whereas in collaboration cognitive processes may be divided into intertwined layers that facilitate continued attempts to share concepts in order to achieve the desired results. Roschelle and Teasley (1995) affirm that cooperation involved division of labour among participants to accomplish a task; while collaboration involves mutual engagement of participants in a coordinated effort to solve a problem together. According to Panitz (1996), collaboration is a philosophy of interaction and personal lifestyle whereas co-operation is a structure of interaction designed to facilitate the accomplishment of an end-product or goal through people working together in groups. This distinction is echoed by Slavin (1997), who views cooperative learning as within a well-structured knowledge domain and collaborative learning as within an ill-structured knowledge domain.

It is clear that there is no easy distinction between cooperation and collaboration. This can be attributed to the fact that individuals have different purposes, goals and perspectives (Kreijns et al., 2003) for which they define these concepts. This thesis adopts Roschelle and Teasley's (1995) distinction of cooperation and collaboration, which is based on participation and the different roles played by group members during a learning activity. Of utmost importance, however, and a crucial aspect herewith is that the two concepts have similarities that are significant in supporting the learning process. Kirschner (2001)

points out that in both cases: the learning process is active, the teacher takes on a facilitator role, teaching and learning are a shared experience, students are engaged in group activities, students take responsibility for the learning process, reflection on one's contribution is enhanced through discussions and articulations of one's ideas within a group; and social and team skills are developed through consensus building. This thesis adopts Roschelle and Teasley's (1995) distinction of cooperation and collaboration.

2.3. Collaborative E-learning as an Alternative Learning Approach

In recent years, the use of the Internet has broadened and it is being adopted not only for accessing information but also for facilitating the creation of online communities in order to support interaction among individuals who share common interests and goals (Bouras & Giannaka, 2008). The adoption and use of collaborative e-learning with the Internet as a facilitating tool have created an environment that has enabled knowledge-sharing/creation, social interaction and cognitive development regardless of geographical boundaries, time and socioeconomic status. Through this learning environment, students have access to and benefit from various electronic resources and experts in various fields through synchronous and asynchronous means. Consequently, collaborative e-learning has increasingly become attractive to students and educational institutions as an alternative learning approach. Collaborative e-learning supports learning, since students can interactively customize their learning and have more control of their learning process (Cantoni et al., 2004). The underpinning aspect of collaborative e-learning is social interaction among students. Kreijns et al. (2003) believe that shared understanding through interaction is a natural way for students to learn. This implies that within a learning environment collaboration and social interaction coexist and are dependent on each other. This thesis defines collaborative e-learning *as a learning method that uses ICT to support students working interactively in a group to achieve their learning outcomes*.

Current developments in technologies which support collaborative learning have made online collaborative learning readily available and ubiquitous. Technology plays a critical role to support and mediate the interactive process (So & Bonk, 2010), through which students are able to establish social and academic support networks while becoming constructively involved in their learning activities. Through online collaborative learning students can engage in higher-order thinking skills such as meta-cognitive knowledge, reflective inquiry and epistemic agency (So et al., 2010) that facilitate examination of existing knowledge and generate new knowledge. Students are exposed to various online learning resources and conditions for quality interactions (with peers, teachers and content) in order to achieve worthwhile learning goals and profound levels of understanding (Garrison, 2007). Meta-cognitive knowledge is knowledge of one's own cognition and about oneself in relation to various subject matters (Anderson et al., 2001, p.44). Reflective inquiry involves one's own processes of thinking, knowing and learning while engaged in a conscious process of inquiry in order to understand (Lyons, 2010). Epistemic agency is construed as the individual and collective responsibility for continuous professional development via purposeful and progressive discourse with team members for the purpose of advancing knowledge (Russell, 2002, p.5).

Studies such as Kamba (2009) have also established that students engage in peer interactions in order to achieve their academic goals. Ravenscroft and Matheson (2002) reported that through dialogue games in a physics course students were able to demonstrate conceptual understanding of the course material and obtained improved grades. Prosser and Trigwell (1999) argue for a holistic approach that focuses on student learning experience, context and learning outcomes as correlated variables and processes vital for collaborative e-learning. Dutton et al. (2002) identify the need for some level of computer competence as

a predictor of student participation and achievement in online activities. Thompson and MacDonald (2005) further assert that although it is important to establish effective communication and develop social bonds, there is a need to create a secure environment that facilitates open communication to sustain the community. This implies that online courses have to be designed in such a way as to facilitate acquaintanceship and trust among students (Östlund, 2008). Some studies have also indicated that aspects such as motivation (Hollow, 2012), self-discipline and self-directed learning (Kahiigi et al., 2009b), learning styles (Fahy & Ally, 2005), and experience with ICT use (Shany & Nachmias, 2000) are facilitators of collaborative e-learning.

Then again, challenges to the effective adoption and use of collaborative e-learning have been realized in various contexts. These challenges include the unclear expectations of teachers, additional workload, slow access and no synchronous communication (So & Brush, 2008). Cantoni et al. (2004) indicate that in some instances technology and online environments can be frustrating and point to the lack of technology skills of students and teachers. Kirschner and Kreijns (2004) note that a challenge to collaborative e-learning is the lack of proper pedagogy and the application of traditional face-to-face pedagogy in online environments. Kahiigi et al. (2009b) emphasize the limited understanding of integrating technology and pedagogy as a major challenge in designing collaborative e-learning. Koponen et al. (2011) additionally view the lack of teacher training for modern educational technology, user environment, culture and language as aspects that challenge the effective adoption and use of collaborative e-learning. Other studies have reported scaffolding, group cohesion, failure to get timely feedback, persistent technical problems, time to manage online courses and motivation as having a negative effect on collaborative e-learning (Dillenbourg, 1999; Kirschner & Kreijns, 2004; Lehtinen et al., 1999). While acknowledging the benefits and challenges described above, I think it is worth noting that appropriate design strategies can eliminate most of the challenges, whereas without accurate and informed instructional design the benefits become unachievable in any context.

The collaborative e-learning approach can be summarized by Salmons's (2006) taxonomy, which is based on a belief that understanding levels of collaboration and ways to organize learning activities facilitates collective learning outcomes (Figure 2). The taxonomy of collaborative e-learning contains three key elements: level of collaboration, learning activities and trust continuum.

Trust Continuum	Low Trust ← → High Trust				
Level of Collaboration	Dialogue	Peer Review	Parallel	Sequential	Synergistic
E-learning Activities	Learners exchange ideas	Learners exchange work for mutual critique through peer review	Learners each complete a component of an assignment to form a final product	Learners build on each other's contribution to form a final product	Learners collaborate fully at all stages to form a final product

Figure 2. Taxonomy for collaborative e-learning, adopted and modified from Salmons (2006)

Salmons (2006) explains five levels of collaboration that facilitate the acquisition of new skills and transfer of knowledge:

- Dialogue, which describes a shared interactive event, typically in the form of a discussion. Learners are given an opportunity to find coherence in the ideas, plans and/or tactics needed to coordinate their efforts.
- Peer review, a process of critique and feedback between learners;
- Parallel collaboration that involves individual work. Through a process of dialogue and peer review contributions are integrated into the final product. Learners complete a component of their assignment to create a final product.
- Sequential collaboration, where each step involves individual work, and through a process of dialogue and peer review learners determine how each contribution is integrated into the final product. The final product is built upon each learner's contribution by combining their ideas to create the final product.
- Synergetic collaboration that involves a group of learners synthesizing their ideas and working through all stages of the project to plan, organize and complete the assignment together. The level of activity involves the actions taken to achieve the desired outcome at each level of collaboration.

The trust continuum on the other hand illustrates a relationship between trust and the level of collaboration. As collaboration between the learners increases, so does the level of trust. Collaboration means reliance on others' abilities and integrity, and confidence that the other learner(s) can and will share one's commitment toward meeting the learning goal of the assignment (Salmons, 2006). The peer review level for collaborative e-learning is adopted for the studies in this thesis as a means to support students learning and is elaborated in the section that follows.

2.4. Peer Review in Collaborative E-learning

The concept of students' engagement in peer review has gained increased attention in several universities in recent years. This can be attributed to the growing focus placed on collaborative learning as supporting student learning (Zhu et al., 2009). The peer review process within a collaborative e-learning environment involves students having access to their peers' work and providing each other with feedback. Consequently, feedback is seen as an integral part of a learning process through which students construct knowledge and develop their learning (Topping et al., 2000). By providing constructive feedback to each other, students are involved in their learning process and achieve greater understanding and appreciation of other students' perspectives. Students are provided with an opportunity to reflect on their peers' work and their own (Sahin, 2008), thus reinforcing key learning objectives that facilitate their understanding of what is required to improve their performance. Increasingly, lecturers' workload from the adoption and use of collaborative e-learning has been a large concern. The peer review process can potentially reduce the lecturers' workload by forcing students to review and evaluate each other. Students simultaneously provide each other with the timely feedback essential to support their learning and development (Richardson et al., 2007). Peer review processes cultivate lifelong learning and positively impact on the development of employability skills which include oral and written communication, reading, learning skills and strategies, problem-solving, decision-making, dependability, and responsibility (Cassidy, 2006). In addition, students become deep, rather than surface, learners, as they work harder with an insight that they will be assessed by their peers; students gain insights into assessment procedures and develop

expectations of high-quality work and they develop increased responsibility and autonomy; students take responsibility for their learning (Sahin, 2008).

Despite the benefits derived from implementing peer review processes, there are some challenges. For instance, students engaging in meaningful reviews that are informative and provide insight into their submissions require skills (Richardson, et al., 2007; Sahin, 2008). Peer review skills development can be linked to a learning environment that supports a process of inquiry and some level of interaction that enables students to have the confidence to inquire and share knowledge (Kahiigi et al., 2012). Indeed, Pegrum (2010) affirms that when students learn to work together in a relatively safe learning environment overseen by a teacher they are encouraged to contribute information and provide insights to peers. Students gain confidence in their peers to be able to critique and make meaningful reviews of their submissions. In a sense, the peer review process is highly dependent on the nature of interaction and the process of inquiry. Students take more ownership of their learning processes whereas the lecturer takes on the facilitator role. In addition, Cassidy (2006) and Van den Berg et al. (2006), while examining peer assessments, revealed concerns relating to the validity and reliability of grades given by students resulting from lack of expertise and potential bias. Indeed, Bushell (2006) affirms the need to moderate the peer review results in order to ensure equity owing to possible conscious or unconscious bias on the part of peer reviewers. Thus, the importance of supervised peer reviews in e-learning is emphasized. Additionally, other concerns relating to the peer review process include high levels of subjectivity; students are uncomfortable carrying out assessments as they think that it is teachers' responsibility to assess and award grades, and thus consider it an additional burden. The peer review process in collaborative e-learning is the main research issue pursued in this thesis; further discussion and elaboration will be presented in subsequent sections.

3. Research Method and Design

Chapter 3 describes several approaches and methods that have been applied in the research to analyse the adoption of a collaborative e-learning approach.

3.1. Research Perspective

The underlying research perspective presented in this thesis is based on social informatics. Social informatics is a multidisciplinary perspective that examines social consequences of the design, implementation and use of ICT in a given context. Sawyer and Rosenbaum (2000) point out that social informatics is a problem-driven research domain that assumes that ICT and the social and organizational settings in which it is embedded are mutually exclusive. The emergence of the Internet and new applications has excited considerable speculation about the social changes that could arise from widespread adoption. For example, at the Comdex Conference in 2001, e-learning was viewed as the next "killer application and was linked to several concepts like improving the quality of education and improving the quality of the workforce essential for national productivity and competitiveness (Moore & Jones, 2001). From a social informatics perspective, however, these claims are deterministic and consequences of the adoption of e-learning strongly depend on the context in which it is implemented and used (Kling, 2000). The research presented in this thesis moved away from a deterministic perspective to a contextual inquiry in order to explore and answer the research question: *how can collaborative e-learning support student learning in Uganda?* Kling (2000) asserts that it is this kind of contextual inquiry that illustrates ways in which social informatics researchers frame questions in order to develop an analytical understanding of information technologies in social life. It is thus envisaged that, through systematic empirical research, the findings in this thesis will provide insight into whether collaborative e-learning does support student learning at Makerere University.

Furthermore, social informatics provides a set of empirically-grounded principles that makes explicit particular elements of the socio-technical perspective regarding developing, deploying, and using ICT (Sawyer & Tapia, 2003). ICT is viewed not just as a tool but as part of a complex socio-technical interdependent system which includes people in various roles and relationships with other system elements (Kling, 1999). The underlying assumption is based on the roles of ICT in social and organizational change and how ICT is used and influenced by social and organizational structures and actions (Sawyer & Rosenbaum, 2000). This perspective is crucial for investigating and understanding the complexity involved in implementation and adoption of information systems such as collaborative e-learning in a developing country context.

Additionally, the research in this thesis is inclined towards a functional approach. Functionalists theorize that people can and do perform the same actions, but these actions may serve different psychological functions for different individuals (Houle et al., 2005). This implies that individuals can engage in similar activity, but their attitudes or behaviours towards the activity may satisfy different motivational functions. The functionalist approach is problem-oriented and utilizes practical goals in order to look for explanations and generate usable knowledge. The aim in using this method is to achieve understanding while continuing on a functional level to innovate and solve problems as they arise (Vesisenaho, 2007). Consequently, the research results provide insights in relation to identifying factors that influence the adoption and use of collaborative e-learning to support student learning. Understanding the integration of collaborative e-learning in a developing country context is crucial if the desired learning

outcomes are to be realized. This is important especially when e-learning progress in developing country contexts is still limited. The assumptions made in this thesis were based on contextual composition of both facts and established values that relate to the adoption and use of a collaborative e-learning approach at the university level in Uganda.

From an epistemological viewpoint such as interpretivism, understanding a phenomenon is based on the meanings that people assign to it (Myers, 1997). In this respect, interpretivism emphasizes the importance of subjective meanings and social-political as well as symbolic action in the processes through which humans construct and reconstruct their social reality (Orlikowski & Baroudi, 1991). The assumption made is that access and meaning of reality can be derived iteratively through social constructions within a given context. Willig (2001) asserts that research from a social-constructive perspective is concerned with identifying the various ways of constructing social reality that are available in a culture, to explore the conditions of their use and to trace their implications for human experience and social practice. This all points to the concept of contextualization, an aspect that was prominent in the research design.

Wicander (2011) describes contextualization as having a local problem and local resources as a starting-point, a bottom-up perspective, and considering local communication patterns in relation to information transfer. Islam (2011) affirms that knowledge can be generated iteratively in the process of investigation through purposefully constrained construction within contextually situated social environments. The research in this thesis required students and lecturers collaboratively to explore the problem and build consensus in generating the solution (a peer assignment review process for collaborative e-learning).

Ontological assumptions are concerned with what we believe constitutes social reality. The reality in this thesis is based on the interpretation, construction, reactions and actions of individuals in a collaborative e-learning environment. Although there were several activities related to the students' learning process it was only possible to study empirically and interpret some of them, and it is from these activities that the conclusions of this thesis are drawn.

