A FRAMEWORK TO ENHANCE FINANCIAL BENEFITS OF IMPLEMENTING WEB TECHNOLOGIES AT CENTRAL UNIVERSITY OF TECHNOLOGY (CUT), FREE STATE

BAPTISTA RATAKANE MAIME

Thesis submitted in fulfilment of the requirements for the degree:

DOCTOR OF BUSINESS ADMINISTRATION (DBA):

In the

Department of Business Support Studies

Faculty of Management Sciences

At the

Central University of Technology (CUT), Free State

Promoter: Professor SW. Musvoto

Co-promoter: Professor P. Rambe

BLOEMFONTEIN

May 2019

DECLARATION WITH REGARD TO
INDEPENDENT WORK

I, **Ratakane Baptista Maime**, identity number and student number , do hereby declare that this research project submitted to the Central University of Technology, Free State for the Degree Doctor of Business Administration (DBA): BUSINESS ADMINISTRATION, is my own independent work; and complies with the code of academic Integrity, as well as other relevant policies, procedures, rules and regulations of the Central University of Technology, Free State; and has not been submitted before to any institution by myself or any other person in fulfilment (or partial fulfilment) of the requirement for the attainment of any qualification.

SIGNATURE OF STUDENT

3rd June 2019

DATE

ACKNOWLEDGEMENTS

I acknowledge God as my anchor and tower of strength in all endeavours, especially those that have such a significant meaning in my life and that of my family. I needed his endorsement to start this path and his strength to walk through this journey I needed. I thus thank God for guiding me and giving me strength during my studies.

I am grateful to my wife, **Lerato Maime**, the heir with me in the gracious gift of life, for sacrificing her family time and resources while I followed my academic journey. My wife encouraged me and always believed that I am smart enough to continue in this path especially in times when I did not have that confidence.

I also acknowledge my boy, **Jethro Bohlale Maime.** His sincere and loving motivation urged me, his daddy, to work towards completing my studies and pay attention to the most meaningful preoccupations in his life.

I owe my completion of this study to my promoters. Prof **Wedzerai S, Musvoto**, whom I believe was provided to me by God, made this journey feel so easy. I always emerged stronger and fit for the task every time after calling him. His statement to me at the beginning of this study: *"it's very easy, do not let anyone tell that it cannot be done,"* always resounded in my invisible ears when I encountered challenges during my studies. In addition, **Prof Patient Rambe**, always believed that I am capable of doing things that I never thought I could do. I thank both mentors, we need such people in life who always see potential in those that are unaware of their capabilities.

I also thank the **CUT research office** for making this journey bearable. The financial support and research workshops hosted by this office assisted me in many ways, hence, my appreciation.

Finally, I thank those of the common faith that supported me spiritually. Thus, I cannot forget the inspiration of my father in the faith, **Phillip Bakani**. I always emerged stronger and purposeful after a phone call with you.

THANK YOU VERY MUCH!

ABSTRACT

The implementation of various generations of web technologies worldwide and in South Africa (SA) is continuously replacing the traditional e-learning methods. These changes are charging e-learning with greater potentials such as the ability to enable learning and access to educational material without the limitations of space and time. The primary preoccupation of traditional e-learning was to allow a one-way sharing of material and information with students using electronic tools. However, current web technologies have augmented this with collaborative core functions, which have the ability to transform teaching and learning into a participative reality among all stakeholders. Collaborative and participative benefits of web technologies allow for a flexible interaction between students and lecturers in ways that defy physical boundaries. However, Universities including the CUT have not been able to fully take advantage of the potentials of web technologies that are available within and outside their current Learning Management Systems (LMSs). This fact is noted in their underutilisation, where they use web tools to fulfil one-way publicity of information and content sharing. Moreover, a lack of institutional approaches has resulted in staff members at SA universities utilising the tools in self-directed ways.

The current reality where operational costs are escalating while external funding for universities has been declining, and the trend marked by a rise in demand for higher education, presents universities with the need to optimally utilise the tools that address a greater capacity with less resources. Since web technologies help institutions to administer education to a large number of people with less costly efforts, lack of proficient utilisation will make it impossible to address the ever-increasing demand for higher education. Consequently, underutilisation of web tools means that universities cannot reap significant financial benefits. It is similarly difficult to benefit and measure the impact of the tools that are utilised in self-directed ways without a holistic institutional approach. In the midst of these underutilisation within the educational sector, operational costs that could be mitigated by web tools have been rising. The financial sustainability of universities will also be at stake if cost efficient core business does not become a priority. Moreover, the current disturbances in SA educational sector indicate that the time has come for universities to adopt approaches that will safeguard resources from being damaged and ensure that educational processes remain uninterrupted all the time. The main purpose of this study was therefore to develop a framework that could assist CUT to implement web technologies in a manner that will achieve cost efficient core business without compromising quality education.

A case study design was followed in which CUT is used as a critical case. Since the study aims at exhausting field generated data to unravel the phenomenon of web technologies and its impact, and because the nature of financial impact of web technologies in education has not been significantly researched, the field work of the study employs qualitative techniques. The qualitative techniques

employed are documentary reviews which are supplemented by one focus group discussions and analysed through thematic analysis. It was found out that at CUT, web technologies are being underutilised; there is no holistic institutional approach that guarantees growth of web technologies; fragmented styles of utilisation by staff members make it impossible for an institution to experience a detectable financial impact; the main reason for adopting web tools is to enhance learning which is viewed as incongruent with financial benefit imperative; and the policies that drive teaching and learning are not in congruence with financial sustainability imperatives embodied within the vision and strategic goals of the University. All this is in spite of the University's rising operational cost, ever increasing number of student populace and regular disturbances which are continuously interrupting teaching and learning. It is therefore recommended that the University implements a framework that guarantees a holistic implementation of web tools over a specified period of time. Such a framework should target specific operational costs and the ability to identify them. Since the benefits of web tools are not so visible owing to fragmented utilisation within the University, there is a need for an implementation approach that will guarantee wide institutional usage and impact. The unique contribution of the study is a framework that demonstrates that the possibility of detecting the financial benefits of web technologies lies in formalising the implementation thereof and establishing clear standards of technology utilisation.

KEY CONCEPTS

Financial benefits

Financial benefits may be seen as any pay-back in financial terms to organisation of implementing a certain method of operation or information system. These pay backs may come in the form of operational costs saved or profitability achieved. As such, techniques like ROI and capital budgeting techniques may be utilised as measures of profitability in financial terms or capital budgeting appraisal methods respectively.

Financial efficiency

It is the degree at which the goals of an organisation are achieved with minimum costs to the organisation. One method of operation may be seen as more efficient than the other provided that the operational costs of running the core business of an organisation are lower compared with the other.

Web technologies

Web technologies are all web-based tools (including LMSs) the use of which enables an organisation to transfer some or all of its core business to the web. The evolution of web concepts has led to various types and generations of web technologies which are utilised by organisation to different degrees to achieve diverse goals of the organisation.

Teaching and learning

Teaching and learning includes all set of activities and procedures that are aligned together or put in place to facilitate the learnership of students at one given university. Examples of these activities and procedures comprise administration of classes, consultation with students, assessment of students, supplying students with supporting material like learning guides, curricula, syllabus and subject related notes. All of these activities and the manner in which they are administered have varying levels of cost implications to the core business of the university

ABBREVIATIONS

AR	Average Return
ADS	Academic Development Support
AGU	Assessment and Graduation Unit
ARC	Assessment Review Committee
CTBM	Case Time-Based Measurement
CFO	Chief Financial Officer
CITL	Centre for Innovation in Teaching and Learning
CeLET)	Centre for e-Learning and Educational Technology
CUT	Central University of Technology
ITDT	Information Technology Diffusion Theory
TLP	Teaching and Learning Plan
DIT	Diffusion of Innovation Theory
DSN	Digital Signage Networks
DPB	Discounted Pay-Back
DHET	Department of Higher Education and Training
EET	E-leaning and Educational Technology
EIU	Economic Intelligence Unit
EVA	Economic Value Added
FEICT	Faculty of Engineering, Information and Communication Technology
FHES	Faculty of Health and Environmental Sciences
FH	Faculty of Humanities
FMS	Faculty of Management Sciences
IBM	International Business Machine
ICT	Information and Communication Technology
IIBA	International Institute of Business Analysis
ILT	Innovation in Learning and Teaching
IRR	Internal Rate of Return
KPAs	Key Performance Areas
IHL	Institution of Higher Learning
IAS	International Accounting Standards
LMS	Learning Management Systems
OER	Open Education Resources
PBP	Pay-Back Period
PI	Profitability Index

PV	Present Value
RI	Residual Income
RBT	Resource Based Theory
NPV	Net Present Value
ROI	Return On Investment
ROA	Return On Asset
ROV	Return On Value
SA	South Africa
SAUs	South African Universities
SCI	Statement of Comprehensive Income
SCA	Student Centred Approach
SFP	Statement of Financial Position
SPET	Strategic Plan for Educational Technology
SOPAD	Strategic Operational Plan of the Academic Division
TTD	Total Teaching Deployment
TUT	Tshwane University of Technology
TVM	Time Value of Money
UCT	University of Cape Town
UKZN	University of Kwa-Zulu Natal
UAD	Unit for Academic Development
UNISA	University of South Africa
UP	University of Pretoria
UoT	University of Technology
USAF	University South Africa
VAIW	Videos, Audios, Images and Weblinks
VSP	Vision 2020 and Strategic Plan
WACC	Weighted Average Cost of Capital
WIL	Work Integrated Learning

TABLE OF CONTENTS

LIST OF TABELS

LIST OF FIGURES

CHAPTER 1: ORIENTATION TO THE STUDY

1.1 Introduction

The purpose of this study is to develop a framework for enhancing the financial benefits of implementing web technologies for teaching and learning at Central University of Technology (CUT). The study focuses on the implementation of web technologies and the potential it holds for higher education in relation to the financial benefit imperative that plays an indispensable role in the adoption of technology. Various issues make web technologies indispensable in today's higher education sphere. The current scarcity of resources and the increasing demand for higher education (Dlalisa & Van Niekerk, 2015:2, 3) are among the contending issues that underscore the need to consider the significance of web technologies. The current and unrelenting upheavals currently encountered in the higher education sector provide a compelling need for methods that can cushion university processes from easy disruption. Furthermore, the decline in external funding and the escalating operational costs (USAF, 2016) indicate that universities need to financially reconsider their processes of offering the core business. However, the manner in which web technologies are used in South African Universities (SAUs), including CUT, is too fragmented to allow any financial benefits. Moreover, the main motivation to adopting the tools, as evidenced by the CUT case, is void of any financial benefit.

Web applications form substantial amounts of modern private and public sector organisational budgets (Song & Lee, 2014:525), and yet it appears that there are no financial frameworks that can be used to determine the associated economic paybacks. Mangiuc (2009:76-86) notes that the continuous existence of web applications within organisations depends on the ability to ascertain the related benefits. Thus, the growth of web technologies witnessed in recent years, could have been more significant if there had been reliable methods that could measure the financial impact. The modern management accounting techniques have not solved the problem of quantifying financial benefits of web implements and this has undermined the motivating factor of the financial aspect to organisational adoption (Gilfoil & Jobs 2012:637, 645). Some consultancy surveys discuss the paybacks of web 2.0 tools but the figure orientated accounting function is left unimpressed. Previous studies present the qualitative nature of the benefits as a measurement predicament as opposed to the quantifiable and measurable financial benefits that are specifically preferred by management accounting (El-Sayed & Westrup,2011:3-4; Ross, 2009:5), whose primary purpose is the measuring of financial impact of projects in quantifiable ways (Horngren, Foster, Datar & Uliana, 2008:2).

Private sector organisations were the first to adopt web technologies with Institutions of Higher Learning (IHL) world-wide joining the band wagon later (Lwoga, 2012:93). However, IHLs do not seem to possess clear and measurable objectives of implementation. A lack of set measurable

objectives may result in an organisation's loss or gain and a further failure on how to utilise the gains in ways that contribute to financial or any other value (Mangiuc, 2009:76-86). Thus, numerous studies (Goo, Watt, Park & Hosp, 2012:39; Hough & Neuland, 2013:604; Wanaco, 2013:18; Dahar & Lazarevic, 2014:42; Ramdeyal, 2014:77-99, Song & Lee, 2014:524), well aware that today's educational sphere is composed of digital learners, propose that learners must be provided with the tools that are relevant. However, such studies appear to advocate for a singular approach that benefit a learner at the expense of the institutional resources. Only a minute number of studies mention financial benefits from the universities' point of view. For example, Sahd and Rudman (2013:40-41) focus mainly on the ability of the tools to allow cost effective sharing of information, while only Dlalisa and Van Niekerk (2015:2, 3) advocate for their implementation as a means to cut operational costs of SA Universities.

The above discussion suggests that there is a need for a study that will provide a framework for enhancing the financial benefits of web technologies. The framework should also consider ways on how to measure these financial benefits. The researcher holds the view that a casual utilisation of the tools undermines the possibility of having a noticeable financial impact. Hence, this chapter introduces web technologies and their benefits to both the private and public sector. It presents the background of the identified research problem within the context of a higher learning institution and brings to the fore the problem statement, research objectives of the study and the methodology adopted in investigating the problem and analysing research findings. Finally, the chapter presents a layout of the study.

1.2 Background of web technologies

The phenomenon of web technologies has been evolving. It is identified by numeric designations with numerals "1.0", or "2.0" providing an implication of the evolving nature of web tools. In fact, web 2.0 evolved out of web 1.0 (Getting, 2008; Song & Lee, 2014:511). As a result, this study has considered the evolution of web technologies from web 1.0 to the newest form appropriately called web 4.0. Traditional web sites through which organisations primarily focused on web presence are classic examples of web 1.0 applications. Web 1.0 allowed e-commerce organisations to display contents on websites without enabling targeted users the ability to participate in content creation or modification (Getting, 2008). Information on web 1.0 applications was not re-usable by other online applications or users, neither was any web 1.0 application able to link with information from other applications on the net for re-use (O'Reilly, 2007:17). This notion is like the "read only' access of word document as opposed to the ability to read and edit a document (Getting, 2008).

Web 2.0 developed out of web 1.0. It incorporates web-based tools that enable users to contribute to, and modify the content on the web thereby allowing online two-way interactions between organisations and their stakeholders (Getting, 2008). Web 2 is a result of various web implements

that have been popping out of the internet in fragmented ways even though they were not known as web 2.0. For example, blogs were developed in 1993 yet they gained much popularity in 1999 and beyond. Although social networking sites were developed in 2002, they gained much popularity in 2004. In addition, YouTube was developed in 2005 (Armstrong and Franklin, 2008:4, 5). In the same year (2005), O'Reilly and MediaLive International stated, during a conference that, the demise of the dot-com concept had not led to the anticipated collapse of the internet and instead led to the internet's further development with new applications. As a result, they concluded that the new notion of web 2.0 was taking the front line in the web (O'Reilly, 2010:17). There are many Web 2.0 technologies discussed in literature, but the following are widely known.

Blogs: They are controlled internet sites that enable informal and corporate exchange of information through the publishing of ideas and connections with other websites. Bloggers usually share and post their opinions (blogs) on a web-based blog (El-Sayed &Westrup, 2011:2). For example, the multinational computer consulting company International Business Machine (IBM) Corporation, which operates in 170 nations around the globe, has a free blogging platform called blogCentral that collects ideas from employees and allow them to share business ideas with each other (KPMG, 2008:2).

Wikis: They are internet platforms that enable various users to make additions, removal and editing of online information. Wikis capture users' electronic discussions and enable modifications of content by users (El-Sayed & Westrup, 2011:2). Examples include IBM's BlueIQ Resource Centre, which is designed to supply employees with a platform to share their work-related challenges and the solutions that serve as resources for all employees in need of corporate help. Oracle Corporation also uses wikis to enable collaboration of physically disbanded individuals in order to unify knowledge in project management. In another case, MTS Allstream uses wikis to contribute to knowledge sharing among employees. Their marketing and sales departments developed their own wiki in an effort to achieve competitive aptitude (KPMG, 2008:2). Finally, as Mihai (2014:77) notes, *"The most well-known example of a wiki site is Wikipedia."* Mihai (2014:77) notes further that, *"wikis can be used in a very broad area of activities, like collaborative workflow for certain documents, reports, studies etc. and for team work when managing projects."* Thus, the main difference between wikis and blogs is that, bloggers can only contribute to the content through comments, while wikis allow for additional functions such as adjusting the content and contributing to its substantial form. Therefore, wikis have a more collaborative functionality (Mihai, 2014:77).

Social networks: These online platforms bring together people from various stratus of life and enable them to create both online friendships and business communities. Examples include Facebook and LinkedIn (El-Sayed & Westrup, 2011:2). International Business Machine has the BlueIQ Ambassador program on which colleagues assist one another on how to use work

applications more efficiently. Their BluePages is designed to enable contemporaries to share their technical know-how. Furthermore, Oracle.com uses a program called connect, which has a Facebook that enables employees to create profiles and business networking (KPMG, 2008:2).

Real time collaboration tools: These include famous instant messaging and its contemporaries, web meeting and video conferencing, which achieve a real time audio and visual communication of individuals from different parts of the world or regional offices of companies (El-Sayed & Westrup, 2011:2). For instance, T Systems, a service provider in Information and Communications Technology (ICT), which is located in Germany and operates in 24 nations, has a web visual platform that enables employees to share tips on product ideas.

Mash-up: This is a web application that links information from different sources through internet protocols to develop a new online document through a recombination (El-Sayed & Westrup, 2011:2). Organisations can use mash-ups to integrate separate sets of information into one cohesive material. IBM uses this tool to facilitate employee competition towards the invention of creative programs with some of the created programs already available in the current information technology market (KPMG, 2008:2).

Currently, the web has already advanced beyond web 2.0 to web 3.0 and web 4.0 notions. While various promoters are still battling with appropriate definitions, the tools have already made their way into the web and some organisations are already using them. Concepts like 'semantic mark-up', and 'web services' provide a foundation to understanding web 3.0 concept (Getting, 2008; Hendler, 2009). In addition, Web 4.0 is considered to be a symbiotic web (Matade & Rajeev, 2017). Although the current study has covered all generations of web technologies, it is mostly dominated by web 2.0 notions. The pace at which internet applications are being developed leaves little or no room for adopters to understand them and absorb the benefits. Therefore, the current study may be viewed as foundational to understanding web technologies and their benefits using the initial generations as a point of departure.

Learning Management Systems (LMS): Web technologies are viewed in this study as web-based programs that are contributing to shaping up today's e-learning environment. E-learning is the exchange of educational resources that is enabled by information technology. Nevertheless, the innovations in the world of IT and internet resulted e-learning becoming a generic name for web technologies concocted to form modern LMS at IHLs.

1.3 Benefits of web technologies

The benefits of web technologies can be classified into 'hard' and 'soft' benefits. The hard benefits can be measured in monetary terms using accounting techniques while the soft benefits cannot be measured in monetary terms using accounting techniques (KPMG, 2008:4; Mangiuc, 2009:78). It

is therefore, considered essential to determine which benefits are financial in nature and therefore could be measured using accounting techniques before attempting the measurement of web technologies (Mangiuc, 2009:96). At the same time, Gilfoil and Jobs (2012:92) suggest that in the end non-financial benefits may contribute to financial constructs such as revenue, cost reduction or savings, and are therefore most likely to become financially measurable. For instance, the use of blogs, wikis and social networking is linked to financial constructs like revenue increases because of their ability to motivate customer interactions (Mangiuc, 2009:96). Web tools enable online discussions and contributions to company innovations by employees and other stakeholders thereby eliminating expenditures associated with travelling and holding physical meetings. Furthermore, they enable clients to contribute their opinions regularly to product development and enhancements and in the process add to customer satisfaction, which increases chances of sales. Hence, web tools create a new sense of life to the traditional hierarchical structures of leadership, grants autonomy to employees and clients to create their own flexible methods of operation, and facilitates interaction and information exchange, which all move innovations and save companies on huge expenditure attributed to stiff organisational structures (Mangiuc, 2009:78; El-Sayed & Westrup, 2011:3-6).

Technologies such as Instant Massaging (IM) enable the exchange of information across departments and beyond organisational frontiers to create communication and online meetings at a minimal or no cost (KPMG, 2008:1, Mihai, 2009:81; Bughin & Chui, 2010:1). A survey by Bughin and Chui (2010:2,8) shows that respondents who claimed measurable benefits from using web 2.0 technologies also reported quicker infiltration into the market and accessibility of knowledge as measurable paybacks. Although their study comments on financial and non-financial benefits, it does not divulge the tools used to measure the financial benefits in as much they reveal the research methods for conducting the study. In addition, El-Sayed and Westrup (2011:4-5) conducted an interview with the financial director of Corp Company in which they document the director's praises on collaborative technologies, unlike the traditional emailing system, for their ability to facilitate the exchange of real time financial information on spreadsheets and through video conferencing tools. Their survey reports that businesses that use collaborative technologies effectively, especially those companies that operate in different regional offices, are likely to reduce communication and travelling costs. Similarly, the Economic Intelligence Unit (EIU) survey reports that 85% of executives of business corporations around the globe were of the view that enterprise 2.0 technologies possess both the ability to improve work related relationships and cooperation, and to increase company revenues (EIU, 2007:9). What can be deduced from these discussions, is the fact the benefits of web technologies can be realised in organisation where they are not just casually used. There must be an intention by organisations to replace traditional structures and consistently grow web technology utilisation. In that setting, the impact would be undeniable even if it cannot yet be calculated by use of an accounting formula.

1.4 Measurement of financial benefits

The need to measure financial benefits of web technologies is compelled by the payback imperative in accounting that; substantial monetary amounts should be spent on items that generate a financial return (Horngren *et al.,* 2008:975-977). This need is related to the definition of an asset, which states that it is *"a resource controlled by an entity, as result of past events, from which future economic benefits may be expected to flow to the entity"* (Kew & Watson, 2010:34). In the past, universities did not have to consider this financial outlook because they viewed themselves as not existing to make profit. However, the present scarcity of resources, the rising demand for higher education and reductions in external funding are going to present institutions with no alternative to financial benefit outlook. These benefits must be measured using acceptable financial models (Manqiuc, 2009:86) because the inclusion of technological innovation into the budget of an organisation is determined by perceived financial returns (Gilfoil & Jobs, 2012:642). Lack of measurable results yields no data on whether the technologies were well-chosen and efficiently employed or not. In addition, the lack of a measurement standard leads to the impossibility of proving that the investment in a technology is financially efficient (Mangiuc, 2009:76). Hence, web tools, just as any other technology, have to be used correctly and their benefit measurable, in order to obtain added value to an organisation.

Various management accounting techniques are used to measure financial paybacks of projects (Weinberg & Pehliven, 2011:275). The literature chapters of this study evaluate the possibility of capital appraisal and Return On Investment (ROI) techniques in assessing the financial paybacks of web technologies. Capital budgeting encompasses the obtaining of investment opportunities, and the estimation of the potential financial benefits while matched up with the expenditures. Its purpose is to assess how an investment affects scarce resources such as '*land, labour and capital'*. Capital budgeting techniques are possible in instances where clear cash inflows or outflows are ascertainable (Els, Erasmus and Viviers, 2014:161-62). Return on investment is an accounting technique, which compares related income with the cost of an investment in order to determine the divisional financial benefits harvested by a business. Since the resources or assets used to generate income may be collectively viewed as an investment, ROI addresses the financial enquiry of how huge is the operating income relative to the resources used to gain it (Horngren *et al.,* 2008:975). Commentators of social media paybacks (Weinberg & Pehliven, 2011:275-276; Mangiuc, 2012:96; LePage 2014;) regard ROI as the probable technique to measure the financial efficiency of a web application as long as it is modified. Nevertheless, there exists other views held by researchers such as Zheng, Chen, Lusch and Li (2010:14) who completely dismiss any attempt to measure the financial efficiency of a web application on the basis that it is impossible to quantify the variables concerned. A more positive view suggests that it is possible to measure ROI without difficulty through the use of a holistic approach focused on overall business processes (Gilfoil & Jobs,

2012:639). Furthermore, even if ROI was possible to calculate, it should be regarded only as the threshold and its victories, if ascertainable, could be extended to other management accounting techniques (Mangiuc, 2009:86).