3.2.Mixed-Methods Research

Mixed-methods research uses quantitative and qualitative approaches in combination to provide a better understanding of research problems than either approach alone (Greene et al., 1989). Researchers have argued that several sources of evidence should support conclusions in order to be more convincing and provide various dimensions of a phenomenon (Chen & Hirschheim, 2004; Yin, 2003). In addition, mixed methods can be crucial in investigating a complex phenomenon by capitalizing on the strengths of each approach and offsetting their different weaknesses.

Primarily qualitative research seeks to understand and interpret the meaning of situations from the perspectives of the people involved and as understood by them. Qualitative research is inductive in its approach, and thus generates theory from interpretation of the evidence, albeit against a theoretical background (Spratt et al., 2004). Quantitative research relates to measurement in terms of collecting and analysing data following the natural science model of the research process to establish objective knowledge. Simply, quantitative research makes use of numerical analysis to illustrate the relationship between factors in the phenomenon studied whereas qualitative research emphasizes the description and understanding behind the factors (Chen & Hirschheim, 2004).

In this thesis, a mixed-methods research approach that involved the use of both qualitative and quantitative research methods was adopted with data collected concurrently and data analysis mainly focusing on qualitative methods. Quantitative data analysis provided general information that was used to concretize the qualitative results. This in effect provided a holistic investigation and explanation of the phenomenon.

3.3.Case Study Research

Zainal (2007) asserts that case study research facilitates exploration and understanding of complex issues within a given research context through complete observation, reconstruction and analysis. Indeed, Yin (2003, p.13) describes case study research as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not evident. Yin (1994) notes three categories of case study, namely exploratory, descriptive and explanatory. Exploratory case studies set out to explore any phenomenon in a given context which serves as a point of interest to the researcher. Descriptive case studies describe the natural phenomenon which occur within the research context. Explanatory case studies on the other hand examine the data closely at the surface and deep levels in order to explain the phenomena. The research presented in this thesis is an exploratory case study, based on the research question: *how can collaborative e-learning support student learning in Uganda?* In an effort to answer this research question, iterative studies were conducted to probe and understand the research context.

Benbasat et al. (1987) present three reasons for the viability of case study as an appropriate research approach. First, research can be conducted in a natural setting, learning about the state of art and generating theories from practice. The research presented in this thesis focuses on getting insights on students' perception, beliefs and experiences in relation to the adoption and use of a collaborative e-learning approach in a developing country context. Second, understanding the nature and complexity of the processes taking place. In the research context, the integration of collaborative e-learning in teaching and learning activities is indeed complex, since this is a new innovation that can be accepted or rejected. Third, the case study approach is viable when few studies have been done. E-learning, especially collaborative e-learning in developing contexts, is still in the development stage (Kahiigi et al., 2008a) and only a few studies have been carried out.

Consequently, this thesis aims to explore and provide a better understanding of how a collaborative e-learning approach can be adopted and effectively utilized to support student learning at the university level in a developing country. The exploratory nature of the study and the research questions justify the adoption and use of case study research. Merriam (1998) views case study strategies as the best way to tackle problems that need good understanding before implementation. This further motivates the adoption and use of case study in this thesis as the results derived herewith are meant to provide an input into further research towards the development of appropriate strategies for successful collaborative e-learning implementation in Uganda. The multiple data collection methods permitted through the case study strategy on the other hand provide for valid results that can guide strategies for collaborative e-learning implementation.

3.4. Development Research

Development research, also termed "design experiments" or "formative research" (Reeves, 2000; Van den Akker, 1999), relates to placing educational experiments in real-world settings to establish what works in practice (Roosevelt, 2001). Development research from an educational perspective aims at determining how the design of learning environments contributes to learning (Botha et al., 2005). According to Cobb et al. (2003), development research investigates the possibilities for educational improvement by bringing about new forms of learning in order to study them. Collins et al. (2004) further discuss how development research addresses several issues central to the study of learning:

- the need to address theoretical questions about the nature of learning in context;
- the need for approaches to the study of learning phenomena in the real world rather than the laboratory;
- the need to go beyond narrow measures of learning and;
- the need to derive research findings from formative evaluation. Development research is based on solving real problems while at the same time constructing design principles that can inform future decisions (Reeves, 2000).

In an effort to develop and effectively implement collaborative e-learning enivronments, Reeves et al. (2005, p.103) emphasize the adoption of development research and characterize it as follows:

a. a focus on broad-based, complex problems critical to higher education;
b. the integration of known and hypothetical design principles with technological affordances to render plausible solutions to these complex problems;
c. rigorous and reflective inquiry to test and refine innovative learning environments as well as to reveal new design principles;
d. long-term engagement involving continual refinement of protocols and questions;
e. intensive collaboration among researchers and practitioners and;
f. a commitment to theory construction and explanation while solving real-world problems.

These characteristics are encompassed in the research undertaken in this thesis. For instance: Study 1 relates to characteristics a, e; Study 2 relates to characteristics b, c, d; and Study 3 relates to characteristics e and f.

Van den Akker (1999) affirms that methods of development research differ from other research approaches in terms of the philosophical framework and goals of these different approaches.

> More than most other research approaches, development research aims at making both practical and scientific contributions. In the search for innovative "solutions" for educational problems, interaction with practitioners ... is essential. The ultimate aim is not to test whether theory, when applied to practice, is a good predictor of events. The interrelation between theory and practice is more complex and dynamic: is it possible to create a practical and effective intervention for an existing problem or intended change in the real world? The innovative challenge is usually quite substantial, otherwise the research would not be initiated at all. Interaction with practitioners is needed to gradually clarify both the problem at stake and the characteristics of its potential solution. An iterative process of "successive approximation" or "evolutionary prototyping" of the "ideal" intervention is desirable. Direct application of theory is not sufficient to solve those complicated problems. (Van den Akker, 1999 p. 8-9)

The fundamental tenet in development research is the interaction between researchers and practitioners intended to derive design principles that underpin the effect of the intervention. This provides insights into the contextual problems and possible avenues to address the problems from an informed perspective (Van den Akker, 1999). The studies in this thesis are based on assessment and contextual investigation into the research domain, aspect typical of development research. In an effort to facilitate and support the student learning process a collaborative e-learning approach was designed. This was carried out with the involvement of lecturers and students to clarify both the problem within the research context and the eventual solution. The design process followed development goals described by Reeves (2000) as: (1) analysis of practical problems by researchers and practitioners; (2) development of a solution with a theoretical framework; and (3) evaluation and testing of solutions in practice and documentation and reflection to produce design principles.

In an attempt to explore and understand the research context, interpretative research was integrated into the development research process since it focuses on the complexity of human sense-making as situations emerge (Myers, 2009). According to Orlikowski and Baroudi (1991), interpretivism attempts to understand phenomena through the meanings that people assign to them. In this respect, although the research in this thesis was guided by principles of interpretive inquiry, development research was adopted to provide a systematic research process. In addition, the research further adopted an exploratory case study. This was because the goals dictated by the nature of development research are built around an exploratory approach.

3.4.1. Mapping Development Research and Thesis Research

The research process stages undertaken in relation to development research are summarized as follows:

- *Analysis of practical problems:* deals with evaluating the problem domain and establishing the current state in relation to the adoption and use of collaborative e-learning. This evolved from investigating the scope, benefits and challenges relating to implementing e-learning (Kahiigi et al., 2008a, 2009a, 2009b) and collaborative e-learning (Kahiigi et al., 2011) from a general perspective in Uganda. Evaluation of the problem domain was a response to the fact that albeit e-learning had gained prominence in Uganda its adoption and use was limited. Kahiigi et al. (2008b) provided an exploratory study of the current status of e-learning within the Uganda education system. The paper analysed and discussed ICT and e-learning developments in Ugandan institutions and relayed emerging issues and theoretical assumptions aimed at suitable approaches for the effective adoption and use of e-learning at the higher education level in Uganda. Kahiigi et al. (2009a) addressed pertinent issues that impact on the adoption and effective use of e-learning. This paper further set out strategies for effective e-learning adoption and use in developing country contexts. Kahiigi et al. (2009b) focused on investigating students' general perception of e-learning and identifying factors students perceive to be important in relation to the integration of e-learning in their learning process. These studies modelled the problem domain and subsequently narrowed down the research focus to a collaborative e-learning approach (a peer assignment review process) to support student learning, as presented in Kahiigi et al. (2011).

- *Development of a model with a theoretical framework*: the development of the model started with the establishment of a theoretical framework, a set of questions to be answered by the research. These

questions are based on the problem to be investigated by the study, what is known about the topic, what is not known, why it is important to know it, and the specific purpose of the study (Winegardner, 2000). A theoretical framework forms the scaffolding or underlying structure of the research (Botha et al., 2005). For the research in this thesis, the model development was initiated through theory generation of principles of a peer review process and studies carried out to evaluate the problem domain. The study presented in Kahiigi et al. (2012) relates to modelling the peer assignment review process for collaborative e-learning. This was carried out in two parts and involved the development of the peer assignment review process model and empirical testing of the process stages in relation to the student learning process. Modelling of the peer assignment review process was based on a review of previous research (Kahiigi et al., 2008b, 2009b, 2011) and feedback received from a consultative workshop held with lecturers at Makerere University in August 2011. During the consultative workshop the peer assignment review process was modelled to fit into the Makerere University learning context. The lecturers were introduced to a process containing stages that were identified at theory generation and review of previous research. The aim was not to influence the lecturers into accepting the proposed process stages, but rather to make them aware of and appreciate alternative approaches for use in their teaching to support student learning. The proposed process stage descriptions acted as initiators of the discussion that facilitated a process of examination and elaboration to fit in with the overall student learning process. The outcome was a description of four process stages; familiarization, assignment, review, and feedback (see the detailed description of peer assignment review process stages in Chapter 4 (Summary of Findings and Discussion). An initial empirical examination of the peer assignment review process stages was carried out which further improved the model.

- *Evaluation and testing of solutions in practice:* related to analysing the collaborative e-learning approach in the research context by testing the peer assignment review process model stages in relation to the student learning process. Prior to the assignment, the students were introduced to the peer assignment review process and given a walkthrough of the application. The students were made aware of their role as reviewers and the importance of providing constructive feedback during the review process. Question and answer sessions were carried out to facilitate a deeper understanding of the process and further help with regard to the peer assignment review process was sought through the class mailing list. This communication approach was adopted to facilitate quick feedback on student queries from peers and lecturers. After the tutorial sessions, students were required to complete an assignment and make their submissions in an online learning management system (Moodle). To minimize potential bias among the students, after the submission deadline, the system anonymously assigned each student two peer assignments to review. The marking criteria developed by the lecturers were discussed with the students after the submission deadline that was set when the lecturer was in class. This aimed to equip the students with a marking guide and an explanation of why each response merited a specific score. At completion of the review, the students submitted their reviews and grades were calculated and sent back to each student with feedback on their assignments. Students were awarded up to five marks for each peer review completed. Marks were deducted if the peer feedback was not provided as assigned, if the feedback was not given in a timely manner or if the feedback was deemed below average by the lecturers. The lecturers moderated the peer assignment review process. The evaluation of the peer assignment process are described and elaborated in Paper 6 (Kahiigi et al., 2012) and Paper 7 (Kahiigi et al., submitted).

- *Documenting and reflection to produce design principles*: provides for the final stage of the development research process, in which findings are organized and reported in a precise manner. For the research presented in this thesis, documentation and reflection of findings in relation to the collaborative e-learning approach using the peer assignment review process were carried out throughout the study process. Results emerging from previous studies guided the development of subsequent studies. The findings derived from the studies carried out are part of scientific papers that were presented and published as conference proceedings and journal publications in the e-learning field. Summaries of the findings are in part presented and discussed in Chapter 4 of this thesis. The research process stages undertaken in relation to development research are illustrated in Figure 3.
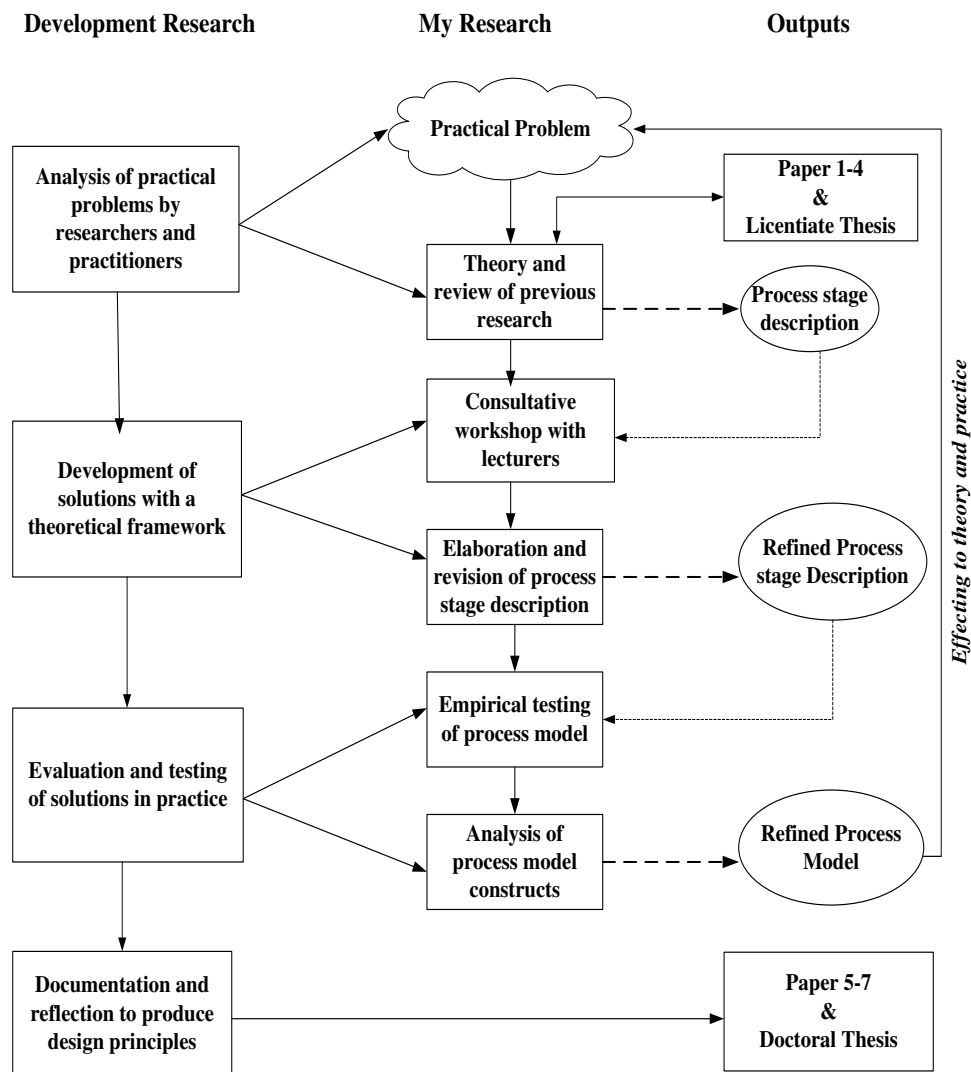

Figure 3: Mapping development research with my research

Although development research provides a suitable means to facilitate the process of understanding and developing an appropriate approach to collaborative e-learning in this context, it also poses challenges. Wang and Hannafin (2005) point out that development research is an immature methodology that has not been widely accepted in the research community. Development research generates unstructured data that

take a lot of time to analyse and report and complexity arising from engaging teachers and students in the design process that may cause bias in the research output. These challenges are crucial aspects that were considered during the course of the studies in order obtain justifiable results.