Apart from the fact that both capital budgeting and ROI techniques require quantifiable variables to measure financial impact, another problem is that web technologies are utilised in disjointed styles which prohibit the discovery of a noticeable impact. The normal accounting computations are unable to measure paybacks because of the nature of the inherent income and cost drivers (Mangiuc, 2012:77). Most social media applications have been adopted mainly as sources of information supply to management's decisions. As a result, research in this field articulates performance measures only to determine whether they are effective contributors of valuable information. Habitually, the variables are completely qualitative in nature and do not appear to have direct bearing on financial outcomes of adopting organisations thereby making it difficult to devise any financial frameworks or techniques (Zheng *et al*., 2010:14). This factor gives birth to the prevalent view that profitability can only be measured against previously set financial goals. The proponents of this view (KPMG, 2008:1, Mangiuc, 2009:79; Romero, 2011:147; Gilfoil & Jobs, 2012:644) posit that financial objectives targeted by web technology adoption must first be established at specific departments or units. These critics note further that the use of web tools throughout their lifetime should be controlled to meet the objectives with the measurement of those financial objectives carried out at some point during or after utilisation. Based on these studies, one may argue then, that the issue of quantifiability and disjoined practices is not the first problem. Primarily, the lack of financial objectives prior to implementation means that organisations start off on the wrong ground altogether.

In line with the above-mentioned schools of thought, Gilfoil and Jobs (2012:641-642) offer a framework that explains ROI within the context of social media. Their unit of analysis approach suggests that specific goals, such as revenue or cost saving to a specific department, unit or individual, should be determined first and then measurement carried out at that specific level. These assertions that organisations must set clear and measurable objectives before implementing tools paint an undesirable picture to the adopting institutions. Nonetheless, the reality that there is a lack of measurable objectives, as a preliminary step to the measurement of financial benefits reveals that most organisations merely adopt the technologies without proper strategies. It further reveals that some organisations implement web technologies out of the fear of being left behind, which places scarce organisational funds at risk of being spent on resources that may not benefit an organisation.

1.5 Background of global implementation of web technologies

At the global stage, web tools have been adopted by universities as they pace themselves with new developments and the prospects of traditional methods of offering pedagogy fading away

(Armstrong & Franklin, 2008:12). This reality is hastened by the fact that current learners are technologically inclined and this is slowly rendering traditional methods irrelevant (Bosch, 2009:197-198). Despite these seemingly student-focussed motivations of adoption, the usual force behind academic staff utilisation appears to be self-motivated rather than institutionally sanctioned (Armstrong & Franklin, 2008:1, 2). Therefore, although many universities world-wide have adopted these web tools, good and well-established practices are not widely appreciated and recognised. For example, Whitmer, Nuñez, Harfield and Forteza (2016) have lamented the general poor utilisation of web tools globally. As a result, they emphasise the need to investigate existence of good practices whose cases may be used as exemplary. Although there are very few models on good practice, world-wide implementation of web technologies in higher education is considered to have the potential of yielding cost-efficient operations (MacKeogh *& Fox* 2009:149). Although cost reduction is one benefit that cuts across both the educational and private sector (Grosseck, 2009:480) there is an argument to the contrary that there is no sufficient proof in research that web-based tools reduce costs in higher education (Katsifli, 2010:7. This argument is related to the fact that most studies only make claims without singling out the amounts of cost reduction and the calculation techniques used. Nevertheless, a case study by Klonoski (2008) also cited by Katsifli (2010) shows that some educational institutions have reaped benefits in the reduction of costs in data administration and new overall advancements. It would appear therefore that, for a university to benefit significantly from the use of web technologies, there must be a formal take-up by all academic staff. This take-up should also be followed by a consideration of targeted student users. The resulting effect will be cost efficient operations.

According to Armstrong & Franklin (2008:91), the early implementation of web 2.0 tools at institutions of higher learning started in the USA. The first institutions to take the lead were Whiteman College, the University of Pennsylvania and the State University of New York where technologies like blogs, wikis, podcasting and social networking sites were employed to issue and receive assignments, class work and notes by instructors. According to the above-mentioned authors, a State University College of Agricultural, Human, and Natural Resource Sciences extended the use of blogs to drive open and timely communication with colleagues for administrative purposes because of their perceived cost-effectiveness. Apart from the daily routines of classroom engagements and collaborative power, it was found that researchers at the University of San Francisco also enjoy the benefit of innovative and smart ways to find information and create knowledge through web 2.0 tools. In other parts of the USA web portals were invented with the input of educators, primarily to support the user-friendly exchange of scholarly information between educators and learners at no cost (Wanago, 2013:18).

In the United Kingdom (UK) the earliest implementations of web technologies for on-campus information sharing through blogs and wikis started in the year 2004. Three universities: The University of Warwick (in 2004), the University of Wales and the University of Edinburgh (in 2006) were the first movers (Armstrong & Franklin, 2008:3-4). Even though the transition was not quick and academic staff and learners were sceptical about them, the benefits could not be ignored. Users discovered new ways of doing their work and recognised the affordability of large storage space *vis-à-vis* traditional emailing. Subsequently Australian Universities also started to cautiously adopt applications like Facebook, blogs, wikis and YouTube with the general understanding that they could assist higher education with low cost structures and strategic thinking processes (Armstrong & Franklin, 2008).

1.6 Background of web technologies in South African Universities

The institutions that first used educational web tools in SA were the traditional universities as they transitioned from the older forms of ICT. The University of Pretoria (UP) is one of the earliest adopters of web 2.0 platforms, as it was transitioning from the WebCT LMS (Bagarukayo & Khalema, 2015:172). Currently, almost all universities in SA have their websites entrenched with educational web applications (Jaarsveldt & Wessells, 2011:72). Their benefits include observations of reductions in the impediments of distance to accessing study material through use of web platforms, as reported at the University of Stellenbosch (US) and University of South Africa (UNISA). In addition, most part-time students perceive web platforms as more rewarding to their education than full-time students, because they lack the benefit of regular and close proximity access to on-campus resources than the full-timers. Nevertheless, both full and part-time student respondents used these technologies as a means of sharing information and creating online profiles (Hough & Neuland, 2013:594). The same reality was noted at Tshwane University of Technology (TUT), where their current Blackboard application enables instructors and students to exchange assignments and notes in the form of documents and videos (Bagarukayo & Khalema, 2015:172).

Furthermore, a study (Bagarukayo & Khalema, 2015:172) undertaken on four undisclosed UoTs found out that web technologies have become the main source of information sharing and access between students and lecturers. The use of smart phones by the students enables this although also stifled on the other hand by lack of computer resources beyond the university campus. Social networking and academic information search are typical examples of online activities utilized by students and lecturers. A study on Tshwane University of Technology (TUT) shows that their current Blackboard application is being used as a medium through which instructors and students exchange assignments and notes in the form of documents and videos. This suggests that, the use of interactive communication can be more beneficial to many universities. However, most benefits remain only a potential because, unlike the enthusiastic and techno savvy generation Y at UoTs,

most of the academic staff are still sceptical about these web tools. It should be stated that observations made on institutions where students are positive towards the use of technology applications, such as IM and WhatsApp, blogs and other online interactions, confirm that the benefits run contrary to academic staff's general view that web technologies are time wasting and disruptive (Ramdeyal, 2014:77-99). The conflicting views on the impact of web technology use point to the complications faced in South African universities (SAUs) in evaluating the benefits of web technologies, which Armstrong and Franklin (2008:5) attribute to the fragmented nature of utilisation by staff members. It goes without saying that staff members utilise tools in self-directed ways because of lack of clear institutional expectations and plans.

1.7 Problem background and rational of the study

Considering the manner in which web technologies are underutilised, it can be concluded that the full potential of web tools is yet to be realised. There is lack of application of web tools that matches the efforts that bring such technologies to universities (Badenhorst, 2014:14-15). Furthermore, there is lack of common practices on how to implement web technologies which has resulted in institutions and users applying the technologies in individualistic and self-directed ways. This aspect makes it difficult to concoct standard performance measures of the impact of these technologies (Armstrong & Franklin, 2008:3-4; Badenhorst, 2015:2-3).

Research (Bagarukayo & Khalema, 2015:168) notes that most of the benefits are not being realised to the extent that it is customary for IHLs to assess their web technologies' level of implementation by comparing themselves with their counter parts. The challenge with this approach is that the level of implementation per university has always been blurry (Badenhorst, 2015:2-3; CUT: 2015-2010, e-learning strategy). In addition, the common approach by university management, with regard to investment decisions, is to consider perceived value of e-learning by lecturers. The limitation of this approach is that value differs from lecturers to management (Badenhorst, 2015:2). In many cases, the costs of acquiring such technologies are very high (Song & Lee, 2014:525) and yet, web-based education needs to be implemented for its cost effectiveness (Goo, Watt, Park & Hosp, 2012:39). Nonetheless, there is a lack of the much-needed evidence of whether it is financially worthwhile to adopt the web-based technologies nor is there enough academic research on the matter (Hough & Neuland, 2013:605).

The earliest implementation of web technologies at CUT was in the year 2002. However, this initial implementation was not followed by a significant migration of the core business to the web. As a result, the limitations with which web tools were used led to some revision of e-learning designs. Subsequent revisions of these designs, especially during 2009 and 2010, culminated in the adoption of the existing blackboard platform that consists of a plethora of web tools. Blackboard offers CUT the potential to reduce manual facilitation of teaching and learning with the program currently

reported to be approaching a hundred percent (100%) subject integration since its inception. The reality, however, is that subject integration hardly defines the successes reached through the proficient use of web technologies, thus suggesting that most of the web technologies, which are available at CUT are being underutilised (CUT: 2015-2010, e-learning strategy).

The institution has not yet been able to maximise the greater potential of web tools. While web tools' offer interactive abilities, the current practices of content sharing and announcements indicate that the institution at large has not yet been able to maximise their greater potentials. Much of the pronounced subject integration has only evolved into availing items such as study guides on E-Thuto and to a lesser extent, study material (CUT: 2015-2010, e-learning strategy). Moreover, the underutilisation of the web tools is confirmed in recent reports from the financial department and ICT services that indicated the existence of higher operational costs and bulk printing (CUT 2016, Cost Containment Implementation (CCI); CUT 2017, ICT services). As indicated by the Chief Financial Officer (CFO), operational costs on stationery, printing, transport and accommodation have been rising and yet these can be reduced through a pronounced utilisation of web tools in teaching and learning (CUT 2016, Cost Containment Implementation (CCI)). Moreover, the ICT services in 2017 indicated that bulk printing continued to be a problematic issue at CUT (CUT 2017, ICT services).

The use of web tools at CUT, as is with other universities in South Africa and abroad, is too fragmented to result in any visible financial impact. This reality has left the University unable to determine the benefits of implementing web technologies. The CUT has also not determined the financial impact of web-based subject integration on the operations of the University. This underutilisation indicate that the financial benefits of web technologies are not easy to observe. Nonetheless, the financial department of CUT, which realised the threat posed on the smooth running of the institution owing to the escalation of costs, has made recommendations that web tools should be used to cut operational costs. Ironically, the recommendations are not supported by any a clear strategy on how to achieve such cost cutting benefits. In the meanwhile, the University continues to spend on new technologies and annual upgrades of the LMSs without knowing how they can be used to safeguard the scarce resources. Moreover, both the number of students enrolling with the University and the number of subjects offered have been increasing annually, thus resulting in further annual costs to the University's core business (CUT 2017, Archives).