3.5. Case Selection and Setting

The cases used in the studies were selected through purposeful sampling to derive information-rich cases (Patton, 1990). The course selection was based on: students using e-learning in their learning activities and the will of the lecturer to participate and drive students' involvement in the study. Notably, although all students registered on the different courses were part of the studies, involvement in the survey was voluntary.

Students' perceptions of e-learning systems have been attested to by several studies as one of the crucial elements in providing management with better understanding of what is required for effective e-learning development and use (Yaghoubi et al., 2008). Consequently there was a need to understand how students perceive and react to collaborative e-learning since their perceptions and attitude are critical in motivating them as well as enhancing their learning. This thesis regards students as crucial in providing management and implementers with valuable insights that relate to effective collaborative e-learning development and use. It should be noted that students are the primary stakeholders and beneficiaries of this intervention, yet in most cases their participation has been excluded in e-learning implementation processes. As a result students formed the main object of study in this thesis.

3.5.1. Study 1

The empirical investigation (Study 1) presented in Kahiigi et al. (2011) was carried out with undergraduate students pursuing the Bachelor of Information Technology (BIT) and Bachelor of Medicine and Surgery (BMS) at Makerere University, Uganda. The first group of students, 700 BIT third-year students studying strategic management as part of their degree programme, regularly used computers/Internet and online resources were incorporated in their learning activities. The strategic management course aimed to expose students to business/organizational thinking that is relevant when making business decisions. The students explored fundamentals in strategic planning, considered the foundations requisite for effective strategic planning and explored implementation of strategic planning. The second group constituted of 120 second-year BMS students, taking a head-and-neck region course. These students were subjected to a problem-based approach placed at the centre of their learning activities. The course objectives were: to describe the anatomy and development of the head-and-neck regions; to describe the radiological anatomy of the head and neck; to explain the physiological and biochemical basis of the higher functions of the special sense organs in the head-and-neck region; to describe the techniques used in investigating the head and neck and describe their normal findings and to appreciate the different emergency scenarios arising from the complex nature of the head-and-neck region.

Study 1 took place between September 2010 and January 2011 with the aim of investigating the application of a collaborative e-learning concept in the learning activity. The first activity aimed at introducing students to the online learning environment Moodle, also referred to as the Makerere University E-learning Environment (MUELE). As part of the course activity students were given online quizzes and also encouraged to write journal entries about the course. This activity aimed to get the

students acquainted with MUELE. The online quizzes and journals were used to assess the students' level of understanding of the course. The second activity aimed at introducing the collaborative e-learning approach. Students were divided into groups of 10, and were required to complete a case study assignment using MUELE's online discussion forums. The results of the case study were then posted to MUELE for comments and a poster presentation within the classroom sessions. To achieve the course objectives, students were expected to attend face-to-face lectures, tutorial sessions, self-directed learning sessions, and online class assignments, and also to engage into discussion on various course issues largely through the online learning environment.

At the end of the semester a survey instrument was disseminated to students in order to obtain their perception and experience of the collaborative e-learning approach in relation to the value they derived and challenges faced. After the data was cleaned up (elimination of incomplete questionnaires with missing entries) 276 usable student responses were obtained.

3.5.2. Study 2

Study 2 reported in Kahiigi et al. (2012) was carried out at Makerere University, College of Computing and Information Sciences with 998 undergraduate students enrolled in a database management systems (DBMS) course. The DBMS course was a cross-cutting course for students registered for Bachelor of Science in Software Engineering, Bachelor of Science in Computer Science, Bachelor of Information Technology and Bachelor of Information Systems. This course was unique in that it was taken by students from various disciplines and had a large student population. This DBMS course aimed to provide students with a strong foundation in systematic approaches to design and implementation of database applications; provide practical experience and knowledge in developing database-driven applications in real-world scenarios. The course was traditionally taught by three lecturers following the same course outline with lectures held in a classroom setting on campus.

The study took place between October and December 2011 and aimed at modelling and integrating a peer assignment review process for collaborative e-learning as an approach to supporting student learning in a developing country context. The peer assignment review process was embedded within the course and marks earned on the assignment formed part of the final course evaluation. Student participation in the peer assignment review process was mandatory. Although the course had other activities within an online and traditional learning environment, the studies focused on the peer assignment review process that was introduced in the students' first assignment.

At the end of the peer assignment review process a survey instrument was disseminated to students. This aimed to solicit students' responses in relation to the impact of the peer assignment review process stages on their learning process. After the data was cleaned up 401 usable student responses were obtained.

3.5.3. Study 3

Study 3 reported in Kahiigi et al. (submitted) was carried out concurrently with Study 2 between October and December 2011 with the same students registered on the DBMS course as reported in Study 2 (see section 3.5.2 above). Study 3 aimed to evaluate and report the perceived change in learning process resulting from the introduction of the peer assignment review process. Students followed the peer assignment review process stages of familiarization, assignment, review and feedback (Kahiigi et al.,

2012). During the *familiarization stage* students were introduced to the peer assignment review process with a demonstration of the peer assignment review application integrated into MUELE. A question-and-answer session was scheduled at the end of the demonstration to facilitate a deeper understanding and elaboration of the peer assignment review process. The familiarization stage aimed to equip students with peer review skills. At the *assignment stage*, students were then given the assignment that was supposed to be submitted online via MUELE. After the submission deadline, which was scheduled to take place during the classroom sessions, the lecturers presented and discussed the marking criteria with the students. This exposed the students to possible answers and explanations that merited scoring.

The *review stage* meant students were assigned two peer submissions anonymously. The students were required to download and review the submissions according to the set criteria, in addition to making constructive comments for each review. Students were awarded five marks for each completed review and marks were deducted if peer feedback was not provided as assigned, was deemed inappropriate by the lecturer or was not provided before the review deadline. The *feedback stage* marked the end of the peer assignment review process. Students received feedback from their two peers and grades awarded by the lecturers. If students were not satisfied with the feedback received then they flagged the review which would then be moderated by the lecturer. Students sent emails to the course mailing list in case they needed help in using the application. The case study concluded with dissemination of a survey instrument.

Table 2: *Relationship between the studies, aim, course activities undertaken and outputs*

Study	Aim	Course Activity	Outputs
Study 1	General investigation of students' perception and experience of collaborative e-learning. Identification of factors the students perceive to be of value and challenging in relation to the integration of collaborative e-learning in their learning process	1. Completion online quizzes 2. Make online journal contribution 3. Online case study assignment 4. Engagement online discussion forums	Completed course activities Students' (participants') responses Analysis of factors impacting on collaborative e-learning
Study 2	Modelling a peer assignment review process for collaborative e-learning	1. Designing and modelling the peer assignment review process 2. Identification and elaboration of the peer assignment review processes 3. Development the course assignment 4. Preliminary survey (testing the process stages) 5. Development of survey instrument 6. Dissemination of survey instrument	Peer assignment review process stages Course assignment Survey questionnaire Students' (participants') responses Analysis of students' perception in relation to the peer assignment review process stages
Study 3	Test and validate the peer assignment review process Evaluating students perception in relation to change the learning process.	1. Introducing the peer assignment review process (Tutorial session) 2. Dissemination of the course assignment (Assignment 1) 3. Assignment submission 4. Assignment review 5. Feedback stage 6. Development of survey instrument 7. Dissemination of survey instrument	Course assignment Completion of peer assignment review process Survey questionnaire Students' (participants') responses Analysis of students' perception in relation to change in the learning process

3.6.Data Collection Methods and Analysis

The exploratory nature of the studies required multiple data collection methods: literature reviews, consultative workshops, informal interviews, survey research questionnaires and focus group discussions. The combined approach for data collection was based on Yin's (1994) affirmation that multiple sources of evidence within a study of the same phenomenon rest on the premise that the weaknesses in one method are compensated by the strengths of another method. This reduces the likelihood of misinterpretation of the research findings.

3.6.1. Literature Review

As a starting-point for examining and understanding collaborative e-learning from a developing country perspective literature reviews on previous studies were adopted as one of the data collection methods. The intent of the literature review was to systematically review the current state of e-learning and specifically collaborative e-learning. In this case several databases and online journals were used to search for articles related to:
- e-learning;
- e-learning and developing countries;
- e-learning benefits and challenges;
- e-learning initiatives and implementations;
- e-learning and students' perception;
- collaborative learning;
- collaborative e-learning;
- peer review and assessments, among others.

Webster and Watson (2006) assert that a complete review covers relevant literature on the topic and is not confined to one research methodology, one set of journals or one geographic location. This complies with the approach adopted for reviewing the literature in this thesis. The methodology focused on finding as many articles as possible that related to e-learning and collaborative e-learning in general and from a developing country perspective, since e-learning implementation in developing country contexts is still in its infancy (Hamtini, 2008). The analysis of the various articles formed the theoretical grounding of the papers included and partly reported in Chapters 1 and 2 of this thesis. The literature review was an ongoing process during the course of the research and started in April 2006.

3.6.2. Interviews and Workshop

In Study 1, semi-structured interviews were carried out among students taking part in the study. The interviews aimed to capture the conceptual perspective of the students in relation to collaborative e-learning. More specifically the interviews aimed to explore the level of acceptance and use of collaborative e-learning. In an effort to depict the adoption and use of collaborative e-learning, students were asked to describe their perception and experience about online versus traditional interactions during their learning activities. The interviews were scheduled between lecture breaks which lasted 30 minutes. The interviews were documented by written notes and voice-recordings. The recordings were transcribed

and analysed to extract emerging themes that were later used to develop the survey questionnaire. The interviews took place in September 2010 and December 2010.

Study 2 and Study 3 were initiated by a half-day consultative workshop involving six lecturers in October 2011. The objective of the workshop was twofold: to introduce the lecturers to the peer review assignment process as an alternative approach using e-learning in teaching and learning; and to solicit the lecturers' views and input in the peer assignment review process design. This was particularly important in terms of gaining a developing country perspective on the process. During the workshop the lecturers were required to reflect on and share their experiences, challenges, and needs in relation to the adoption and use of collaborative e-learning as well as profile their students' learning culture. In addition, the discussions also alluded to the amount of time the lecturers took to mark their students' assignments and whether the students derived value from the feedback process. This aimed to emphasize the need to adopt and use the peer assignment review process. The workshop proceedings were documented by written notes, which were later used to model the peer assignment review process.

3.6.3. Involvement, Participation and Observation

The researcher and author of this thesis (Evelyn Kigozi Kahiigi), also an employee at Makerere University, was involved in the initial e-learning implementation at Makerere University in 2002; specific focus was on formulating the e-learning policy document[10] and training lecturers in online course authoring. During the course of the research, time was spent interacting with the students, lecturers and management and discussing aspects related to the integration of e-learning in the teaching and learning processes at the university. This was important to gain a deeper understanding of the research context and interpretation of perception and experience of adopting and using e-learning. Participation and observations were carried out during the lecture sessions. The researcher was invited by the lecturers to introduce the collaborative e-learning approach and the peer assignment review process to the students. This was done during lectures, taking up one hour of the allocated lecture time. A question-and-answer session was carried out at the end of each lecture, with further involvement and support rendered to students via email. Individual sessions were also carried out with the lecturers who took part in the study to clarify and describe how the peer assignment review application works (setting the criteria, resolving conflicts, grading students, etc.) and emphasizing their role as facilitators. Support for the lecturers was provided throughout the study via email and face-to-face sessions. The various activities during the field studies are illustrated in Figures 4, 5 and 6.

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[10] Makerere University E-learning policy: http://policies.mak.ac.ug/policy/ict-policy-and-master-plan-2010-2014

Figure 4. Lecture sessions to discuss the collaborative e-learning approach and the peer assignment review process

Figure 5. Groups of students working on the assignment (left), Lecturer/student discussion - poster presentation (centre), Student explaining to a fellow student how to use the peer assignment review application (right)

Figure 6. Lecturers' consultative workshop

The researcher's involvement in the research context would suggest that the research undertaken was action research, but this was not the case as although the researcher was employed in the research context (Makerere University), she was on study leave, and thus was outside the community with minimal involvement in the research context. The researcher did not lecture on any of the courses that were part of

the research studies. The researcher's observations and participation in the studies were carried out as follows: Study 1 - September to December 2010); Study 2 and Study 3 - October 2011 to December 2011.

3.6.4. Survey Questionnaire

The choice of a survey questionnaire was motivated by three perspectives: the need to collect information in a structured format; standardizing information required to define, assess and relate variables of interest within the research model and generated hypotheses; providing a generalizable perception of findings from the population sample (Fowler, 1988).

In Study 1, a pre-test of the questionnaire was carried out on 10 randomly selected students in order to provide feedback relating to the general structure of the questionnaire and the clarity and relevance of the questions. On completion of the pre-test, feedback received from the participants was used to modify the questionnaire. A semi-structured questionnaire with open- and close-ended questions was used to solicit qualitative and quantitative responses on variables of interest, thus facilitating rich empirical data. The questionnaire items were subdivided into sub-themes/sections covering different aspects which included students' background characteristics such as: course unit, gender, email and mobile phone details, level of ICT skills, ownership of ICT (computer, laptop and mobile phone), and comparisons between classroom and online learning environments in relation to student learning process. The questionnaire also comprised open-ended questions, whereby students were asked to state the benefit and challenges faced in adopting and using the collaborative e-learning approach. The questionnaire was disseminated to students in December 2010 and participation in the survey was voluntary.

In Study 2 and 3, during the second half of the semester, a survey questionnaire was developed and disseminated in December 2011. The questionnaire aimed to capture students' experience and willingness to adopt the peer assignment review approach in their learning activities. In addition the questionnaire aimed to elicit the students' understanding of the potential pedagogical benefits. The validity of the questionnaire used for these studies was based on two aspects: first, the questionnaire items used were contextually modified from Wood and Kurzel (2008) and De Raadt et al. (2009). Second, the questionnaire was pre-tested on 10 randomly selected students in the DBMS class at Makerere University, Uganda. The pre-test aimed to examine the general structure, clarity and relevance of the questionnaire items. On completion of the pre-test, feedback received from the participants was used to modify the questionnaire.

In order to provide coherence in the responses, the questionnaire was subdivided into sub-themes/sections covering different aspects which included participants' background characteristics (gender, course unit, email address) and items relating to the peer assignment review process stages (familiarization, assignment, review and feedback). These specifically required answers to questions related to Study 2. In relation to Study 3, the questionnaire captured the overall student perception in relation to adopting and using the peer assignment review process in their learning activities. In addition, the questionnaire addressed questions related to the perceived change and impact on the learning process in relation to adopting and using the peer assignment review process. Students were required to rate their level of agreement for each question on a five-point Likert scale ranging from (5 = Strongly Agree to 1 = Strongly Disagree).

Table 3: *Overview of data collection during the research period*

Data collection method	Study	Time period
Interviews/workshop	Study 1	September - December 2010
	Study 2	October 2011
	Study 3	
Observation	Study 1	September 2010 - January 2011
	Study 2	
	Study 3	October 2011 - December 2011
Survey questionnaire	Study 1	December 2010
	Study 2	December 2011
	Study 3	
Literature review	Ongoing during the entire research period	April 2006 - May 2012

3.6.5. Ethical Considerations

Ethical considerations relate to protecting the confidentiality and anonymity of the participants (Stake, 2003) and dealing with them with respect (Creswell & Plano-Clark, 2007). Ethical issues related to the research in this thesis have been dealt with in the following manner. Lecturers were approached and requested to allow their classes to participate in the research. The design and modelling of the peer assignment process was done in consultation with the lecturers, since they were conversant with the learning style of the students.

At the beginning of the course, students were informed about the peer assignment review process that was going to be adopted as part of their learning activities. Prior to adopting the peer assignment review process, students were given a tutorial on how the application was going to be used. The benefits and challenges of adopting and using the peer assignment review process were also explained to the students. A question-and-answer session was included in the tutorial to resolve any concerns that the students had.

The confidentiality and anonymity of the students was maintained through anonymous reporting in all the papers that were generated from the studies undertaken. The nature of the peer assignment review process was based on anonymity; reviews of assignments were anonymous. Although involvement in the study was mandatory, as the assignments were part of the final course assessment, participation in the survey was voluntary and thus did not affect the awarding of marks. Students were not in any way persuaded to participate in the survey or even asked to respond to questions in a particular way. All responses reflected the personal experiences and perceptions of students who took part in the survey.

3.6.6. Data Analysis

This section describes the process of analysing data derived from studies carried out during the research process.

Study 1 aimed to investigate the adoption and use of collaborative e-learning in the students' learning activity. To analyse the various factors related to the value derived and challenges encountered in collaborative e-learning environments, content analysis was employed to examine data from the survey questionnaire and interviews in order to obtain deep insights into the phenomenon (Neuendorf, 2002; Vesisenaho, 2007). According to Randolph (2008), content analysis specifies what categories or events

occur, why or how they occur, in what contexts they occur, and the meanings of such occurrences. Creswell (1998) asserts that category formation is a key aspect in content analysis as it facilitates detailed description and development of themes through which researchers can provide an interpretation in light of their own views. Creswell and Plano-Clark (2007 p.12) further assert that a more typical content analysis study would be one in which the researcher collects only qualitative data and transforms them into quantitative data by counting the number of codes or themes. In Study 1, content analysis commenced with reading of the responses obtained from the survey questionnaire and interviews for a conceptual understanding of the data. This was followed by highlighting statements and writing down short phrases that emerged from the text, resulting in a short list of categories. After the responses had been categorized, the frequency of occurrence of each category was commuted to establish the level of impact it had on the students' perception of collaborative e-learning (Tables 4 and 5). High level of occurrence equated to high student perception of a given category in relation to using collaborative e-learning (Paper 5, Kahiigi et al., 2011).

Table 4: *Categorization: value derived from adopting and using collaborative e-learning*

Student quotations: value derived (n=195)	Emerging category	Occurrence
"I have been in a position to acquire new knowledge from various people" (Student 51); "I get to learn from different people since different people have different options" (Student 175)	Knowledge sharing and knowledge gain	41
"It makes it easier for me to grasp concepts better than my individual learning" (Student 52); "Helps when you are stuck, while trying to understand a particular concept. Helps 90% of the time" (Student 27)	Understanding course concepts	35
"Exposure to information from various students" (Student 205); "Diversified ideas and different perspectives of something"(Student 236)	Access to various views and learning material	58
"Enabled me to expand my ICT knowledge" (Student 132); "Learning to use ICT resources to further my learning" (Student 228)	Improved ICT skills	17
"Promote interaction with lectures and fellow students"(Student 112); "Promotes student-lecturer interaction and familiarity"(Student 74)	Interaction with fellow students	18
"It helps with timely access to the latest and well researched information relevant to the learning process" ;(Student 145); "Timely information, wide sources of reference and easy communication" (Student 22)	Timely information	16
"It gives you capability to freely express yourself and understand core competencies" (Student 66); "Helps me know myself better and what other students are doing"(Student 45)	Self-evaluation and confidence	10

Table 5: *Categorization: challenges encountered in adoption and use of collaborative e-learning*

Student quotations (n=189)	Challenges encountered	Occurrence
Pedagogical Issues		
"At times you don't receive feedback from your other students online" (Student 243); "Some people do not provide feedback on time thus delaying your activities" (Student 51)	Lack of timely feedback	7
"Some people are not so comfortable with teamwork" (Student 217); Lack of trust (Student 203)	Lack of self-esteem and trust	2
"Some people in a group have no idea of how to handle other people's mood which in turn causes misunderstandings among the group" (Student 52)"There is always the challenge of lack of cooperation and lack of commitment"(Student 231)	Conflict resolution	12
" I don't physically see the people I am learning from, especially on the Internet" (Student 7); "The face- to-face interaction that helps me express ideas more is lost"(Student 269)	Lack of face-to-face interaction	9
"A lot of assignments drive me nuts" (Student 108)	Workload	1
Technical Issues		
"Sometimes access to some of the websites is so slow and quite irritating to wait for minutes for a webpage to load, hence a lot of time is wasted and important information missed."(Student 161)	Inadequate bandwidth	62
"Lack of access to computers and the Internet when needed on time" (Student 195); "Lack of dedicated devices and the student ratio to machine is big"(Students 257)	Inadequate Internet/computer access	55
"Not very good computer skills" (Student 122); "Some of us are not computer literate so find ourselves left behind and slow in aspects concerning computer work" (Student 143)	Lack of ICT skills	24
"The most challenging aspect is the shortage of materials to use and also lack of help on some occasions when needed" (Student 150)	Support	15
"Buying airtime for mobile phones, accessing the Internet in cases of no power, inability to access the ICT resources" (Student 55); "Communication cost and capital to buy phones" (Student 103)	Cost	2

Study 2 aimed at modelling and testing the peer assignment review process stages for collaborative e-learning. By means of SPSS Version 16.0, descriptive statistics (means, standard deviation and frequencies) were used to analyse the questionnaire items relating to peer assignment review process stages (Paper 6, Kahiigi et al., 2012). Fourteen questionnaire items relating to the peer assignment review process stages were tested for internal consistency. The items presented a high level of reliability with a Cronbach alpha coefficient of 0.833. George and Mallery (2003) indicate that a Cronbach alpha coefficient >0.8 provides a good measure of internal consistency of items on scale.

In Study 3, data obtained from the survey was imported into SPSS for analysis. Ordinal logistic regression was used to study the effect of independent variables on the dependent variable. Ferdousi and Levy (2010) affirm that ordinal logistic regression does not require the assumption of linearity in the relation between independent and dependent variables. It estimates the magnitude of the effect of the independent variables on the dependent variable, thus making it superior in predicting the likelihood of the dependent variable (Ferdousi, 2009). Ordinal logistic regression is used for developing models to predict ordinal variables (Hoffmann, 2004).

In the study, the learning process was treated as the dependent/outcome variable, which constituted five items; conversely the independent variables constituted 18 items. Both the dependent and independent variables were scored on a Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). The ordinal regression model was fitted to each of the five dependent/outcome variables of the learning process and analysed separately in order to reveal the effect of the various independent variables concerning the peer assignment review process at 95% level of

confidence. The study had a different hypothesis for each of the dependent variables. The independent variables were categorical and thus treated as factors.

3.7.Research Rigour Measurements

The studies presented in this thesis mainly adopted a qualitative research approach adhering to a constructivist paradigm. As a result measurement of rigour in this case is discussed according to the naturalistic process quality criteria of trustworthiness presented in Lincoln and Guba (1985). The measurements of rigour for conventional scientific inquiry, that is, internal and external validity, reliability and objectivity, were thus replaced by credibility, confirmability, dependability transferability, communicability and originality.

Credibility replaces the internal validity concept which seeks to establish that the study measures what is actually intended and the truthfulness of the research results are drawn from the phenomena under scrutiny (Lincoln & Guba, 1985). This is based on incorporating correct operational measures for the concept studied (Yin, 2003). During the course of the research, credibility was strengthened in several ways. A consultative workshop involving six lecturers at Makerere University was held to solicit views and input in the peer assignment review process design. In addition several data collection strategies (data triangulation) were used: survey instruments, interviews, observations and document reviews. This strategy was adopted to eliminate the shortcomings of a single method in an effort to obtain a deeper understanding of the studied context as well as valid results. Credibility was further enforced by the student perceptions and experiences that were derived from varying disciplines (i.e. computer science, information technology, information systems and software engineering), those taking the DBMS course, students taking the strategic management course and medical students taking the head-and-neck region course. Student participation in the studies was voluntary.

Confirmability in this thesis replaces objectivity, which invokes auditing as a means to demonstrate quality in the research. Ghauri (2004) points out that data and conclusions drawn from it should be rooted in circumstances and conditions outside the researcher's own imagination and should be coherent and logically assembled. In the research presented in this thesis, the questionnaire items were adopted and revised from De Raadt et al. (2009) and Wood & Kurzel (2008); responses and photographic images of sessions between the researcher, students and lecturers are available from Evelyn Kigozi Kahiigi (the researcher) and are presented in part in section 3.6.3. The data generated from the studies has been variously published (Kahiigi et al., 2008a, 2008b, 2009a, 2009b, 2011, 2012, submitted) and discussed in this thesis provides the confirmability of the research. Triangulation of data and data sources was employed to provide elaborated understanding of the results obtained and to reduce the effect of bias. Confirmability of the research on the other hand related to the beliefs underpinning the decisions made and methods adopted, as discussed in Chapter 3.

Dependability relates to reliability, which refers to the extent to which results are consistent over time. Dependability of the findings presented in this thesis was based on the methodological approach adopted for the studies described in this thesis and the related publications (Kahiigi et al., 2008a, 2008b, 2009a, 2009b, 2011, 2012, submitted). Students and lecturers were involved in the development and refinement of the peer assignment review process. In addition, dependability of the interviews was further enforced through the application of the same interview guide to students who participated in the study. The informal interviews with students were also extended to include items in the survey questionnaire that needed further clarification in an effort to eliminate misinterpretation of the responses given. All data collection procedures were carried out in a university setting within the same timeframe.

Transferability, which corresponds to external validity or generalizability, relates to whether the findings can be valid in a different setting than that which was tested and confirmed (Yin, 2003). The peer assignment review process can be generalized to other contexts, but, given the contextualized approach adopted for the studies presented in this thesis, it is evident that the findings and conclusions cannot be generalized to another context but rather must be used to explore and make comparisons in other contexts.

Communicability refers to findings sufficiently vivid to persuade readers in the research community or field of study. The findings presented in this thesis have been tested, discussed and argued in peer reviewed conferences, journals, peer discussions and with research supervisors. Comments and inputs through these interactions have greatly enriched the findings presented in this thesis.

Originality of the research presented in this thesis is based on a contextualized stakeholder involvement approach. The development and refinement of the peer assignment review process elaborated in Kahiigi et al. (2012) was designed in consultation with lecturers at Makerere University in Uganda. This resulted in a peer assignment review model with a developing country perspective that was tested in the same educational setting.

4. Summary of Findings and Discussion

This chapter provides a summary of findings and discussions of the three studies that have been included in this thesis. In addition it describes a conceptual framework that evolved from the research.

4.1. Study 1

Study 1, reported in Paper 5 (Kahiigi et al., 2011), provided a starting-point for examining the viability of collaborative e-learning as a learning method that supports student learning at the university level in Uganda. The study investigated the students' general perception of collaborative e-learning and identified factors which students perceive to be of value and challenging in relation to integrating collaborative e-learning in their learning process. The study involved 700 undergraduate students registered for the strategic management course and 120 students registered for the head-and-neck region course at Makerere University, Uganda. At the end of the course, an online questionnaire was disseminated to students but produced only 17 completed responses (2% of the students in the study). The low response rate can be attributed to lack of time as students were preparing for their examinations. It could also be attributed to the limited access to computer facilities or to the fact that the students were not accustomed to the online questionnaire culture. These aspects raise concerns, especially if online learning methods are to be adopted and used in this context. Subsequently, 400 questionnaires were randomly distributed to the students of which 266 out of the 276 returned questionnaires were usable.

The student background characteristics indicated a gender composition of 38% female and 62% male distribution. 35% of the students were taking the head-and-neck region course, and the strategic management course accounted for 65% of the students who took part in the study. Examination of the level of ownership and accessibility of ICT revealed that 74.4% of the students had access to a shared computer and 98.1% owned personal mobile phones. The high ownership level of mobile phones can be attributed to high penetration rates and some degree of affordability among the students.

From a general perspective, although the students were aware of the challenges in adopting and using collaborative e-learning, they also had strong beliefs in its viability as an option to support their learning. Students identified the Internet and the collaborative e-learning environment as a means to access various views and a variety of learning material to supplement the course content which in turn helped them to understand the course concepts. It was noted that students in the research context have limited access to physical study materials which are in most cases outdated. Indeed, Perraton (2000) affirms that in developing countries, lack of resources, which includes the limited number of textbooks and desks or writing spaces, libraries without journals, and laboratories without equipment, remains the reality.

In relation to the collaborative e-learning activity, a typical approach adopted by students while working on their group assignments was to conduct offline discussions in their face-to-face discussion sessions and then post their work in the e-learning environment (MUELE). This resulted from the limited computer access and slow Internet connectivity that would have otherwise supported asynchronous and in some cases synchronous online discussions. This emphasizes the need for adequate computer and Internet access to drive collaborative e-learning developments. The large student numbers and the few available computers meant that students had to queue to use the computers in order to work on their assignments. A total of 74.4% students who took part in the study had access to shared computers. It is worth noting that the cost of computers in developing countries is still high, making it difficult to meet the growing demand. Instituting student loan schemes or making available low-cost computers that students can afford

could offset the inadequacy of the present computer facilities. It should be noted that 98.1% of the students in the study had personal mobile phones. In order to support the low computer facilities, one option could be to explore avenues that can support affordable mobile phone pedagogies using basic functionalities to support collaborative e-learning.

The ability to technically support and maintain the computer facilities was another aspect that impacted on collaborative e-learning adoption and use. The frequent technical problems meant that many students working on the few computers resulted in numerous failures. In addition, slow computers, frequent power outages and insufficient bandwidth to download relevant learning materials further frustrated the students.

Although the students viewed collaborative e-learning as an approach to supporting their learning, it was difficult to see their involvement in online activities during the observation period. This pointed to the fact that collaborative e-learning was a new learning approach that the students were not accustomed to and thus did not understand. Students missed the face-to-face component, which constrained their ability to express themselves in the online environment. The lack of immediacy of responses and interactive cues during dialogues resulted in the online forums not being effectively utilized. Reviewing the online forums indicated that questions posed by the lecturers through MUELE hardly received any responses and requests for contributions did not produce an increase in postings.