The above discussions provide the background to this study focus on the kind of institutional approach to the implementation of web technologies that will lead to a wide institutional acceptance and proficient use. The assumption is that a formalised use of web tools that is completed by an optimal use of these tools creates conditions that make the measurement of these tools possible. It should be noted that, previous studies on measurement techniques left out the proficiency of use as

a basis to impact and this has led to haste refutes of the possibility of measurement. As a result, Whitmer *et al.,* (2016) in their study, which realised that there is a poor utilisation of web tools in universities worldwide, resolved that the existence of one university context with good practices may lead other institutions to learn from such an institution and customise the context for their individual benefit. This shows that the benefits and measurement of web technologies are context specific as organisations differ on how they use the technologies and the operations they replace them with (Botchkarev & Andru, 2011: 245-69; Lehmkuhl, 2014:1). Hence, the need for a study that evaluates both the contextual aptitudes of web technologies within one university and how these aptitudes can be used proficiently to derive financial benefits.

1.8 Problem statement

In spite of the overarching beliefs among senior executives world-wide that web technologies bring financial benefits to adopting organisations, lack of acceptable measurement techniques renders these claims difficult to believe (EIU, 2007:9). In addition, the reality at CUT, which is the institution under focus in this study, characterised by low and fragmented utilisation of web tools also delays the benefits that the University could reap from the technologies, thus adding further to the factors contributing to the difficulty of detecting and measuring the impact (Armstrong & Franklin, 2008:5; Lehmkuhl, 2014:4). This underutilisation can be seen in the fact that online education is largely a one-way traffic from lecturers to students with functions such as announcements and content sharing being the most utilised (Whitmer *et al.,* 2016). Alternatively, a proficient practice which leads to financial efficiencies should be one where interactive functions feature more prominently in facilitating teaching and learning (Veletsianos, 2010:3; Unal & Unal 2011:3; Weinberg & Pehliven, 2011:276). It is also difficult to benefit and measure the impact of the tools that are utilised in self-directed ways without a holistic institutional approach (Armstrong & Franklin, 2008:5; Thinyane, 2009:406–414; Gachago, Ivala, Backhouse, Bosman & Bozalek, 2013:98). Therefore, the CUT's e-learning strategy indicates the prevalence of disjointed styles of utilisation (CUT 2015-2020: e-learning strategy).

The identification of the underutilisation of web-technologies within CUT is nonetheless linked to suggestions that the use of web-tools will mitigate against the escalating operational costs that have also been noted as evident in the institution's daily operations (DHET, 2014; Dlalisa & Van Niekerk, 2015:2, 3). Thus, there is a need to reduce operational costs more so when considering that, external funding that forms substantial income of all universities in SA, is dwindling. Web technologies assist institutions to administer education to a large number of people with less financial efforts (Penzhorn, 2013) thus, the lack of proficient utilisation undermines the potential to meet the ever-increasing demand for higher education (Dlalisa & Van Niekerk, 2015:3; USAF, 2016). In addition, failure to make cost efficient core business a priority will affect the financial

sustainability of universities (Dlalisa & Van Niekerk, 2015:2, 3). Therefore, a study that examines the potential financial effects of proficient utilisation of web technologies for universities is essential. Using CUT as an exemplary case, the present study seeks to explore ways in which web technologies can be utilised to enhance detectable financial benefits to an institution's teaching and learning processes. An exemplary case is chosen because the benefits of web technologies are by nature context specific as it has been established above.

1.9 Research objectives

The main objective of the study was: *To develop a framework for enhancing the financial benefits of implementing web technologies for teaching and learning at CUT.*

Co- Objectives

1. To carry out an investigation of the nature of accessible web technologies for teaching and learning at CUT.
2. To assess in detail the potential financial contributions of web technologies to CUT since their implementation.
3. To examine the effectiveness of current practices for assessing the financial impact of web technologies at CUT.
4. To develop a framework for enhancing the financial benefits of implementing web technologies for teaching and learning at CUT.

1.10 Research questions

The main research question of the study was: *How can the financial benefits of implementing web technologies for teaching and learning be enhanced at CUT?*

Sub- Questions

1. What web technologies are accessible for teaching and learning at CUT?
2. What are the potential financial contributions of web technologies to CUT?
3. How effective are the practices that CUT utilises to assess the financial impact of web technologies?
4. What is a possible framework for enhancing financial benefits from implementing web technologies for teaching and learning at CUT?

1.11 Research methodology and design

The research methodology and design of the study is explained in detail in Chapter 6. The fieldwork of the study employed qualitative techniques because the study aimed at exhausting field-generated-data in unravelling the phenomenon of web technologies and its impact. The rationale behind using this approach is that the financial impact of web technologies, especially in the educational sector where only the quality of learning is the focus, has received scant analysis. Therefore, the field work

perspectives of the study were deemed as valuable towards reaching the conclusions. The study also followed a case study design with CUT used as an exemplary case. Finally, the qualitative techniques employed in the study are documentary reviews and focus groups – where for instance one focus group discussion composed of all four staff members of the centre for e-learning – and these are analysed through thematic analysis.

1.12 Limitations of the study

Like any other scientific enquiry, the present study is not without limitations. These limitations, which are inherent to a study of this nature, are discussed in Chapter 8

1.12 Outline of chapters

The entire thesis is divided into nine chapters. Each chapter's focused is outlined below.

CHAPTER 1 presents the introduction, preliminary literature review, background to the problem and rationale of the study, problem statement, research questions and objectives of the study. **CHAPTER 2** defines various generations of web technologies and their inherent benefits within the private sector. **CHAPTER 3** discusses web technologies within the higher learning context from the global to the specific SA conditions. **CHAPTER 4** reviews literature on management accounting techniques that normally measure the financial performance of investments. Other frameworks are also discussed. **CHAPTER 5** focuses on the background and context of CUT that can be driven with web technologies. **CHAPTER 6** presents the methodology, data collection and analysis techniques applied in this study. **CHAPTER 7** presents and discusses the results on the available web technologies and how they are used at CUT. **CHAPTER 8** presents the findings on the financial effects of web technologies and practices used in assessing their impact. **CHAPTER 9** articulates the conclusions and recommendations and the develops of the framework of the study.

CHAPTER 2: DEFINITION OF WEB TECHNOLOGIES AND THEIR BENEITS

2.1 Introduction

In the previous chapter an overarching perspective on the study was given. The background to the study, research objectives, questions, methodology as well as the layout of the study were described. This chapter defines the various generations of web technologies and exposes the financial benefits realised by the adopting organisation. Two assumptions have influenced the articulations on web technologies in this study. The first assumption is that, a proper identification of the tools permits an accurate determination of the tools that can be included in web technology enquiries. The second assumption is that, a proper understanding of the web-tools facilitates a clear presentation of the financial effects of web technologies to the adopting organisations. Nonetheless, the chapter begins with an outline of the evolution of web technologies and its differentiation using four concepts. It also shows the manner in which web technologies affect the financial performance and position of organisations if used appropriately.

In this study, the financial benefits are the profitability and cost reduction effects of using web technologies. According to Els, Erasmus and Viviers (2014:74) profitability is the ability of an organisation to utilise its resources proficiently to generate income. This demands an investigation on the different elements within the financial statements to establish profitability. As a result, this chapter determines how web tools are classified within the financial statements of organisations. The outline of the proper definitions and benefits is followed by a discussion on some of the challenges associated with the adoption of web technologies.

2.2 Definition of web technologies

The speed at which web technologies evolve leads to some difficulty of conceptualisation. As Armstrong and Franklin (2008:2) attest, it is very difficult to harmonise the activities that happen beyond physical boundaries of organisations owing to the location of the internet clouds. As a result, organisations are habitually unable to differentiate web technologies from other tools while seeking those that would add value to their processes (Grosseck, 2009:480). In research, this lack of proper conceptualisation leads also to the difficulty in identifying the technologies to include or exclude as web based. In view of the widespread misconceptions around the second generation of web tools, Lehmkuhl (2014:4) affirms that lack of proper demarcations between various types of technologies undermines the full advantage offered by these technologies. Therefore, it seems that the proper definition of a web concept should precede the credentials of the tools that serve that concept. The sections that follow discuss the various web concepts as a means to divulge the minimum requirements necessary to satisfy web technology classification.

2.2.1 First generation (Web 1.0) of web technologies

The web, launched in the 1990s, consisted of applications that could only present information for view only. At that time, effective communication was the main objective that the adopting organisations intended to achieve (Choudhuri, 2014). Web 1.0 is the earliest web concept, which was characterised by tools that fulfilled a one-way publicity of ideas, information and products. For example, the primary goal of organisations that implemented traditional websites and online shopping was to publicise their products or make information available to intended consumers (Getting, 2008). Notions like 'DoubleClick', 'personal web sites', 'page views', 'publishing' and 'content management', and others that enable accessibility of information fit well into this idea (O'Reilly, 2010). In that setting, web sites are singularly controlled from one cradle to which stand-alone computers are central. Furthermore, the web pages contain documents, videos, text and pictures for intended user-consumption or view-only (Choudhury, 2014).

Therefore, that nature of web 1.0 concept and the associated tools sought a one-way input by organisations, with the achievement of publicity noted as the key characteristic in the above discussion. The benefit to the organisation would be less costly information dissemination and advertisement campaigns. However, the limitation is that contribution to content could only be from one centralised source, thus making it difficult for organisations to break through inflexible traditional structures and the related costs.

2.2.2 Second generation (Web 2.0) of web technologies

The expression 'web 2.0' has been used haphazardly and mostly as an advertisement catchphrase over the internet. This is evident in the articulations made by various practitioners in the field of web technology. For example, Web technology expert, Tim O'Reilly (2010) indicates that there are several tools referred to as web 2.0, which are not in any way web-based. Misconceptions around the idea have given rise to a belief that web 2.0 is nothing but some electronic 'junk' (Grosseck, 2009:480). On the other hand, web 2.0 is routinely viewed synonymously with social media, where the latter refers to social networking sites because of their ability to connect people through the internet (Owusu-Ansah, Gontshi, Mutibwaand & Ukwoma, 2015:30). Whereas social media applications largely embody the features of web 2.0, the issue of connectivity of people is only a one-step development from publicity imperative that has always dominated the internet usage. One might argue that traditional emails, which are web 1.0 compliant, still connect people in some way. Hence, in fact, if publicity and connectivity are the defining attributes, then web 2.0 would be a less valuable development since the previous web 1.0 more or less offered those functions.

It is clear that the function of publicity and other functions is subsumed within web 2.0 notion. As indicated in the figure below, there are additional functions that are unique to web 2.0 tools and these are syndication, collaboration and recombination. The explanation of these functions is integrated into the definition of web 2.0 platform beneath the figure.

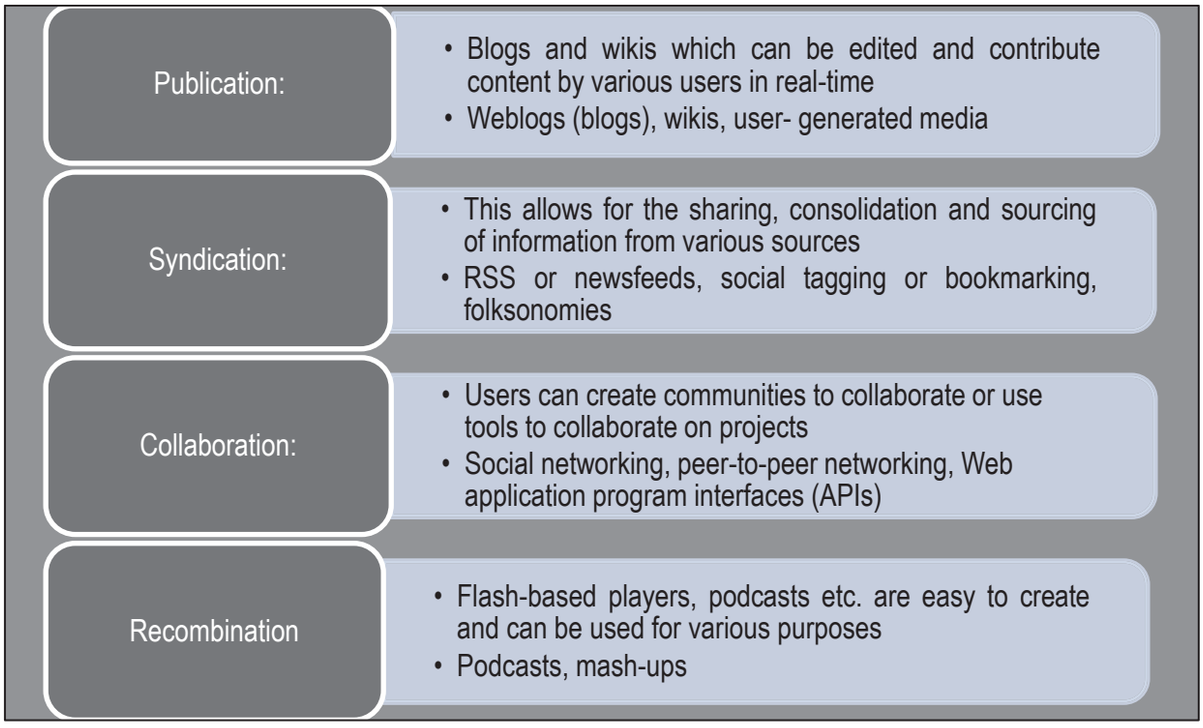


Figure 2.1: Four main categories of web 2.0 functionality. Source: Rudman & Steenkamp (2009:3).

2.2.2.1 The web as a platform

Web 2.0 is a concept that augmented the previous web platform to allow a two-way interaction between users (Getting, 2008). Even though the preceding web 1.0 had the web as a platform, it depended on the installation of software on a personal computer for web browsing and did not allow users the benefit of interaction. As a result, web as a platform is not exclusively indicative of web 2.0, but the ability to allow users the autonomy to participate in content creation is a crucial aspect of web 2.0 platform (Getting, 2008; Zheng *et al.,* 2010:13). Accordingly, web 2.0 tools are web-based tools. However, not every tool that runs on the web is web 2.0. The question that has to be answered in determining if a platform is web 2.0 is; what functionalities does it allow? (Getting, 2008; O'Reilly, 2010). Therefore, web 2.0 has a platform that is characterised by certain competencies that distinguish it from its precursor. Implied in the above assertions is the fact that within the context of web 2.0 the web as a platform may be used to transfer some or all of the core business of an organisation to the web to take advantage of cost-efficient operations.

2.2.2.2 Harnessing collective intelligence

The web 2.0 tools enable users, unlike with the singular publicity role served by web 1.0, to contribute and participate in content creation. The ready access of content has become an intrinsic part of the web such that other users can access the same content and use it for other purposes. This feature allows collaborative sites to evolve gradually out of the contribution of different individuals (O'Reilly, 2010:19). The ability to allow users to participate in content creation allows for a notion known as *'harnessing the wisdom of the crowds'* (Constatinides & Fountain, 2008:232; O'Reilly, 2010:19; El-Sayed & Westrup, 2011:2; Mihai 2014:77). This notion translates into *"the belief that*

large numbers of people can make better decisions about a wide range of topics or products than a single person or even a small committee of experts" (Laudon & Laudon, 2014:619). This demonstrates that the vast majority of the tools that satisfy web 2.0 concepts are a product of the evolution of the internet tools rather than products of a certain company. It further indicates that the majority of the tools are available on the internet for organisations to incorporate at their convenience. Any main web content created by one individual and adjusted by other remote users is perceived as meeting publicity and collaborative goals with tools such as wikis and blogs being available to enable these goals (Rudman & Steenkamp, 2009:4). Bloggers can only contribute to the content through comments, while wikis allow for additional functions such as adjusting the content and contributing to its substantial form. Therefore, wikis have more collaborative functionality than blogs (Mihai 2014:77).

2.2.2.3 Data is the next Intel Inside

The notion that Data is the next Intel Inside refers to data-base orientation as the core competency of web 2.0 (O'Reilly, 2010:29). The arrival of web 2.0 applications led to the fading of the prominence of computer brands, cutting-edge operating systems, performance and speed owing to the rapid accessibility of information that is readily available on the web. Hence, the ability of the internet to function fast and manage the traffic are the new challenges, which when managed well, contribute to the competency of web applications (Nazree, 2010).

The isolated and controlled database was an unavoidable means of data administration prior to the era of web 2.0. Companies such as Google earned large financial returns through investment in databases that they exclusively controlled. However, the advent of web 2.0 concept led to the fading away of the idea of controlling databases. Currently, technologies, like mashups, are well able to recombine data from internet open sources with those of companies such as Google, whose internet configurations are now web 2.0 compatible. Consequently, there is a prediction that the web companies' realisation of the kind of data that is intrinsic to building up web 2.0 will increase competition between those that supply data and those that supply web applications (O'Reilly, 2010:29). Mashups and podcasting are recognised as recombination tools, owing to their ability to source information from different portals and amalgamate it in a less costly and quick way to form another document (Rudman & Steenkamp, 2009:4).

2.2.2.4 End of software release cycle

Another feature of web 2.0 presence is that adopting organisations are shifting from the need to constantly upgrade their software to the latest versions, to the continuous monitoring of web applications' functionality. The implications to adopting organisations are that they need to continuously monitor performance of web applications and respond timeously to inquiries posted through applications such as blogs and wikis. The organisations also need to watch out for security

threads and be ready to take advantage of the newest applications available on the net to integrate them into their existing platforms (O'Reilly, 2010:30). The fact that web 2.0 tools do not require continuous physical upgrades to computers and software shows that they do not depend of stand-alone machines to function. This implies that the physical disruption of daily operations linked with software upgrades is not prevalent with the second generation of web tools. Therefore, the recombination and reusability of web tools decreases levels of disruption and permits less costly continuous improvements.

2.2.2.5 Software above the level of a single device

The web 2.0 concept is operational beyond the boundaries of standalone computers that were prevalent during the traditional dot.com age. A computer at its core or origins may power web 2.0, although users do not always need one computer with installed software to operate on this platform. The current smart phone handsets are typical examples of tools that allow this notion (O'Reilly, 2010:34). This indicates that an organisational context where personal computers are the only tools that power daily operations will not take full advantage of the web 2.0 concept. In addition, a computer is one alternative as organisational operations should not be limited to physical or stand-alone tools. Hence, organisations' adoption of web 2.0 eliminates the physical disruption of daily operations since it is essentially a virtual and non-physical idea.

2.2.2.6 Lightweight programming models

Web 2.0 tools have easy programing configurations that allow reuse for other purposes that might have not been foreseen during the original build up. Simplicity is the feature of web 2.0 programing configuration, leading to the web 2.0 programming feature being called Really Simple Syndicate (RSS), which allows the recycling of data beyond its original setting in all creative ways possible. The syndication functionality points to a web application that allows users to mine data from different web sources and merge it together to produce one body of knowledge for use in an organisation or sharing with colleagues (Rudman & Steenkamp, 2009:4; O'Reilly, 2010:31-32). It should be underscored that the web 2.0 notion subscribes to the notion that a web application is useful if it can be re-used with minimal control from its origins. Hence, innovation in this setting can be judged on the ability to pull together what is already existing (innovation in assembly) rather than creating something new (innovation in production) (O'Reilly, 2010:31-32).

2.2.2.7 Rich user experiences

Rich user interfaces are also not necessarily a new success of web 2.0, but as the internet evolves, it reaches certain significant benchmarks to the point of rendering the latest achievement as new. The internet has been developing with a goal to produce interfaces that are user-focussed and able to offer customised applications like Gmail and google maps on different levels of interaction and accessibility (O'Reilly, 2010:36). Thus, web 2.0 has enabled the attainment of this goal as a

significant apogee through programing altered from the more complicated Hypertext Transmission Mark-up Languages (HTML) to simpler and reusable User Interfaces (UI) (Nazree, 2010).

- *Definition of web 2.0*

Web 2.0 tools run on an interactive and collaborative platform that allows users to engage in content creation (Weinberg & Pehliven, 2011:276). The tools serve most or all of the requirements of web 2.0 concept, such as web application as a service instead of mere publicity goals, and they have become popular as more users take advantage of them (Constatinides & Fountain, 2008:232; O'Reilly, 2010:17; El-Sayed & Westrup, 2011:1). In private sector utilisation, social media platforms are also called Enterprise 2.0 (Kaske, Kügler & Smolnik, 2012: 3898 - 3899). Andrew McAfee (2009:23), the originator of the phrase, defines Enterprise 2.0 as the *"use of emergent social software platforms within firms, or between firms, and their partners or customers"*. Thus, it can be inferred from the discussions that web 2.0 is an idea and not a tool in its self because *"web 2.0 doesn't have a hard boundary, but rather, a gravitational core. You can visualize Web 2.0 as a set of principles and practices that tie together a veritable solar system of sites that demonstrate some or all of those principles, at a varying distance from that core"* (O'Reilly 2010:17). As a result, this study, which recognises significant advances from first generation of web tools, takes a stance that web 2.0 tools are *"second generation, interactive internet-based services that enable people to collaborate, share information, and create new services online…"* (Laudon & Laudon, 2014:618). The concept of web 2.0, as discussed above, can be conceptualised as shown in the figure below.

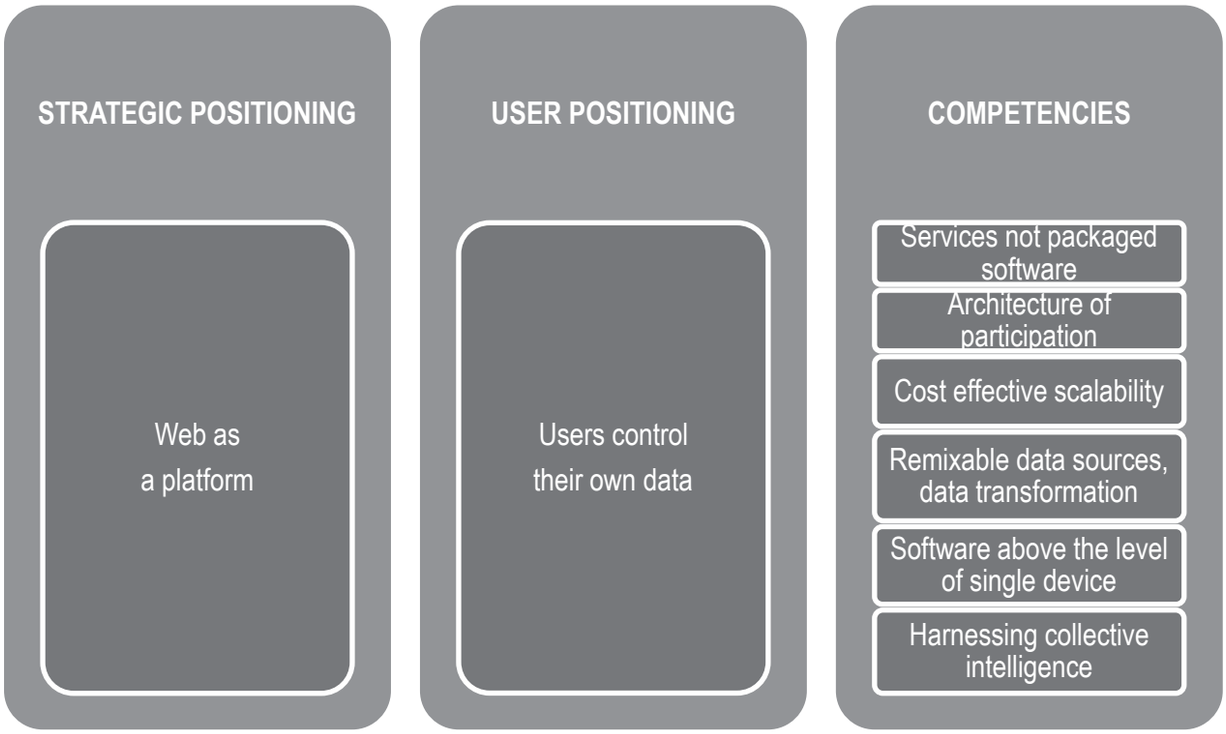


Figure 2.2: The platform and competencies of web 2.0 concept. Source: O'Reilly (2010:18)

2.2.3 Third generation (Web 3.0) of web technologies

There is another step beyond web 2.0 that is known as web 3.0. Although difficult to define, concepts such as 'semantic mark-up, and 'web services' provide a foundation to understanding what web 3.0 is (Getting, 2008; Hendler, 2009). Semantic mark-up refers to *"the communication gap between human web users and computerized applications"* while web services refers to the ability of some internet-based applications to induce transaction on their own without human initiatives (Getting, 2008). The implication here is that, while web 2.0 allows interaction among human users through related web tools, and the related tools enable interconnectivity between human users and web applications, the web 3.0 enables application to application interactions without a human being initiating transactions. The resulting effect of web 3.0 is that organisations do not have to build physical databases as the web itself functions as a virtual database (Matade & Rajeev, 2017). One may therefore postulate that information may evolve within the web 3.0 setting without specific human or organisational origins. The web tools that serve this concept may also initiate a transaction. In addition, a transaction that originates from the human user may have a non-human, or internet application as the intended recipient.