The study further established that different learning styles and levels of understanding of the course concepts triggered conflicts during student discussion. This led to low self-esteem and lack of trust among some of the students, affecting their online interactions. Kong (2006) has shown that positive constructive cognitive conflicts have promoted positive learning outcomes. This implies that if the conflicts within the student groups are geared towards cognitive development, then students are given an opportunity to learn from their peers. In such situations, lecturer presence is crucial in supporting and sustaining the process of inquiry.

Some students lacked adequate ICT skills to support their engagement in the online environment or access to and manipulation of the information in MUELE. This resulted in reluctance to engage in collaborative e-learning activities. Continued engagement with the collaborative e-learning environment over the semester, however, led to changes in students' attitude towards MUELE that resulted from improved ICT skills. This finding is supported by Hamid (2008), who established that users' expectations change as they become more familiar with the technology. This attitudinal change in the students interacting with the technology also relates to the concept of behaviourism. From a behaviourism perspective, learning is an observable change in behaviour that can be achieved by applying the concept of drill and practice (Mödritscher, 2006). Students also gained confidence when working in the collaborative e-learning environment and were able to self-evaluate their contributions. Lehtinen et al. (1999) recognized that interaction between participants forces them to consider their conceptions from the viewpoint of others, thus facilitating a growing awareness of their own knowledge and belief.

The students were apprehensive about engaging in collaborative e-learning activities because they were mostly concerned with perceived increased workload from sieving out information relevant to and valuable for their learning. This can be attributed to the lack of Internet literacy skills the students demonstrated, namely: ability to evaluate, critique, and make decisions about a variety of sources and content. One of the students commented that "*...many students start using ICT at university level and as a result they don't have the necessary experience to apply it to their learning process...*"; another student mentioned that "*… most students and lecturers lack skills that are mandatory for effectively utilizing technologies in their teaching and learning activities…*".

In the study it was established that students were used to receiving information from lecturers and were not encouraged to get involved in the learning activities. Whereas the concept of self-directed learning and research among the students can be perceived to influence students' learning positively (Robertson, 2011), students who took part in the study were not keen to learn independently. An inherent student characteristic in the study context is being passive learners whose role is to absorb knowledge as presented to them by the lecturers. This in fact points to the weak pedagogical culture in the research context that does not help students to take ownership of their learning and personal development.

The limited student-lecturer interaction was a major aspect impacting on collaborative e-learning adoption and use in the research context. The students pointed out that lecturers provide limited support during the lecture sessions. Clarifications outside the class were sought through peer discussion, with limited, and in some cases no, contact with the lecturer. This can be attributed to the large student numbers that prevent the lecturers from giving timely feedback on course queries, especially in the collaborative e-learning environment where lecturers have to review several student posts. The lack of student-lecturer interaction, however, could also point to lack of skills or lack of an ICT culture, lack of a clear understanding of how to conduct collaborative e-learning among the lecturers or the reluctance to adopt online instruction as lecturers fear to lose control over the learning environment. A positive finding however was the strong interaction which the students exhibited mostly relating to aspects outside classroom activities. Furthermore "informal e-learning" which encompasses the use of the Internet, access to e-content, mailing lists, etc. has created an environment through which significant learning has been realized. The assumptions drawn from Study 1 are that collaborative e-learning effectiveness can be achieved by (1) creating awareness and training lecturers on the benefits and pedagogical use of collaborative e-learning to support their teaching activities (an aspect that is lacking in this context); (2) exploiting the student-to-student interaction where considerable learning can be achieved by encouraging collaborative e-learning activities and a process of inquiry. As a result the lecturers' workload will be rationalized, and the students receive timely feedback on their queries.

Study 1 showed no variation in students' perception of collaborative e-learning from a gender perspective. This can be attributed to the fact that the students were exposed to equal study opportunities and to the emancipation drive of the "*girl child*" in Uganda. This finding contradicts Keller and Cernerud's (2002) European study which indicated that female students were more receptive to e-learning than male students. Hogan and Kedrayate (2010) established in five developing country contexts that gender was a barrier to online learning, causing students to be reluctant to participate in mixed-gender groups.

Study 1 aimed to answer research question 1: *what are the students' perception and experience of adopting and using collaborative e-learning in their learning activities in Uganda?* The study attempted to identify the factors which students perceive to be most influential in supporting their learning. These provide the necessary information to guide management in evaluating policy decisions that will result in holistic and effective approaches to collaborative e-learning implementation, since students are the main beneficiaries of education. Study 1, in common with other studies, has shown that collaborative e-learning is one of the approaches that can have a positive impact on student learning (cf. Fordyce & Mulcahey, 2012; Koponen et al., 2011; Zhu et al., 2009). Findings in Study 1 for example indicated that students were able through collaborative e-learning to identify new methods of learning through which they could access resources as well as share their knowledge and experiences with their peers, understand course concepts, access various views, interact with fellow students and acquire ICT skills. The social and communicative perspective created by an online learning environment facilitates a process of inquiry among students and enhancement of skills, leading to opportunities in the job market. Factors such as

inadequate ICT infrastructure, unreliable Internet access, and traditional pedagogical culture are, however, significant barriers to implementing collaborative e-learning. In addition, there were inconsistencies in understanding the integration of technology in teaching and learning processes for benefits to be realized. It seems that the current development and implementation of e-learning, and specifically collaborative e-learning, at the university level in developing countries is weak (Nihuka & Voogt, 2012; Sife et al., 2007; Usoro & Abid, 2007). The implications of the findings described in Study 1 were further adapted and used to design and model the collaborative e-learning approach presented in Study 2.

4.2.Study 2

Study 2 employed students to pedagogically support each other's learning through a peer assignment review process. This concept was motivated by the inherent challenge faced by most universities in Uganda and the rest of the developing world, which relates to large student numbers that prohibit lecturers from providing timely feedback and creating sustainable interactions with students regarding their class assignments. This challenge was prominent in Study 1 and thus further pursued and elaborated in Study 2 with the design of a collaborative e-learning approach using a peer assignment review process. The assumption made was that students interact and share knowledge through an online learning community. This can be achieved through a collaborative e-learning approach employing a peer assignment review process. As a result, Study 2 aimed to discuss and model a peer assignment review process for collaborative e-learning at Makerere University, Uganda. Four stages of the peer assignment review process were developed and refined (Figure 7).
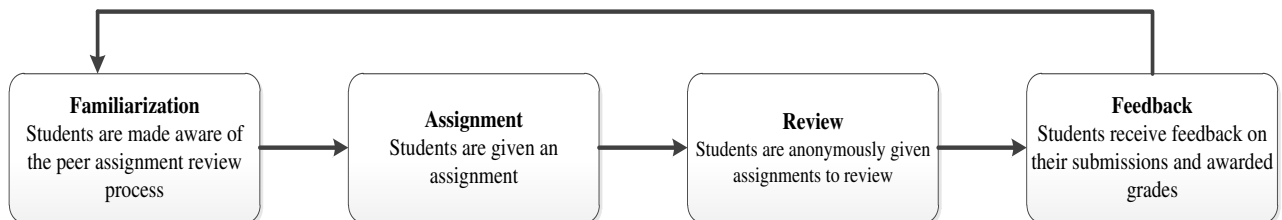
Figure 7. Peer assignment review process

The process stages illustrated in Figure 7 can be described as follows.
- **Stage 1 - Familiarization:** during this stage, students are introduced to the peer assignment review process and grading criteria are discussed. The students are made aware of their role as reviewers and the importance of providing constructive feedback during the review process. The output of the familiarization stage is skills development and understanding of the peer review process. Students are able to appreciate how the grades are awarded, students rely on their judgments, and the teacher takes on a moderator role in case conflicts arise.
- **Stage 2 - Assignment:** in this stage, the students are given an assignment. Students can engage in discussions, exchange knowledge, and share their understanding of the assignment. This can be done in the online learning environment through the discussion forums or face-to-face

interactions. Additional course resources are made available to the students to guide them while they work on their assignments. Actions required at this stage are preparation and dissemination of assignments to the students; setting a deadline for assignment submission; students' submission of completed assignments to the e-learning system. The output of the assignment stage is completed student assignments, submitted and saved to the peer review system.

- **Stage 3 - Review**: this is a major stage of the peer assignment review process; the success of the review process is dependent on students being able to produce constructive and fair reviews. The students are anonymously assigned two sets of assignments to review against a set of marking criteria. The premise of the anonymous assignment of peer review is that it reduces collusion and biased marking. Each student submission is assessed by two other students and an average grade is rewarded. In addition to the awarding of marks based on the criteria, students give constructive feedback reflecting upon and identifying the strengths and weaknesses in submissions they are assessing. The lecturer provides the final assessment and feedback on any conflicting students' reviews. Action required at this stage is the assignment of students' submissions, the review of submissions by students, the submission of completed reviews to the system, and assessment of the reviews by lecturers. The output at this stage is completed student reviews.

  In an effort to put students at ease when carrying out the reviews and giving constructive feedback, it was agreed that after the assignment stage the lecturer should discuss the assignments with the students, giving them model reviews and preparing them for the review process. This was necessary since the peer assignment review process was a new concept that the students were not used to. In addition, the students felt more comfortable carrying out the reviews from an informed perspective.

- **Stage 4 - Feedback:** the feedback stage marks the end of the peer assignment review process. Students obtain the feedback given on their submissions; students view their grades and the comments made on their assignment. Anonymity of the student reviewers is maintained at this stage to avoid conflict. Lecturers play a crucial role in resolving any conflicts and supporting students' understanding of the comments and grades they receive.

The peer assignment review process stages are iterative, in order to address issues and challenges encountered at each stage, and thus refine the process.

The peer assignment process stage development led to an empirical study (n= 401) reported in Paper 6 (Kahiigi et al., 2012). The empirical study aimed to test and capture student willingness to adopt and use the peer assignment review approach and to elicit the students' understanding of the potential pedagogical benefits. The study implemented the collaborative e-learning approach in a blended learning environment as a supplement to the traditional face-to-face learning method.

The findings indicated varying views relating to the peer assignment review process stages (familiarization, assignment, review and feedback) and how they impacted on the students' learning process. The *familiarization stage* was designed to impact on skills and knowledge of how the peer assignment review process should be carried out. The participants indicated that the introductory sessions helped them to understand the peer assignment review process, with agreement levels of 32.9% (= Strongly agree) and 47.4% (= Agree) (M = 4.04, SD = 0.926). In addition, 30.8% and 43.1% of the participants strongly agreed and agreed, respectively, that the explanations during the introductory sessions were clear and understandable. These results imply that the introductory sessions had clearly structured activities that were discussed and carried out before the assignment task. It can also be inferred that during the familiarization stage participants understood the peer assignment review process. The

relevance of the familiarization stage can be explained by the fact that the peer assignment review process was an innovation which participants were experiencing for the first time and thus required attention.

In the *assignment stage*, participants felt that it was more convenient to submit the assignment online than physically with a strong agreement level of 47.2%, (M=4.01, SD = 1.198). This could point to the fact that participants did not travel to the faculty to submit their work and that multiple online submissions could be made by the participants at their convenience with previous submissions being overridden by the system before the deadline. The online submission of assignments required less effort than paper submission. Other results indicated that 46.4% of the participants strongly agreed (M = 4.20, SD = 0.990) that instructions for uploading the assignment were easy to follow and 45.3% of the participants on the other hand agreed that the instructions for reviewing other students' work were easy to follow. This shows that the peer assignment review process was well articulated and implemented, as a result of inclusion of an instruction manual and demonstrations of the peer assignment review application to students before the task. It was also observed that students sought help from their peers when using the peer assignment review system, thus facilitating a support mechanism among the students.

Participants were asked for their opinion regarding their experience and perception of the *review stage*. The findings indicated that 45.9% of the participants (M = 4.06, SD = 0.964) agreed that the review criteria and objectives were clear, thus making reviewing other students' work simple. This can be attributed to the lecturers having discussed the review criteria and probable answers with the students before they started the review process. Similarly, 48.1 % of the participants (M = 3.99, SD = 0.941) agreed that the peer review process helped them to reflect better on their coursework. Also, 39.2% of the participants agreed that they were able to improve on the quality of their assignment as a result of participating in the peer review process. An implication of these findings is that by critiquing other students' work participants were able to make comparisons, thus achieving better understanding of their peers' perspective and their own in relation to the course concepts. Cross-checking one's own understanding is an essential step in the learning process. Indeed, as established in Eryilmaz et al. (2009), knowledge development and understanding is enforced when students reflect on and amend their own work.

Participants' perception in relation to the *feedback stage* indicated that whereas 32.8% of the participants (M = 3.70, SD = 1.255) strongly agreed that the feedback about their assignment came earlier from peers than from the lecturer, 42.2% of the participants (M = 4.01, SD = 1.033) strongly agreed that they would rather receive comments from the lecturer. An indication of this finding is that although the peer assignment review process delivered immediate feedback, the feedback received was not comparable to or better than that from the lecturers. It was observed that some students made brief comments, and in some cases students posted the same comment to two different assignments. The feedback and comments made by peers were not valued highly by most of the students even though they were guided by the marking criteria. This can be attributed to the fact that students lacked experience of reviewing and thus made inappropriate comments. It could also point to the lack of competence, experience, and skills the students had or that the participants' experience of the peer assignment process was influenced by their traditional experience involving lecturer scaffolding. Encouraging greater accuracy of reviews could increase this value as students will review cautiously and from an informed perspective.

The findings further indicated that the peer assignment review process can be justified from a pedagogical perspective where students' actively participate in the learning process through making decisions on their peers' work. The identification of conflicting reviews and the use of lecturers to moderate these conflicts provides for the fairness and reliability of reviews. In this case the lecturer takes on an active moderator role, whereas the students benefit from resolving confusions resulting from

conflicts. Although the students derived benefits, such as evaluating peers' work, timely feedback and interaction with peers, these aspects were not apparent to all students. The benefits should be explained to the students in order for the peer assignment review process to be adopted and used effectively.

4.3. Study 3

Study 3, reported in Paper 7 (Kahiigi et al., submitted), was geared towards studying the relationship between the peer assignment review process and the change in the student learning process. It was envisaged that students would learn from each other and look at different perspectives presented by peers in order to improve the quality of their work and enhance their understanding of the course concepts (Chung-Hsien et al., 2011) supporting their learning. The results derived from the study indicate that the effect of the peer assignment review process on the students' learning process was limited, accounting for the insignificant perceived change in the students' learning process.

Results indicated that although the assignment inspired students to reflect on the use and understanding of the course concepts, the peer assignment review process did not make then interested in the topic. This can be attributed to the fact that peer assignment review process was not aligned with the course objectives, thus affecting the learning outcome and students' expectations. Biggs (1999) refers to the term "constructive alignment" whereby the desired learning outcomes are communicated to students, and learning activities and assessment tasks are coordinated to achieve these outcomes. Worth noting is that the peer assignment review process was a new concept that the students and lecturers were not used to and constructive alignment between the learning outcomes, assessment evidence and learning experiences was lacking.