2.2.4 Fourth generation (Web 4.0) of web technologies

There is no consensus so far on the definition of web 4.0. A few studies make mention of the phenomenon. For example, Mihai (2014:76) notes that web 3.0 and 4.0 are *"based on a semantic web, the philosophy of which is free, unrestricted communication. However, until now, there haven't been developed any generally accepted frameworks and there are lots of controversies regarding terms"*. The fact that the above-mentioned author bundles together web 3.0 and 4.0 is indicative of the existing difficulty to delineate between the two and therefore understand the latter. The same observation is evident in the observation by Choudhury (2014:8099-8100) that *"Web 4.0 can be considered as an Ultra-Intelligent Electronic Agent, symbiotic web and Ubiquitous web. Interaction between humans and machines in symbiosis was the motive behind the symbiotic web".* Clearly, web 4.0 offers something a little or more beyond web 3.0, but these definitions do not provide a clear advancement of web 4.0 from web 3.0.

It can be postulated, from the above-noted recent studies that, the newest generations, web 3.0 and web 4.0 are at an infantile stage. This is mainly because proper definitions and conceptualisations are still being contested. However, one may suggest that web 4.0 seems to allow an independent functionality of web tools without the human as the originator and controller. Consequently, most of the tools discussed in this study will fit into the web 2.0 concept. Accordingly, the common denominator is that all tools discussed are web tools, but sufficient to say, a determining factor of platform as web1.0, 2.0, 3.0 or 4.0 is the functionalities that it allows (Getting, 2008; O'Reilly, 2010). The evolution of the web indicated in the following table.

	Web 1.0	Web 2.0	Web 3.0	Web 4.0
Age of dominance	1990 to 2005	2006 to 2016	2016 to future	Future
Defining feature	One-way **publicity** of information	Participation & collaboration	Interconnectivity of applications & people	Interconnectivity and symbiotic nature of the web
Technologies	Traditional websites, email, DoubleClick, dot.com	Blogs, wikis, RSS, mash-ups, podcasting, video conferencing, social media	Clouds, Skype, WatsApp, SemiBlog, Haystack	Not yet clear
Control	Centralised through a Web master	Decentralised, free space	Applications function by themselves & through user initiative	Independent & Self-initiating environment
Data	Owned & contributed by an organization	Contributed by all participants	Shared but not owned	No one controls data
Primary means of accessibility	Stand-alone computer	Any internet enabled devise. Stand-alone computers & smart-phones included	Any internet-based devises	The web

Table 2.1. Evolution of web tools and the defining attributes

2.3 Benefits of web technologies

There are some consequential benefits accruable from taking full advantage of various generations of web technologies. These include an inevitable replacement of manual processes of carrying out the core business and the related costs that is aided by the use of the web (El-Sayed, H and Westrup, 2011). For example, paperless operations would lead to less or no stationery and printing costs for organisations. Web-based collaboration would also lead to less travel and limited physical meetings as users can engage in collaborative projects over the internet quicker and with little costs (Manguic, 2009). Thus, an organisation that takes advantage of web tools may, in the long run, incur less costs on transport, depreciation, petrol, repairs, electricity, interest and other operational processes. Furthermore, organisations will also need to revise their need for physical assets such as stand-alone computers, furniture, infrastructure and vehicles because they are costly on their own and these non-non-current assets generate other operational expenses. Moreover, an organisation that uses web tools may also enjoy lower costs of information access, sharing and reuse because of simplified programming and integration of data beyond the control originator organisations. The ways of safekeeping information for later reuse will also be less costly as internet-based clouds replace traditional infrastructures that have been the main sources of data warehousing.

Reviewed literature suggests the benefits of web-based services are observable through benchmarking the services against the ability of financial models to capture those benefits. For example, Mohapatra (2013:164) classifies the benefits of web-based operations as either direct or indirect. His view is that direct benefits are quantifiable through financial models while indirect benefits are the qualitative effects such as competitive advantage, which cannot be measured using financial models. However, Mohapatra's (2013) does not explain how direct benefits such as increased revenue and profits, and reduction of costs can be calculated. Moreover, the types of cost that are reduced are not clear. According to Horngren *et al.,* (2008:975-976) the increase in profitability may be a result of reduction in operational costs. While reductions in operational asset costs may contribute to positive ROI, increases in the same costs may lower it. A confirmation of Mohapatra's assertions would suggest that web tools contribute to profitability and cost reductions. Hence, the web tools lower an organisation's cost of offering services by transferring some or all of the core business to the web, which can eliminate the high costs of investing in traditional infrastructure and equipment.

The table below lists the direct and indirect benefits of web-based technologies as discussed by Mohapatra (2013:164).

Direct benefits	Indirect benefits
Increased profits	Increased technology management
Increased revenues	Improved process management
Reduced costs	Reduced cost of errors and manual work
Reduced inefficiencies	Reduced logistics cost
	Reduced communication costs
	Improved accessibility
	Reduced customer care costs
	Increased customer hits
	Improved working capital

Table 2.2: Direct and indirect benefits of web-based operations. Source: Mohapatra (2013:164)

Some studies on how to inspect web technology benefits classify the benefits according to the additional value that they contribute. Hinchcliffe (2010:26-31) discovered additional value benefits such as cost-reduction, transformation, growth and innovation. A case study by Barnes, Fintan, Clear, Dyerson, Harindranath, Harris and Rae (2010:7), which expands on Hinchcliffe's research, discusses these benefits as internal operational efficiency, enhanced capabilities, customised service offerings and effective external communications. The scholars also add Lifestyle benefits as a

further benefit. The discussion below details the benefits together with complementary findings from other studies.

2.3.1 Internal operational efficiency

This benefit links with the web tools' ability to reduce operational costs (Hinchcliffe, 2010:31). The view is that web tools help to cut down daily operational costs while promoting productivity at individual and team level. Eleven out of twelve organisations in the case study (Barnes *et al.,* 2010), admitted that the use of web 2.0 tools enabled them to reduce direct and indirect operational expenses, and improved company operational efficiency. Some businesses claimed that their access to online resources afforded them less costly models in comparison to their traditional internal strategies (Barnes *et al.,* 2010:7). It may be concluded based on the assumption that web technologies contribute to the lowering of operational costs and an assertion by Horngren et al, (2008:975-976) that an increase in profitability may be the result of reduction in operational costs, that web tools have an indirect contribution to profitability. Nevertheless, these studies do not refer to the technique used to detect such financial benefits, as in Mohapatra's (2013) case.

2.3.2 More effective external communications

Web tools improve communication links between an organisation and all members of the supply chain (Barnes *et al.,* 2010:7). Two variables could lead to the translation of effective communication into a financial benefit and these are time and replaced costs. Hinchcliffe (2010:31) submits, with regard to time that, effective communication through web presence contributes to timeous exchange of resources. This claim suggests that a model that can attribute a monetary value to time will be step closer to evaluating web tools financially. In addition, various researchers (Mangiuc, 2009:77; Barnes *et al.,* 2010:4; Mungofa & Peter, 2015:62) are in accord that replacement costs arising from online communication are gaining wide acceptance in organisations and that it has replaced traditional methods of communication and their associated costs. Therefore, web technologies offer a quicker exchange of information and contribute to lower costs of accessing and exchanging information within and beyond organisational frontiers.

Furthermore, Sahd and Rudman (2013:40-41) state that blogs, podcasts, RSS, Wikis, and social networks are used in the public sector to achieve cost effective and speedy dissemination of information. Cost-effective communication strategies through social media can be achieved for both internal and external stakeholder engagements (Schniederjans, Cao & Schniederjans, 2013:914). The reductions of data costs witnessed in recent years has led to a decrease in the costs of communication as opposed to traditional telephone related expenses. These enhancements in communication have also helped organisations to cut travelling costs by creating a sense of closeness through online virtual meetings (Barnes *et al.,* 2010:4; Mungofa & Peter, 2015:62) and low-cost web conferencing tools (Sahd & Rudman, 2013:41). Most companies in a case study by

Barnes *et al.* (2010:7) utilised sites such as blogs and LinkedIn to achieve an efficient external communication. It was however, noted that most users still prefer face-to-face interactions because of their personal interpretation of what commitment means. Hence, the financial benefits of web technologies are linked with the tools' efficient internal and external communication platforms. The same proficiencies of web technologies in efficient communication can translate into replacement of transportation or travelling costs.

2.3.3 Customised service offerings

Web tools have a flexible make-up that allows the recreation of sites that serve individual customer or business needs. The ability to target intended users, such as customers, with tailor-made tools can increase their satisfaction and in the case of customers raise the chances of repeat sales (Barnes *et al.,* 2010:7; Hinchcliffe, 2010:31). Customer satisfaction is a qualitative benefit and would qualify as an indirect contributor variable to revenue, only if the amount of repeat sales resulting from customer satisfaction can be ascertained.There is more to the relationship between the use of web tools and customers. The web has become a virtual world where companies can find their target market and retain the existing customers. Companies that possess web facilities can spread their marketing campaigns easily, and as a result, can pull more clients that are otherwise difficult to reach without web tools. Moreover, web tools enable companies to improve customer relationships by focusing their attention on clients' involvement rather than the one-way publicity of ideas, products and services (Ross, 2009:4). In fact, customers indirectly dictate the kind of web tools and strategies that organisations should use with the success of organisations depending on their ability to build their web strategies around their target market and their allowing that market to contribute contend in the form of ideas and otherwise (Constatinides & Fountain, 2008:233).

The ability to track and record the number of people who viewed the advert and how they rate the advert is an integral part of social media tools usage. The monitoring increases the chances of turning views into sales as more people get to be tagged and the company channels its rigorous advertisement campaigns to potential buyers (Ross, 2009:9). A case study by Manqiuc (2009:84) shows that the use of web tools yields financial reductions in the means used to retain customers. Most of the customers that were willing to make return purchases increased from forty-five percent to seventy percent owing to wikis and social networking facilities created to allow interactions between employees and customers. Therefore, the use of web tools contributes to lower costs of customer retention, which leads to increased profitability.

2.3.4 Enhanced capabilities

According to Barnes *et al.,* (2010:7), web tools enable workers to develop new kinds of expertise through internal and external online interactions. Web tools can enhance the workers' self-development through their provision of access to current professional information and techniques.

About five of the businesses in the case study (Barnes *et al.,* 2010) benefited from networking beyond the organisational boundaries as a means to gaining more business expertise. This benefit can be translated into lower costs of training or acquisition of new skills. Thus, this could be a valuable cost reduction benefit, if an organisation can investigate how the acquisition of professional skills through utilisation of web tools would have replaced traditional spending patterns for the development of their staff members. The establishment of an organisation's ascertainable costs from accessing professional information and techniques will constitute a financial payback resulting from the replacement of such costs through new technology. Moreover, lowering the costs of access to professional information should be financially worthwhile to an organisation that is research intensive.

2.3.5 Lifestyle benefits

According to the case-study (Barnes *et al.,* 2010), this is a benefit that is mostly enjoyed by managers who are able to monitor and lead organisational performance remotely and through virtual presence. Life style benefits include reductions in travel by replacing it with online meetings and transactions that save time and expenditures. Therefore, daily engagements that traditionally require the manager to be in office can be attended through web-based tools (Barnes *et al.,* 2010:7). The same argument, as above, can be made that a study, in the form of a case study approach, can establish if there are ascertainable costs to management's monitoring of performance at work and reveal if such costs have been replaced or not. The implications of this approach are that organisations should carefully consider whether the technology they adopt is used fully to replace previous procedures. This assists in the reduction of redundant procedures, which might otherwise lead to an increase in costs. All staff members should be trained on how to use the technologies and the objectives should be thoroughly communicated so that it becomes a monitored organisational take-up of technology rather than an individualistic one.

2.3.6 Additional benefits of web tools

Some of the benefits of web tools are similar to those attributed to information systems in general. Studies in information systems (Botchkarev & Andru, 2011, 245-69) and web technologies (Manqiuc, 2009:81-86) identify the same intangible benefits such as good decision making, accessibility of information, strategic direction, good reporting and better decision making. Information systems link well with organisational soft benefits such as accessibility of current information for good decision making, which is somehow associated with positive ROI. Information systems also contribute to faster and frequent accessibility of information, and formalised reporting procedures. Faster and frequent information accessibility is an inherent quality of information that links with positive ROI. Better decision making contributes to informed strategic direction, efficient asset management, flexibility and accountability within an organisation (Botchkarev and Andru,

2011, 245-69). Other benefits of information systems, according to the same authors, are *"increased productivity and time savings, increased intellectual capital, enhanced employee goodwill, increased job satisfaction, higher customer satisfaction and better corporate image" (*Botchkarev and Andru, 2011, 245-269). Therefore, if prior to web tools, information systems were already linked with financial benefits, it would be expected that later developments in technology have moved a step further in providing the same benefits and more. Research does not deny this and perhaps the current migration to the web-based notions confirms this to some degree.

2.4 Measuring the benefits of web technologies

The measurement of the benefits of web tools is imperative. In a case study, by Mangiuc (2009:76-77) it is pointed out that an analysis of the structure of organisational operations prior to the incorporation of the web tools should be carried out and compared with the current state. That analysis should determine the extent to which web tools have changed the employees' work. As a result, the usage of new technologies should be evaluated to determine whether, employees have extra time for other responsibilities or not, if web technology usage resulted in a more efficient usage of time and other resources, if the organisation now has improved customer relationships and communication, and if there has been an improvement in the organizational revenue or turnover. The answers to these questions could provide a point of departure towards the measurement of the financial returns. It should be easier, in cases where the adoption of web-based tools replaced traditional paper-based operations to measure concepts such as cost savings resulting from replacing expenses like postages and transportation. Consequently, Mangiuc (2009) proposes that web technology measurement may also compare its usage with modern emailing costs, which he posits, contribute to an increase in revenue compared with traditional paper-based methods of communication. This study by Mangiuc (2009) also underlines other indicators of the financial benefits derived from web tools. The use replaces the cost of administrating the core business manually through paper and even some of the older information systems. The tools also contribute to the improvement of the organisation's profitability through an increase in revenue. However, an increase in revenue may not result in noticeable profitability unless operational costs are reduced with previous discussions indicating that web tools contribute to operational cost efficiency.

A study by Botchkarev and Andru, (2011: 245-69) indicates that information technologies were a source of both tangible and intangible benefits long before web tools. The reason may be that the tools by nature generate intangible benefits as many studies assert. But it may also mean that the organisations do not carefully devise implementation strategies that are measurable. However, Botchkarev and Andru, (2011: 245-69) argue that the intangibility of the benefits means that measurement is possible but comes with a considerable level of difficulty. Accordingly, Manqiuc (2009:86) points out that intangible or *'soft'* benefits should refer to paybacks that are impossible

to assign monetary value, while tangible or 'hard' benefits should denote those benefits that have a considerable level of difficulty of measurement. Some of the benefits may be quantified financially through their association with measurable variables such as time and productivity. A typical technique could be to determine the amount of employee time saved by using a system. Time saved may be a function of improved productivity, better collaboration between employees, and shortened sales conversion. A linear calculation may be created by multiplying minutes saved per day by employee salary (Manqiuc, 2009:81-86; Botchkarev & Andru, 2011: 245-269). The problem with these kinds of procedures is that the accounting field does not recognise them as sound financial approaches which suggests that an adjustment in the accounting field's conceptualisation of acceptable variables would be partly the solution to the problem.

The level of difficulty in quantifying benefits in monetary terms differ but that complexity should be seen as a contextual matter that cannot be generalised. It may be difficult to quantify certain benefits within a certain organisational setting and yet it may be easier within another (Botchkarev & Andru, 2011: 245-69). What determines the possibility of quantification are the functions of such tools within the adopting organisation. The impact of web tools can be detected by assessing the financial implications of replacing specific functions. It therefore means that an organisation's failure to implement the tools strategically and proficiently, limits the benefits and delay their detection. Considering that the original advent of web tools occurred in an unprompted manner (Armstrong and Franklin, 2008:4, 5), which contributed to the fragmented ways in which institutions utilise them (Armstrong & Franklin, 2008:5; El-Sayed & Westrup, 2011:5-6), this explains a lack of wide spread institutional use and a delay in the set of benefits inherent within web tools.

2.5 The costs of implementing web technologies

According to Laudon and Laudon (2014: 569), both financial costs and benefits have to be determined first before a financial evaluation of technology. The intention of this section on cost is to unpack the belief that the open source status of web technologies means that there is no cost to their acquisition. This view potentially downplays any motivation to financial benefit or measurement of ROI from implements that have no cost. It is therefore, vital to discuss the costs related to web tools as a means to justify the need to harness financial benefits and to evaluate such returns. However, financial benefits are relevant whether there was a payment involved at acquisition or not as the tools themselves can assist organisations to save up operational costs or contribute to their profitability. At the same time, the discussion of cost goes beyond the obvious monetary value at acquisition to include other cost implications that are normally ignored.

Management accounting's definition of cost implies that expenditure relates to resources that have financial value. It does not limit cost to purchasing price only because it views coast as a financial

value forfeited in order to achieve a specific benefit (Niemand, Meyer, Botes & Vuuren, 2006:17; Horngren *et al.,* 2008:1033,). The theory of costs and profits also defines a cost as *"a monetary valuation of effort, material, resources, time and utilities consumed, risk incurred and, opportunity forgone in production and delivery of goods and services"* (Cruz, 2014). The inclusion of intangibles like effort and time is valuable to this definition because it highlights that there are other hidden costs to acquisition of resources apart from the obvious monetary value at acquisition. This definition extends to the evaluation of financial benefits by assigning financial value to efforts, resources and time saved through transferring some of the operations of an organisation to the web space.

The definition of cost also infers opportunity cost. Opportunity cost is a term that refers to the benefit that is lost by choosing to allocate the financial resources to the next best alternative (Horngren *et al.,* 2008:1038, Vigario, 2007:23). It refers to the next most valuable alternative that would be forgone if a particular investment is undertaken (Els, Erasmus and Viviers, 2014:196). This means that if a certain organisational direction is undertaken, and there are no immediately visible financial costs, then it is possible to find cost implications in other affected processes or ignored alternatives. Therefore, one needs to focus beyond the face value and engage in a deeper scrutiny of all cost implications in order to find the total related costs to certain actions.

According to Vigario (2007:23), the importance of the concept of opportunity cost is that it highlights if the alternative option has made up for the one that was forfeited. The electronic commerce field also recognises that benefits are lost, while choosing certain online business opportunities over others. This includes sales not made or cost reduction not achieved because of taking or not taking a certain business strategy. Even though the actual value of opportunity lost does not appear in the books of accounting, it is a cost to a business that can be avoided (Schneider, 2014:334). Hence, an examination of the costs of web tools must take a holistic outlook that goes beyond the purchasing price and includes the financial value of other processes that are affected by the given project.

2.6 Determining the costs of web technologies

Management accounting follows five principles in determining and reporting the cost (Niemand *et al.,* 2006:8, 9, 17). The principles are discussed below.

(a) Cost determination: It is a process of gathering enough data about a product or process in order to reveal its costs. Relevant data for this purpose is obtainable from different service units or departments within an organisation. The complexity of determining costs depends on the nature of the acquired resource and the method of its acquisition. If Thus, the costs of a resource manufactured within an organisation will include additional aspects such as labour, additional resources (or

material) and space. Conversely, the purchasing costs of an asset supplied from outside an organisation, are typically uncomplicated to determine through source documents.

(b) Cost recording: This is a process of recording cost data, which is normally done through a double entry system in a ledger so that accounting information may be utilised by management and financial accountants.

(c) Cost analysis: It is one thing to determine cost and yet another to record cost, but these concepts only lay a foundation for yet another concept of giving meaning to what is recorded. Thus, the analysis of cost is a process of making sense out of accounting information so that management can make important business decisions.

(d) Cost management: The function of a cost accountant is to regulate costs for the company based on an analysis. For example, the cost accountant may see the necessity of cutting costs on a certain product or service based on the information received from the analysis. Therefore, the cost accounting function strives to help an organisation with efficient utilisation of scarce financial resources.

(e) Cost reporting: The reporting process here concerns itself with the dissemination of prompt accounting information to relevant decision makers.

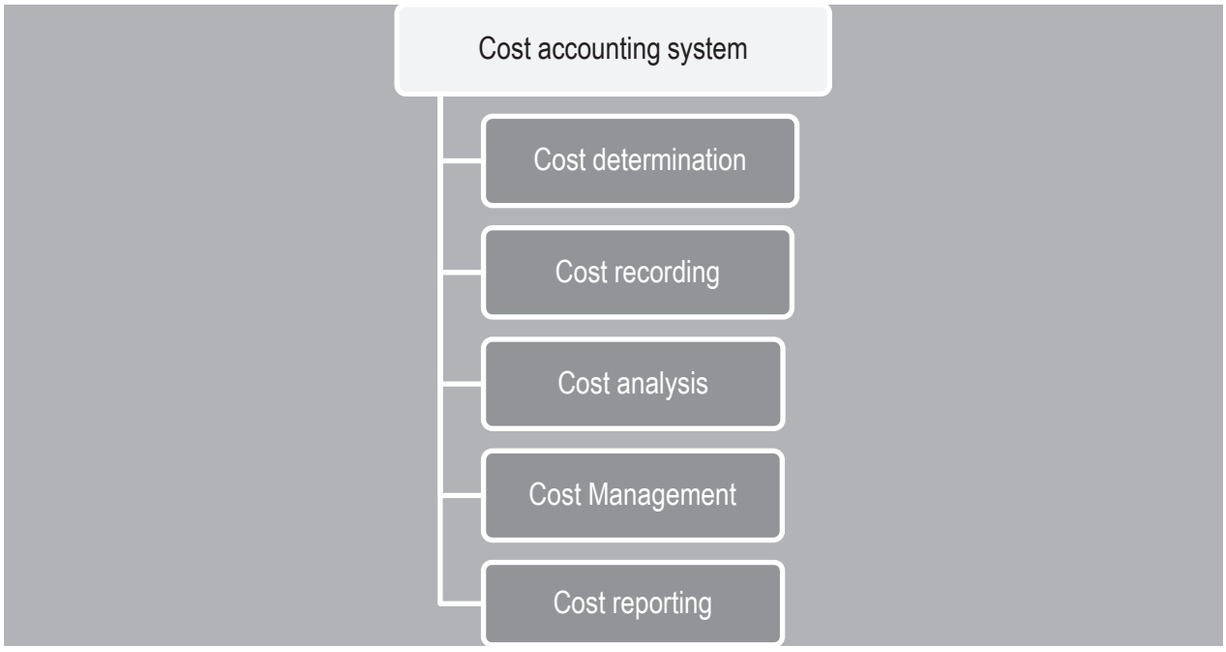


Figure 2.3. Cost and management accounting procedure. Source: Niemand *et al.,* (2006:8-9).