In addition, results show that the assignment inspired students to search and learn beyond the material provided in class, and the peer review feedback did not have added value for the students. It was observed that although the feedback received from the students was timely in some cases it was unsatisfactory. 97% of the student assignments were moderated by the lecturers, based on the fact that the students were not satisfied with the reviews they received from their peers. Studies such as Sharpe and Benfield (2005) and Ramsey (2003) on collaborative and peer learning observed that it is difficult to engage students beyond interaction and information-sharing to constructive peer reviews. It was further noted that the peer assignment review process did not motivate students to improve their work. The educational culture of the research context and in most developing countries is lecturer-centred with lecturers as providers of information and students as receivers of information. In an effort to leapfrog students into the new collaborative e-learning dimension, there is a need for lecturer scaffolding to support and drive the learning process. The lecturer assumes a facilitator role encouraging focused learning and facilitating constructive interactions and reviews during the learning process.

As reported in Cassidy (2006), students expressed concern regarding their ability and that of others to carry out the reviews. Willey and Gardner (2010) view feedback as arguably the most important part because of its potential to affect future learning and student achievement. If feedback is not focused correctly (to inspire and motivate students to learn rather than circumvent their reflection and thinking) it may encourage dependent rather than independent learning. Fordyce and Mulcahey (2012) established that students do not naturally take to the role of critic, attributing it to students shying away from commenting on their peers, their fear of alienating fellow students or their lack of the critical skills necessary to carry out the reviews. This points to the need to empower students and create opportunities among students to practice reviews in order to develop the required peer review skills. Walker (2001) reports a change in students' attitude towards a positive perception of the peer review process resulting

from these opportunities. Increasing students' familiarity with the peer review process and improving their skills can alleviate the perceived difficult sense of responsibility among them (Cassidy, 2006). This implies that the introduction of the peer assignment review process should be gradually implemented to allow for effective and sustainable change in the learning process. From a technology acceptance perspective it can be inferred that a person using a technology or an application should find it free of effort (Davis et al., 1989). In some instances technology and online environments can be frustrating, pointing to the lack of technology skills among the students (Cantoni et al., 2004), affecting the level of student involvement in the peer assignment review process. Zhu et al. (2009) assert that computer competence is a significant predictor of students' achievement in online courses.

The findings indicate that effective sharing and development of knowledge and information through the peer assignment review process had a negative significant effect on the students' learning process. This finding contradicts findings reported in Richardson et al. (2007) that the peer review can foster an authentic learning environment in which students actively construct knowledge through reading, questioning ideas and reflecting on their own and peers' work. Wilson (2004) adds that developing shared understanding among students is achieved through group consensus on knowledge, communicating and discussing different ideas and receiving feedback. As a result students learn by explaining their ideas to peers while participating in the process of inquiry. It is through this process that cognitive functions such as critical thinking increase, thus facilitating the learning process (Richardson et al., 2007).

Developing a community provides motivation for learning, encourages engagement and reduces isolation (Gray & Smyth, 2012). Students interact to construct meaningful and worthwhile knowledge, an aspect that is crucial in any learning environment (Garrison, 2007). This confirms previous claims that student interaction can be related to deep learning, critical thinking, higher cognitive development and long-term knowledge retention (De Wever et al., 2006). It was observed that the pedagogical culture in the research context did not support such collaborative/interactive engagements, probably because the sense of community and connectedness resulting from the interaction in the peer assignment review process was not significant in providing a sense of belonging among students. The results indicated, however, that participants liked reviewing other students' work and comparing it with their own. This result may be related to the fact that students were curious to ascertain how other students had performed in the assignment. This creates competition among students which can lead to improved learning (Takaoka et al., 2012). In addition, Pare and Joordens (2008) affirm that reviewing peers' work encourages deep analysis of students' own work, resulting in improved quality of work.

Study 3 revealed that the peer assignment review process had limited significance in relation to the students learning process. This was attributed to challenges such as: lack of review skills, absence of lecturer scaffolding, low ICT literacy levels and change management. Although these aspects are apparent in the developed country context, they have continually been overlooked in developing country contexts.

4.4.Conceptual Framework for E-learning

Over the past few years, universities in developing countries have taken steps to integrate e-learning into their teaching and learning processes to support and improve student learning, but only a few universities have achieved real benefits from implementing e-learning and others are still struggling to attain minimal educational value (Kahiigi et al., 2009a). In the light of previous experience and the research undertaken in this thesis, various factors have been identified as having an impact on e-learning advancement. This section describes a conceptual framework that highlights factors pertinent in supporting and sustaining students learning in an e-learning environment in a developing country context, as indicated in Figure 8

and Table 6. The framework is inclined towards a blended learning paradigm, combining face-to-face learning and e-learning approaches.

The conceptual framework has three interrelated aspects: institutional readiness, technology/infrastructure readiness and pedagogical change. These aspects have evolved throughout the research study. The technology/infrastructure readiness and pedagogical change aspects featured prominently in the licentiate thesis (Kahiigi, 2009), whereas institutional readiness has been emphasized in the studies that make up this doctoral thesis. Each aspect can be incorporated in various ways and can be informed by the other aspects within a given context. It can be inferred that institutional readiness is an indispensable foundation for e-learning in a developing country context. If issues related to institutional readiness are in place then factors related to technology/infrastructure readiness and pedagogy change arise. For instance, if the institution does not have funds to procure computers and bandwidth then students cannot engage in online learning activities that involve asynchronous or synchronous interactions between students and students or students and lecturers. Additionally, in an e-learning environment, technology/infrastructure readiness enhances and supports pedagogical change. Integrating the use of computers in the curriculum is less likely to make an impact on student learning if the use of the computer is not considered a component of instruction. Computer use should not be treated as a separate entity but should be considered an integral part of instructional delivery.
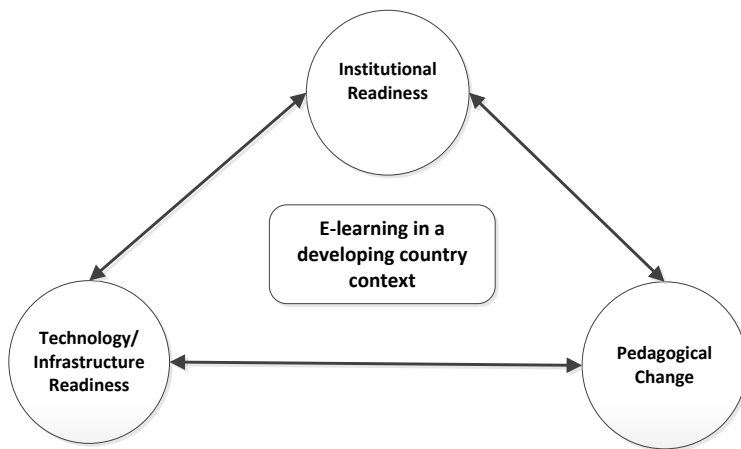

Figure 8. Conceptual framework for e-learning

4.4.1. Institutional Readiness

Institutional readiness refers to an enabling organizational environment that supports the development and sustainability of e-learning. This involves: formation and operationalization of policies (IR1) to support the development of e-learning, provision of finances (IR2) for acquisition and maintenance of technology/infrastructure and resources, recruitment and training of technical support staff (IR3), training of lecturers and students (IR4), change management (IR5), and management support (IR6). The Makerere University e-learning policy (2003) stipulates that:

- *All students shall be required to take the prescribed introductory level module(s) as a requirement for e-learning.*
- *All academic staff shall be required to demonstrate the prescribed level of competence for content development of e-learning.*
- *All new staff shall undergo training in education technology techniques with emphasis on e-learning*

- *Units shall develop and nurture complementary methods of teaching and learning to e-learning as a medium of distance learning both within campus and outreach /up-country centres.*

In the research presented in this thesis it was observed that although the policy drivers were in place the mechanism for deploying e-learning as an integral part of the teaching and learning process was lacking. The introductory level modules that are meant to equip students with ICT skills and introduce them to the e-learning approach have not been implemented at the colleges. The Makerere University e-learning progress report (Makerere University, 2012) asserts that over 500 lecturers have been trained in e-learning content development and 372 online courses are active. Review of the MUELE revealed that the active online courses were limited to posting course notes and announcements with limited use of the learning functionalities provided by the learning management system. This could mean that lecturers are not adequately trained or confident enough to work in the e-learning environment. In this respect it can be concluded that the lack of management in terms of enforcing policies has greatly impacted on e-learning and, in the present context, on collaborative e-learning development at Makerere University (IR1). An aspect that can be implemented in this context to motivate lecturers to adopt and use e-learning in their teaching activities is to certify the e-learning training course. E-learning training course certificates can be used to support promotions and professional development. It should be underscored that lecturers and students need to be trained in the use of e-learning for its benefits to be realized in the developing country context (IR4).

To date, the Makerere University E-learning Unit, under the aegis of the College of Education and External Studies, has only filled two out of the eight proposed positions. The prolonged delay in staffing inevitably contributes to the low advancement of e-learning at Makerere University (IR3). In addition, a proposal to establish college e-learning committees as a way of encouraging a bottom-up approach to embracing e-learning has not been adopted. The proposed roles of the college e-learning committees were to operationalize the e-learning policy, monitor and evaluate online courses, identify courses suitable for becoming online courses and provide an advisory role (Makerere University, 2007). The lack of management to recruit and fill the approved e-learning positions and operationalize the college e-learning committees points to the lack of priority e-learning development is given.

E-learning has prospects for growth that can only be realized when all the needs and concerns of stakeholders are addressed (Wagner et al., 2008). In 2002, with facilitation from Delft University of Technology, the Netherlands, the e-learning project at Makerere University in 2002 was initiated. The reality facing the project at the time was introducing e-learning into an environment where there was a strong preference for the traditional face-to-face learning method and where administrative computing had just been implemented. E-learning was seen as a disturbance of the status quo ("why reinvent the wheel?"), it required time to organize and manage online courses, and also threatened jobs. As a result it was inevitable that adoption of e-learning was going to be slow if not rejected altogether. Stoltenkamp and Kasuto (2011, p. 720) report that "ICT has penetrated tertiary education, but has had more impact on administrative services (e.g. admissions, registration, fee payment, purchasing)" than on the pedagogic fundamentals of the classroom. Managing change (IR6) is crucial in this context, especially when lecturers do not understand or see the potential and benefits e-learning creates.

In relation to financial resources (IR2), return on investment is another important factor to consider especially in developing countries which experience financial constraints. There is a need to determine whether collaborative e-learning receives sufficient investment to support its development and sustainability. Financial resources should be in relation to the cost of technology/infrastructure acquisition and maintenance, course development, time, resource acquisition, training, support and administration.

Management plays a crucial role in supporting the development and implementation of e-learning, through driving the operationalization of policies that support collaborative e-learning adoption or by providing financial support to build the supporting infrastructure and resources for collaborative e-learning development.

4.4.2. Technology/Infrastructure Readiness

Technology/infrastructure readiness relates to the availability of supporting technology/infrastructure resources that will facilitate the development and use of the collaborative e-learning environment. The basic requirements for implementing collaborative e-learning include adequate and reliable bandwidth (TR1) and Internet connections and access (TR3), reliable electricity supply (TR4), access to computers (TR2), access to e-learning environments/learning management systems (TR5) and technical support (TR6).

The studies carried out and presented in this thesis established that the low computer-to-student ratio has had a negative effect on the advancement of e-learning at Makerere University (TR2). It was envisaged that through the ICT Policy and Master Plan 2010-2014[11] students' computing resources would be increased through the setting up of central computing centres like computer labs and computer kiosks to act as a focus for student access. Suhail and Mugisa (2007), however, affirm that as technology changes computers in labs become obsolete. The Makerere University ICT Policy and Master Plan 2010-2014 further explores possibilities of loan schemes for student ownership of computers to ease the load on these pool facilities, but to date they have not been implemented. Despite the growing body of evidence suggesting that investing in ICTs is cost-effective, the total cost of ownership (maintenance, upgrading, skills development, etc.) of ICTs in developing countries is high. This has resulted in limited ICT infrastructure in most developing countries (Ekundayo & Ekundayo, 2009).

Like most universities in Africa, Makerere University has a scarcity in terms of bandwidth (TR1). This has challenged the development of several initiatives such as e-learning. Adam (2003) attributes this to academic institutions' accessing international circuits that require high licensing fees for connection. The current bandwidth at Makerere University is 68mbps for 630USD/mbps and is shared by over 30,000 students and 2000 staff. At peak hours, mainly between 8.00 a.m. and 5.00 p.m., the Internet connection (TR2) is extremely slow. In order to leverage the slow Internet connectivity, Makerere University has configured the e-learning application to run on an internal network, but students and lecturers need to access the Internet for additional educational resources.

The frequent electricity outages (TR4) have also had a negative effect on the adoption and use of e-learning. Although backup generators are available in some units, the generators cannot support the load and the recurrent fuel cost of running the generators is high. It is usual to find units with generators not powered up because there are no funds to buy fuel. In some cases generators are run for short periods of time to support critical university network services. It is therefore underscored that power and bandwidth should not be taken for granted in a volatile environment like Makerere University if e-learning is to be adopted and sustained.

Technical support (TR6) is another aspect needed to sustain e-learning in a developing country context. For instance it was observed that some computer labs had numerous faulty computers resulting from improper use, electricity stocks and lack of regular service maintenance. One of the computer labs

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[11] Makerere University ICT Policy/Master Plan (2010 - 2014):
http://policies.mak.ac.ug/sites/default/files/policies/ICT_Policy_Master_Plan_2010_2014.pdf

had one technical staff member who had other duties assigned to him and thus was not fully available to repair the computers. Given the limited access to computers at Makerere University, if several computers are faulty then the students' access is further reduced. Therefore there is a need to recruit and train technical staff to manage and maintain functional computer labs. Lack of computer access impacts strongly on students' adoption and use of e-learning.

It was noted from the research that most e-learning implementations in developing countries focus on the technology/infrastructure readiness aspect. The underlying belief is that provision of supportive technology/infrastructure equates to e-learning (Kahiigi et al., 2008b). Successful e-learning implementation, however, depends on understanding the integration of technology and pedagogy.

4.4.3. Pedagogical Change

It was inferred that the pedagogical culture at the university level in Uganda is strongly influenced by the curriculum. This curriculum largely focuses on lecturers as the providers of knowledge and students as recipients. Hofstede (2001, p.10) defines "*culture as the interactive aggregate of common characteristics that influence a human group's response to its environment. Culture determines the identity of a human group in the same way as personality determines the identity of an individual. Moreover, the two interact; 'culture and personality' is a classic name of psychological anthropology*". It was observed that students' behaviour and attitude were generally passive in nature as they constantly required guidance from the lecturers. This pedagogical culture is rigid and does not encourage self-directed research and learning (TR4). As a result students tend to concentrate on rote learning to replicate course notes in order to pass their tests and exams, thus becoming surface learners. The need is to provide students with learning activities that will facilitate a process of inquiry through which they can create and share knowledge. This calls for a change in the pedagogical approach which involves re-contextualization of knowledge dissemination and learning situations to support student learning.

In addition there is a need to focus on increasing the quality of education, especially from the perspective of flexibility, diversity and engagement, to facilitate reflective and high-order thinking. Indeed, the UNESCO ICT Competency Framework for Teachers[12] lobbies for a change in the curriculum that supports the creation of new knowledge which requires skills such as problem-solving, communication, collaboration, experimentation, critical thinking and creative expression (TR5). This change aims to emphasize the depth of understanding by students and thus supports their learning process. Nilsson and Nilsson (2011) on the other hand propose an active learning approach for special education that encompasses situated learning situations which combine theory and practice. Consequently students apply knowledge gained from the course as a way of emphasizing learning. It is presupposed that a change in curriculum that integrates these aspects is crucial for the development of e-learning in the research context. The change, however, should be introduced within the lower education curriculum, to facilitate acceptance and continuity at the university level.

Lecturer competence (PC2) relates to the level of understanding and possession of skills to prepare and design course content that will support students learning with or without technology. Nichols (2003) asserts that selecting a pedagogical approach is more important than the selection of the technology itself. Wicander (2011) further points out that focusing on technology is a barrier to successful ICT in education. The reinforcement of this aspect requires creation of awareness and training lecturers in the pedagogical use of technology to support student learning. An inherent challenge observed in the studies

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[12] UNESCO ICT Competency Framework for Teachers: unesdoc.unesco.org/images/0021/002134/213475e.pdf

was that e-learning was more of a problem with multiple facets than a solution. This can be attributed to the lecturers' lack of ability and skill to integrate e-learning in the students' learning activity. For instance, the peer assignment review process was a new concept which the lecturers were not used to and they struggled to manage the students' learning process. It is thus affirmed in this thesis that students rely on the lecturers' skills and competence to drive the adoption and use of collaborative e-learning. Lecturers need to understand the integration of pedagogical aspects and technology for learning to take place effectively in an e-learning environment. As a result there is a need to formulate strategies that will encourage the adoption of e-learning. These could be in the form of training lecturers in computer/ICT skills development, training lecturers to ensure that they are proficient in ICT pedagogy or tagging promotions and acknowledging lecturers who innovatively apply e-learning in their courses.

Lecturer presence (PC1) is another factor pertinent in supporting students in an e-learning environment. Lecturers' presence is viewed as a binding element in creating a community of inquiry for educational processes (Garrison et al., 2000). This is especially the case at Makerere University, where students rely heavily on teacher support in order to achieve their desired learning goals. Indeed, Gilbert and Dabbagh (2005) established that in an e-learning environment the number and type of facilitator postings increased the level of interaction between students and enhanced student satisfaction. Students mentioned that they lacked lecturer support within both the e-learning environment and the traditional face-to-face learning environment. The assumption, therefore, is that lecturer presence can significantly influence the acceptance and eventual use of e-learning.

Table 6. *Factors supporting e-learning in a developing country context*

Aspects	Factors
Institutional Readiness	IR1. Formation and operationalization of policies IR2. Finance IR3. Recruitment and training of technical support staff IR4. Training lecturers and students IR5. Change management IR6. Management support
Technology/Infrastructure Readiness	TR1. Bandwidth TR2. Computer access TR3. Internet connection and access TR4. Electricity supply TR5. E-learning environment TR6. Technical support
Pedagogical Change	PC1. Lecturer presence PC2. Lecturer competence PC3. Student-student interaction PC4. Self-directed learning and research PC5. Curriculum change

4.4.4. Aggregation of Factors Impacting on E-learning Implementation in Developing Country Contexts

The factors identified in the six studies and the thesis, such as resistance, bandwidth, ICT literacy, power outages, access to computers and technical support, are common in all contexts. Resistance to change is the result of limited computer skills and low use of the Internet as a learning tool (Hogan & Kedrayate, 2010), lack of confidence in using computers, preference for traditional face-to-face learning (Bhuasiri et al., 2012; Mahmud, 2010), concerns regarding teachers' ability to integrate technology into teaching and

learning activities (Nawaz et al., 2011), lack of confidence in the security of e-learning material and equipments and lecturers' fear of sharing their lecture material (Tedre et al., 2010). In this thesis resistance to adopting e-learning can also be attributed to lecturers' fear of losing control of their classes and worry about job security, but it should be noted that resistance to change can be leveraged by creating awareness among students and lecturers, as reported in Mahmud (2010) and Oye et al. (2011).

Furthermore the studies reveal that bandwidth and computer access were predominant factors affecting advancement of e-learning in the contexts. Mahmud (2010) points out that because of bandwidth and connectivity limitations downloading content is slow and creates frustration among students. Local content repositories that can be accessed via the internal network can provide a possible solution to the challenges created by inadequate connectivity. Limited access to computers demystifies the notion that e-learning creates flexibility if students in developing country contexts cannot access learning anytime and anywhere because they have to share the few computers available to them (Suhail & Mugisa, 2007).

Frequent power outages was another factor that negatively impacts on e-learning developments in the various contexts. Oye et al. (2011) affirm that this is a major setback for technology advancement in every aspect of the economy including education.

ICT literacy and technical support are other factors that are common in all the studies that were reviewed in section 1.1.10, as well as in this thesis. Students and lecturers need to have basic ICT skills to work effectively in e-learning environments. Given the limited number of computers used by numerous students with varying ICT skills there are bound to be failures; frequent power fluctuations also affect computers and there is a need for skilled technical staff to support the available ICT infrastructure. Indeed, Tedre et al. (2010) emphasize the importance of trained technical support as they found that the lack of skilled technical staff who could manage the system led to system irregularities and malfunction. Bhuasiri et al. (2012) affirm that quality infrastructure and systems is one of the important elements required to ensure proper functioning of e-learning environments.

It is worth mentioning that proficiency in English did not have an effect on e-learning development at Makerere University. Hogan and Kedrayate (2010) and Mahmud (2010) reported that proficiency in English affected adoption and use of e-learning in their study contexts. Mahmud (2010) pointed out that most students find it difficult to read online content which is mainly in English. Hogan and Kedrayate (2010) on the other hand have developed teaching material that can accommodate a diversity of languages, thus pointing to the need to localize online content for a given content.

In addition, Hogan and Kedrayate (2010) pointed out that gender can also be a barrier to online learning, causing students to be reluctant to participate in mixed-gender and intercultural groups. This was not the case at Makerere University as both female and male students were exposed to the learning conditions and students interacted and engaged in mixed-gender discussion groups.

Tedre et al. (2009) assert that no two developing countries are alike. It is evident from the six reviewed studies (Bhuasiri et al., 2012; Hogan & Kedrayate, 2010; Mahmud, 2010; Nawaz et al., 2011; Oye et al., 2011; Tedre et al., 2010) in section 4.4.4 and the studies that make up this thesis that some factors were unique to a given context whereas others overlapped. It should be further noted that addressing these factors depends on the needs and priorities in a given context. The impact these factors create differs in different developing country contexts. Consequently, there is no doubt that e-learning must be implemented to take into consideration the needs of a given context (Nawaz et al., 2011) to facilitate its development and sustainability.

On the basis of the factors identified and discussed in section 1.1.10 and those that were identified during the course of the research undertaken and presented in this thesis the following aggregation of factors affecting e-learning development in developing countries is presented in Table 7. A total of 129

factors have been identified as having an impact on e-learning in developing country contexts. The factors are categorized according to the conceptual framework (see Figure 8).

Table 7. *Aggregation of Factors Impacting on E-learning in Developing Country Contexts*

Aspects	Factors identified in the thesis	Remarks
Institutional Readiness	*IR1. Formation and operationalization of policies* *IR2. Finance* *IR3. Recruitment and training of technical support staff* *IR4. Training lecturers and students* *IR5. Change management* *IR6. Management support*	Factors identified in this thesis
	IR7. Work ethic IR8. Generic IT knowledge IR9. Availability IR10. Commitment IR11. Training plan IR12. Language skills IR13. Practical experience IR14. Accountability IR15. Bureaucracy IR16. Sustainability IR17. Political support IR18. Research permits IR19. Monitoring and evaluation IR20. Openness & flexibility IR21. Long-term planning IR22. Online purchases IR23. Operational costs IR24. Equipment pricing IR25. Initial investment IR26. Secure income IR27. Shipping IR28. Exchange rates IR29. Investment incentives IR30. Aims of education IR31. Funding sources IR32. NGO initiatives IR33. Ratio of 1/2/3ary education IR34. Government initiatives IR35. Job market IR36. Vocational needs IR37. Programme flexibility IR38. Context IR39. Project management techniques IR40. Awareness IR41. Acceptance of online degrees IR42. Recognition and remuneration IR43. Clear direction IR44. Online luddite/fear	Factors identified in other studies (Bhuasiri et al., 2012; Hogan & Kedrayate, 2010; Mahmud, 2010; Nawaz et al., 2011; Oye et al., 2011; Tedre, 2012; Tedre et al., 2010)
Technology/Infrastructure Readiness	*TR1. Bandwidth* *TR2. Computer access* *TR3. Internet access* *TR4. Electricity supply* *TR5. E-learning environment*	Factors identified in this thesis

	TR6. Technical support	
	TR7. System robustness TR8. Malware TR9. Remote management TR10. Centralized updates TR11. Security TR12. Access and use policy TR13. Password secrecy TR14. Practical experience TR15. Compatibility TR16. Environmental effects TR17. Internet penetration TR18. Mobile networks TR19. Government monopolies TR20. Stability TR21. Equipment robustness TR22. Spare parts TR23. Import equipment TR24. Local manufacturing TR25. Local procurement TR26. Environmental protection TR27. Counterfeits TR28. Logistics TR29. Warranty terms TR30. High-tech vs. low-tech TR31. Available stock TR32. Guaranteed access hours TR33. Infrastructure and systems quality TR34. Internet access quality TR35. Reliability TR36. Ease of use TR37. System functionality TR38. System interactivity TR39. System response TR40. Software Piracy	Factors identified in other studies (Bhuasiri et al., 2012; Hogan & Kedrayate, 2010; Mahmud, 2010; Nawaz et al., 2011; Oye et al., 2011; Tedre, 2012; Tedre et al., 2010)
Pedagogical Change	*PC1. Lecturer presence* *PC2. Lecturer competence* *PC3. Student-student interaction* *PC4. Self-directed learning and research* *PC5. Curriculum change*	Factors identified in this thesis
	PC6. Active/passive learning PC7. Group work PC8. Contact vs. individual PC9. ICT literacy PC10. Value system PC11. Communication patterns PC12. Class size PC13. Open courseware PC14. Pedagogical models PC15. Parental involvement PC16. Grading models PC17. Gender PC18. Attitude towards e-learning PC19. Immaterial rights cognitive development PC20. Confidence PC21. Learning style	Factors identified in other studies (Bhuasiri et al., 2012; Hogan & Kedrayate, 2010; Mahmud, 2010; Nawaz et al., 2011; Oye et al., 2011; Tedre, 2012; Tedre et al., 2010)

	PC22. Intrinsic vs. extrinsic	
	PC23. Workload	
	PC24. Mental models	
	PC25. Socioeconomic status	
	PC26. Modalities	
	PC27. Adaptivity/adaptability	
	PC28. Class size	
	PC29. Authenticity	
	PC30. Cultural appropriateness	
	PC31. Contextual relevance	
	PC32. Language (competence in English)	
	PC33. Course quality	
	PC34. Relevant content	
	PC35. Perceived usefulness	
	PC36. Time response	
	PC37. Self-efficacy	
	PC38. Attitude towards students	
	PC39. Interaction fairness	
	PC40. Attitude towards e-learning	
	PC41. User participation	
	PC42. Teaching load	
	PC43. Students' self-motivation	
	PC44. Software piracy	
	PC45. Plagiarism	

4.5. Summary of Publications

In this section a summary of the publications that form part of the research process is presented. The publications have been peer reviewed, accepted and published in various forums. The publications are in a chronological order that relates to: (1) conceptual framing of the research problem, including publications of the licentiate thesis (Kahiigi, 2009); (2) modelling and analysis of a collaborative approach based on a peer assignment review process; and (3) testing and evaluating the peer assignment review process. For all the sections of the papers Kahiigi, K.E (the doctoral student) was the principal author.

- **Paper 1: Kahiigi, K. E**., Ekenberg, L., Hansson, H., Tusubira, F. F., & Danielson, M. (2008a). Exploring the e-learning state of art. *The Electronic Journal of e-Learning 6*(2), 77-88.
  Aim: This paper explores the e-learning state of art. It provides a general overview of the learning process, theories and methods. It then evaluates e-learning implementation trends pointing out a range of frameworks and strategies. It further looks at the changes created by the adoption of e-learning within the higher education process. This paper provides insights into areas for future research that were pursued in subsequent studies presented in this thesis.
  Methodology: Literature review.
  Findings: From the emerging issues of e-learning implementation within the higher education context, two problems appeared: (1) the limited uptake of technology as an instruction delivery method; and (2) the ineffective use of technology to support learning.
  My Contribution: Approximate input of 80%.

- **Paper 2**: **Kahiigi, K. E**., Ekenberg, L., Hansson, H., Tusubira, F. F., & Danielson, M. (2008b). Explorative study of e-learning in developing countries: A case of the Uganda education system. In IADIS International Conference e-Learning 2008, Amsterdam, Netherlands.

  Aim: This paper provides an exploratory study of the current state of e-learning within the Uganda education system. It provides a general overview of the education systems in Uganda and analyses the ICT and e-learning developments in Ugandan institutions. It finally provides a discussion on emerging issues and outlines theoretical assumptions aimed at suitable approaches for effective adoption of e-learning to support teaching and learning activities at the higher education level in Uganda.

  Methodology: Literature review, document/report analysis.

  Findings: The current escalating enrolment figures at all education levels underscore the importance attached to education in Uganda. An issue relating to the quality of education provided has raised a concern, thus driving education institutions to seek alternative approaches to supporting their teaching and learning activities. In this respect the adoption of e-learning within the Uganda education system is seen as a viable option for this support. Typically of developing countries, however, to date there is limited ICT infrastructure and services at the lower level, which is characterized by higher student-to-teacher ratios. This emphasizes the need to develop sustainable and relevant approaches that support teaching and learning objectives. The higher education level, despite similar limitations, has lower student enrolments than the lower levels and is better resourced, making it feasible to utilize ICT effectively in its education functions. Note, however, that emphasis should be placed on pedagogical approaches that support students' self-directed learning and research, in addition to motivation and ICT skills development which includes Internet literacy.

  My Contribution: Approximate input of 75%.

- **Paper 3: Kahiigi, K. E**., Danielson, M., Hansson, H., Ekenberg L., & Tusubira, F. F. (2009a). Criticism of e-learning adoption and use in developing country contexts. In IADIS International Conference e-Learning 2009, Algarve, Portugal.

  Aim: This paper provides insights into the current e-learning implementation trends in developing countries, highlighting the challenges as well as suggesting strategies for effective adoption and use.

  Methodology: Literature review, document/report analysis.

  Findings: The analysis of issues indicates: (1) the need to move from fragmented approaches that mainly focus on ICT infrastructure acquisition to approaches that support adoption and utilization of e-learning to support student learning; (2) policy formulation, transforming the pedagogical culture, utilization of the available ICTs, student involvement, training and localization of content inter alia are key aspects to be addressed if e-learning implementation within developing country contexts is to bring real benefit.

  My Contribution: Approximate input of 80% for all section of this paper.

- **Paper 4: Kahiigi, K. E**., Danielson, M., Hansson, H., Ekenberg L., & Tusubira, F. F. (2009b). An empirical investigation of students' perceptions of e-learning in Uganda. In IST-Africa 2009 Conference Proceedings, Kampala, Uganda.

Aim: This paper aims at: (1) investigating students' general perception of e-learning; (2) identifying factors which students perceive to be important in relation to the integration of e-learning in their learning process.

Methodology: Case study was used as a research strategy employing multiple data collection techniques which included informal interviews, survey questionnaires and focus group discussions. Quantitative entries were imported into SPSS Version 16.0 for analysis, and the qualitative entries were compiled and categorized in emerging themes for analysis. Statistical procedures for description which include frequencies, percentages, means and standard deviations were used to interpret the quantitative data.

Findings: Results indicate that students have a positive perception of e-learning as: (1) it facilitates communication and interaction between fellow students and lecturers; (2) it is a means to access additional information to supplement the course content. In addition students recognize the inherent challenges of adopting and using e-learning in their learning process, placing emphasis on lack of student-lecturer interaction, ICT skills and the pedagogical culture as vital in influencing their perception of e-learning.

My Contribution: Approximate input of 85% for all section of this paper.

- **Paper 5: Kahiigi, K. E**., Hansson, H., Danielson, M., Tusubira, F. F., & Vesisenaho, M. (2011). Collaborative e-learning in a developing country: A university case study in Uganda. Tenth European Conference on e-Learning, Brighton Business School, University of Brighton, UK.

  Aim: This paper explores the collaborative e-learning approach as one of the strategies for effective adoption and use of e-learning at the university level in Uganda.

  Methodology: The study was guided by the first stage of development research. It employed qualitative research methods for data collection with the aid of a survey study as a research strategy.

  Findings: From a general perspective, it was evident that learning and teaching methods are predominantly traditional, with limited/no integration of e-learning and there were inconsistencies in understanding the integration of technology in teaching and learning processes. The findings obtained indicated that students were able through collaborative e-learning to share and gain knowledge, understand course concepts and access various views and learning material. Factors such as inadequate bandwidth, inadequate Internet/computer access, conflict resolution, inadequate ICT skills and face-to-face interaction challenged the adoption and use of collaborative e-learning in this context.

  My Contribution: Approximate input of 75% for all section of this paper.

- **Paper 6: Kahiigi, K. E**., Vesisenaho, M., Hansson, H., Danielson, M., & Tusubira, F. F. (2012). Modelling a peer assignment review process for collaborative e-learning. *Journal of Interactive Online Learning, 11*(2), 67-79.

  Aim: This paper aims to discuss and model a peer assignment review process for collaborative e-learning within a developing country context. The collaborative e-learning component is implemented in a blended learning environment as a supplement to the traditional face-to-face learning method.

  Methodology: The study was guided by the second stage of development research. It employed qualitative research methods for data collection with the aid of a survey study as a research strategy.

Findings: The model developed was based on using students to pedagogically support each other's learning through four process stages: familiarization, assignment, review and feedback. Empirical investigations of the process stages indicated that the peer assignment review process facilitated the students' learning. Students indicated that they were able to participate actively in the course, and gain experience in critical reading and evaluating peers' work while reflecting on their own work. The findings further indicated that students were able to adopt and use online technologies in their learning activities. Therefore the peer assignment review process impacted on the students' learning as both receivers and providers of reviews, creating a level of acceptance of the proposed collaborative e-learning approach.

My Contribution: Approximate input of 70% for all section of this paper.

- **Paper 7: Kahiigi, K. E**., Vesisenaho, M., Tusubira, F. F., Hansson, H., & Danielson, M. (submitted). Peer Assignment Review Process For Collaborative E-learning:Is the Student Learning Process Changing? *(IJACSA) International Journal of Advanced Computer Science and Applications, 3*(12).

  Aim: This paper investigates the application of a peer assignment review process for collaborative e-learning to third-year undergraduate students. The study specifically evaluated the effect of the peer assignment review process on the student learning process.

  Methodology: Case study was used as a research strategy, employing a survey questionnaire for data collection and quantitative methods for data analysis.

  Findings: Whereas the students reported the positive impact of the peer assignment review process in terms of facilitating them to make more effort and improve their work, quick feedback on their assignments, effective sharing and development of knowledge and information and the need for computer competence to manipulate the peer assignment review system, analysis of the quantitative data indicated that the process had limited effect on the learning process. This is attributed to lack of review skills, absence of lecturer scaffolding, low ICT literacy levels and change management.

  My Contribution: Approximate input of 75% for all section of this paper.

5. Conclusions

The drive to adopt and use e-learning at the university level in the developing country context has been fostered by the need for students to leapfrog into the competitive economic market and the rapid transformation in various business sectors that require a skilled workforce with quality education. Recent developments in the education sector have realized a widespread recognition for the need to position e-learning in a broader context of the emerging knowledge economy, since it enhances learning (Selinger, 2009). Consequently, this thesis explores how collaborative e-learning can be adopted and used at the university level in developing country contexts to support student learning. This investigation was based broadly on the assumption that effective learning occurs when students and teachers engage collaboratively to construct meaningful and worthwhile knowledge.

5.1. Reflecting on the Research

This concluding section examines this assumption in relation to the findings obtained in the studies presented in this thesis and the licentiate thesis (Kahiigi, 2009) in order to answer the main research question: *how can collaborative e-learning support student learning at the university level in Uganda?*

The adoption and use of collaborative e-learning at the university level cannot be ignored in the interests of education advancement in Uganda. Collaborative e-learning extends the traditional classroom environment to a virtual environment through which students can access a variety of useful resources to complement their course material and work collaboratively in advancing their knowledge and skills.

First, it has been acknowledged that limited ICT infrastructure and lack of resources have a negative impact on collaborative e-learning in developing country contexts. The inherent challenge at Makerere University is not access to technology per se but how to implement suitable approaches and strategies for effective adoption and utilization of technology to support student learning. Students had a positive perception of adopting and using collaborative e-learning irrespective of the limited resources and skills they exhibited. This implies that with directed and purposeful design efforts and identification of factors that are suited for this context, collaborative e-learning can be adopted and used to support student learning with the available ICT infrastructure and resources.

Second, acceptance and use of collaborative e-learning strongly depends on people with the appropriate attitude focused on improving the quality of the teaching and learning process. Although collaborative e-learning was perceived to be an approach that can support students' learning, it was not highly regarded compared with the traditional face-to-face learning method. Notably, effective collaborative e-learning requires an understanding of the pedagogy and technology integration for learning to take place effectively. If collaborative e-learning is not implemented or promoted in a proper manner it can constitute a major obstacle (Andersson, 2008).

Third, the lecturer's role is one of the factors believed to influence students' positive perception of collaborative e-learning, through encouraging the process of inquiry and providing prompt feedback on students' queries. In effect the interaction and communication between lecturers and students is an essential part of online learning. As a facilitator the lecturer plays an important role in motivating and encouraging student learning, but students indicated the lack of such interaction which negatively impacted on collaborative e-learning. Consequently, lecturers need to renew their competences in order to assimilate, use and adapt to changes created by the new learning environment in order to support student learning effectively.

Fourth, working collaboratively to construct meaningful knowledge is not straightforward. For the students that took part in the studies presented in this thesis, the link between socio-cultural and cognitive aspects of learning and higher-order thinking is still limited and the integration of technology does not make it any better. Collaborative e-learning attempts to embrace the cognitive and constructive aspects of learning whereby participation is part of learning and not just a means to an end. These aspects serve to highlight the complexity of collaborative e-learning, all the more so in a developing country context where its implementation is still limited. In addition there is a need to investigate further aspects that relate to culture, learning styles and human-computer interaction in the research context. Ewing and Miller (2002) affirm the importance of social interaction skills in online learning environments. Rightly so, it was observed in the research studies that there was a significant difference in students' social behaviour in the collaborative e-learning environment and the traditional face-to-face learning environment.

This thesis further focuses on students' voice as a valuable insight into students' current practices and experiences in adopting and using collaborative e-learning in their learning process, especially as they are the main stakeholders, in effect providing a better understanding of what is required for effective collaborative e-learning adoption and use at the university level in Uganda.

5.2. From Methodological Limitation to Further Research

The findings presented in this thesis provide an insight into the integration of a collaborative e-learning approach to teaching and learning activities at the university level in Uganda and offer practical suggestions for its implementation. Several limitations of the research, however, that call for further study have been identified.

The first limitation is that the findings presented in this thesis were generated from three case studies carried out concurrently. Premkumar and Bhattacherjee (2008) point out, however, that users' expectations and attitude change as they become more familiar with the technology. Consequently, the findings obtained can be enhanced through longitudinal measures in order to provide a deeper understanding of collaborative e-learning adoption and use and its effect on student learning. In fact, a longitudinal study within this context could yield more concrete findings. Indeed, some of the aspects of this research can be extended in order to measure the changes in student learning. It is assumed that the peer assignment review process should improve the students' level of critical thinking and understanding of the course concepts, thus translating into a change in their learning process. In the research presented in this thesis, however, such a change was not observed or even measured. A prolonged study would establish if this peer assignment review process actually facilitates such a change.

Another limitation of the research relates to the study participants. Participation in the studies was voluntary; as a result students included in the studies were not fully representative of all students registered on the courses. The limited participation of the students may not project a full picture of the adoption and use of collaborative e-learning within the selected courses or within the entire university. For instance, in Study 1 only 276 out of 820 students participated (34%), and 401 out of 998 students (40%) participated in Study 2 and Study 3. The loss of participating students could have impacted on the validity of the research.

Further limitations of the study relate to the broadening of the scope of the research. For instance, one of the criteria for the case selection was students using e-learning in their learning activities. It became evident during the research that inclusion of courses that did not use e-learning or courses that introduced the use of e-learning for the first time was equally important. In addition, responses from

students who took part in the studies were analysed as one entrant rather than as separate entrants for the different courses. This can be explained by the exploratory nature of the study but it might be interesting to carry out comparative studies between groups, in order to provide deep insights into collaborative e-learning implementation strategies for various courses. Although the students are faced with similar challenges, they also differ in some ways.

The research carried out in this thesis did not address the effect of the peer assignment review process on the learning outcome. Shuell (1986, p. 429) affirms that "*If students are to learn desired outcomes in a reasonably effective manner, then the teacher's fundamental task is to get students to engage in learning activities that are likely to result in their achieving those outcomes...*". The key here is to align the learning activities (in this case the peer assignment review process) with the intended learning outcomes. As a point of interest, there is a need to extend the research to explore the interrelationships of the peer assignment review process and its impact on the students' learning outcome, in addition to evaluating the students' engagement in the peer assessment process and how it impacts on the learning process and outcome. This relates to the completion of the tasks, comprehensive constructive feedback, frequency of access of the online application and login duration.

Further research could explore the type of motivation needed to engage the students with the peer reviews. The type of motivation could be in the form of classroom recognition or the award of extra credits. Students need to take the peer assignment review process seriously so that they can derive benefit from it as a way to develop their internal motivation and also improve their understanding and skills of the peer assignment review process (Turner, 2009).

The studies presented in this thesis comprised a large student number (Study 1enrolled 820 students, Study 2 and 3, 998 students). The large student number made it difficult to manage and monitor the students' activities, especially students as facilitators. Since the collaborative e-learning approach was a new concept in the research context, it would have been more effectively managed by introducing it to a small student group and then creating an avalanche effect on large groups of students.

The research in this thesis focused on the integration of a collaborative e-learning concept as a means to impact positively on student learning. The findings indicated that although collaborative e-learning was appreciated as an approach to support student learning, the learning environment was not ready to adopt it. This was mainly attributed to a number of factors such as pedagogical culture, curriculum and institutional readiness. As a continuation of this research, focus could be placed on investigation of these factors as separate entities to establish the level of impact they have on the adoption and use of collaborative e-learning in the research context.

5.3. Final Remarks

The illiterates of the 21st century will not be those who cannot read and write but those who cannot learn, unlearn, and relearn (Alvin Toffler)

It is apparent that graduates of today need to acquire a new set of skills to be able to work and be competitive in the twenty-first century and beyond. Recent developments in societies have seen economic differences and broadening income gaps, the result of unequal/limited access to quality education and inadequate skills (critical thinking, creativity and innovation, communication and collaboration). As a result, higher education institutions are changing their education systems in order to improve the quality

of education and imbue students with the required skills. This can be achieved through enhanced teaching and learning processes.

From a personal perspective, I conclude with reflections that build upon the findings discussed in this thesis. These reflections are based on my observations during the course of the research in relation to implementation of collaborative e-learning in a developing country context.

The *first reflection* relates to ICT pedagogy. E-learning requires understanding of the interplay between pedagogy and ICT for learning to take place effectively. E-learning combines two aspects. First, the "learning" which is the pedagogical aspect, through which individuals acquire and retain skills and information to facilitate knowledge development; second, the "e" referring to technology/ICT that supports the learning process. From my observation and experience the current e-learning implementations merely deal with teaching about ICT and not how ICT can be used to facilitate and transform teaching and learning processes. The use of ICT in itself does not account for or improve the quality of learning but it is rather an innovative enabler, a fact that has been ignored. Therefore it is essential first to identify and evaluate pedagogical aspects that enable learning to occur in a given context and then appropriately apply ICT to them. The proposed peer assignment review process involves constructive and cognitive pedagogical aspects designed to support student learning at the university level. The underlying idea is to use students to support each other's learning through a process of inquiry.

The *second reflection* is concerned with the readiness of the environment. Despite several challenges that have impacted on e-learning developments in developing countries such as intermittent electricity supplies, inadequate and expensive bandwidth, lack of trained personnel, I would like to review the role of e-learning in supporting student learning in a developing country context, specifically questioning whether e-learning is particularly well suited to supporting knowledge development for students who are not motivated or well-versed in self-directed learning and research-based learning. An alternative approach could be mirroring e-learning to reflect the natural learning environment. Collective efforts are needed, however, to facilitate a change in the learning process that will create opportunities for students in developing country contexts to be competitive in the global economic market. This implies that the global aspect supersedes the contextual aspects.

The *third reflection* relates to the proposed peer assignment review process for collaborative e-learning as a step towards introducing an alternative approach to support teaching and learning at the university level in a developing country context. Garrison and Anderson (2007) point out that we have yet to experience fully the transformative effect of e-learning; indeed this effect has yet to be realized in several developing countries. The proposed intervention, however, has provided some insights into how students can change their learning process by taking advantage of collaborative e-learning.

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