2.6.1 Classification of costs

The classification of costs as either expired or unexpired helps to highlight the implications of costs to the financial performance and position of an organisation. The classifications are the exclusive functions of the Statement of Comprehensive Income (SCI) and Statement of Financial Position

(SFP) respectively. In management accounting, a cost is unexpired if the economic benefits of an acquired resource will still be enjoyed by an organisation in the future (Niemand *et al.,* 2006:17). This agrees with the financial accounting's definition of non-current assets as economic resources that are expected to be held by an organization for a life-time of more than a year. Examples include property plant and equipment (PPE), intangible resources and investments. In addition, current assets are expected to last for a maximum of a year. All assets are presented within the SFP, whose primary purpose is to reveal how much wealth belongs to the organisation and other external parties (Cloete & Marimuthu, 2015:17, 82-85). An expired cost represents costs whose economic benefits have been consumed. For example, if an organisation rents an asset, to the extent that the rental fee gets used, that represents an expired cost, that will be classified as an expense. However, if an organisation pays for the use of an asset prior to its usage, that expenditure will be classified as a current asset in the SFP prior to its usage and then classified as expense afterwards (Niemand *et al.,* 2006:17). Expenses and income are displayed within the SCI as measurers of profitability (Cloete & Marimuthu, 2015:17, 82-85). Assuming therefore that LMSs are normally acquired for longer than a year within adopting organisations (Linsey, Katsifly and Gipps, 2008:27), and that web tools can be viewed in many cases as current LMSs, then they should be considered as non-current assets in the SFP of an adopting organisation. Their cost-cutting effect contributes positively to profitability in the statement of financial performance. The implications of the above discussions to a study that seeks to evaluate the financial benefits of web tools are that the effects of the tools should be determined on specific elements within the SCI and SFP. The optimal use of these tools will yield to long-term cost reductions and profitability. The figure below illustrates this concept of cost classification.

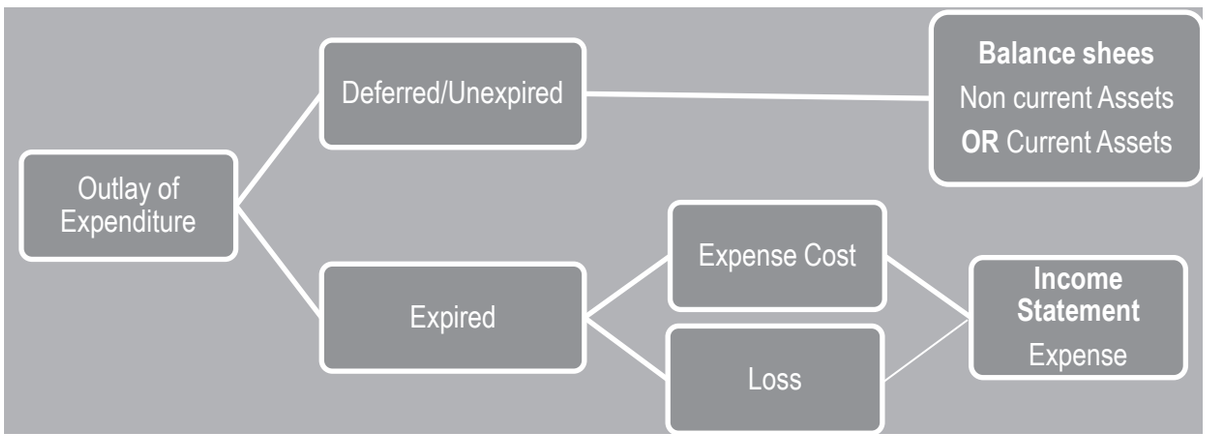


Figure 2.4: The cost concept. Source: Niemand *et al.,* (2006:18)

Expenditures that relate to the acquisition of assets partly constitute the operating costs of an organisation. Total operating costs can also be classified as manufacturing or purchasing costs and commercial costs. Manufacturing costs are directly related to the production of goods and services while commercial costs include expenses incurred through support services such as marketing and

administration (Niemand *et al.,* 2006:19). The fact that web tools considered in this study are purchased in order to offer the service of teaching and learning indicates that they affect the operating costs. The fact that they indeed lower the operational costs has already been highlighted. Operating expenses affect the profitability of organisations to the extent that high expenditure yields low profitability. However, a reduction in expenditure raises the level of profitability (Cloete & Marimuthu, 2015: 82-85). Hence, the web tools' contribution towards the lowering of operational costs suggests that they contribute to profitability in the SCI and lower the costs of asset acquisition in the SFP.

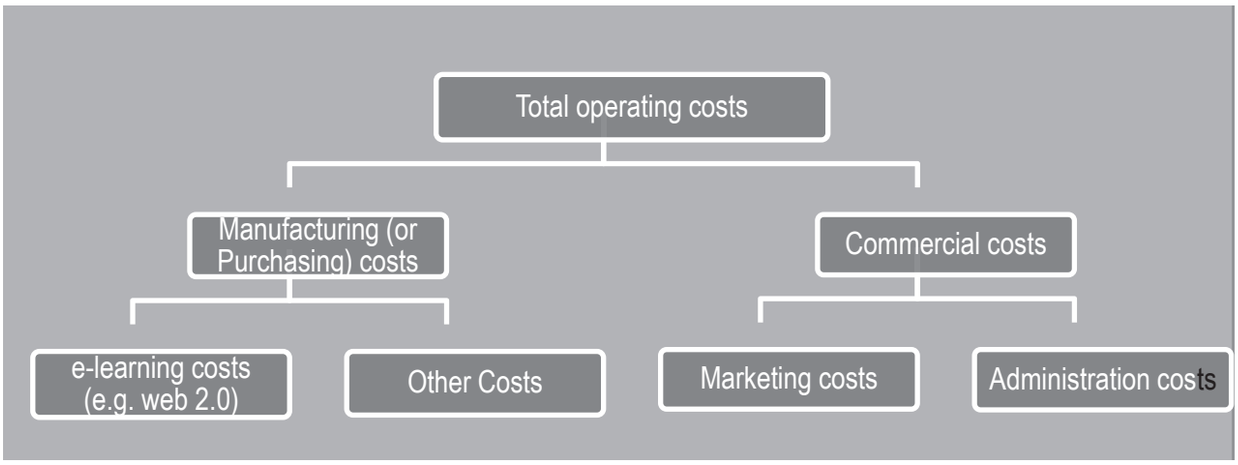


Figure 2.5. Basic structure of costs. Source: Niemand *et al.,* (2006:19)

Institutions incur considerable purchasing costs from obtaining web technologies. In the USA, where this web implements originated, the total costs of educational telecommunication in 2006 amounted to $7 billion dollars. This amount that included Blackboard costs was a thirty-five percent increase from the previous year, 2005. The expenditure attributed to Blackboard and the related internet-based tools may start from annual subscription licenses of $200 000 to $400000 and escalate as institutions incorporate more features into Blackboard (Bradford, Porciello, Balkon & Backus, 2007:306, 313). The purchasing costs of blogs, wikis, and social networking by a German based company amounted to €250 000. The existence of cost implications that relate to technology at acquisition date and other elements such as licensing shows the insufficiency of viewing purchasing cost as the only cost. Hence, it will be inaccurate, even if there are no initial fees paid at acquisition, to consider an approach that precludes expenditure relating to implementation, training and acceptance of the system by users (Manqiuc, 2009:85, Parsons, 2006:1). This makes total cost of ownership a technique that is normally used for these purposes.

2.6.2 Total costs of ownership (TCO)

Gartner Inc (2016) defines TCO as "*a comprehensive assessment of Information Technology or other costs across enterprise boundaries over time".* The definition and view of TCO, according to Gartner Inc. also includes *"hardware and software, management and support, communications,*

end-user expenses and the opportunity cost of downtime, training and other productivity losses". The total costs to an organisation that designs or acquires web tools should include the cost of design, hiring and remunerating design personnel, customizing the tools, and costs for the creation and maintenance of content (Schneider, 2014:333). Therefore, TCO includes purchasing costs at acquisition date and all the other activities that have cost implications throughout the life span of a technology or asset. It is possible to find total cost of technology tripling the purchase costs when the TCO is used instead of the purchasing price only. The most obvious costs at the purchasing phase of technology are those of hardware and software but they usually account for as little as twenty percent of total costs (Laudon & Laudon, 2014: 227, 617). This definition is perhaps another evidence that the costs of IT acquisition should not be limited to the purchasing price only to avoid cost underestimation. Hence, is a holistic approach used to determine the relevant costs involved at technology acquisition date and beyond and considers that all direct and indirect costs as pertinent costs to an organisation.

The identified direct costs of the LMS are hardware, software and IT support related costs. The indirect costs include those pertaining to training given to staff and during the customisation of a system (Katsifli, 2010:45). A USA based syndicate of small and medium distance learning institutions joined their financial resources to purchase a WebCT platform, and Klonoski (2008:5) observed the TCO to this syndicate as including:

- Purchase price through which the buyer organisation obtains a license,
- Operational costs that include implementation, pertinent infrastructure, other services that are central to the functioning of the system, and for integrating a new system with existing technologies,
- And IT support staff support.

In addition, Linsey, Katsifly and Gipps' (2008:27) development of a calculation model of total costs for deploying Blackboard at Kingston University in the USA over a five-year period resulted in the observation that, the costs of technology integration cost up to seventy percent while all other costs shared the remaining percentage. The fact that a measurement was carried over a five-year period indicates that Blackboard fits the category of non-current assets within the SFP, since it was held for more than a year. The study identified direct costs as, firstly, those that relate to all hardware, software, integration and customisation of a system and, secondly all costs related to staff development and training, and IT support services related to blackboard operations. The indirect costs were identified as all costs that were incurred during the learning of infrastructure enhancements. The total deployment costs averaged £136 000 per annum out of which £85 000 were integration costs. There were about 22 000 users, including students and lectures, such that the study calculated the total cost of deployment per user as displayed in the formula below.

Equation 4.1:

$$\text{Total annual cost per user} = \frac{£136\,000}{22\,000} = £6$$

A similar approach to the one described above was followed in more detail by Manguic (2009) while attempting to measure a German IT company's costs incurred from deploying web 2.0 tools as a basis to determine ROI. The company in this case study elected anonymity in order not to expose its internal information to its competitors. For that reason, it was given a fictitious name of "GoodWaterInc". Web 2.0 tools were assembled by a team of ten (10) IT staff members over a three-month period of installation and testing, followed by another three-month period of training staff members on the use of the tools. A team of five IT staff members was assigned the responsibility of maintenance after the completion of the training period. The total relevant costs are summarised as follows:

- The spending on acquisition of hardware and software packages:

COST TYPE	**COST VALUE (€)**
Blogging platform	€50,000
Wiki platform	€100,000
Social network platform	€100,000
Total acquisition costs	**€250.000**

Table 2.3: Web 2.0 acquisition costs of synonymous company. Source: Mangiuc (2009:81)

The above-mentioned costs are easy to determine using source documents because they are incurred at acquisition. However, an assessment of other costs that do not have obvious financial value requires a deeper analysis of other variables. In this case, the cost implications comprise of valuable time and prices in salary terms, which an employee spend on training and during familiarisation with the program instead of doing his/her actual job. For example, instead of IT staff working in their normal value creating areas, they spend their time working on web 2.0 project installations, training staff and maintaining the system. It also means staff member's time was redirected to training instead of normal daily operations. Mangiuc's (2009) view is that to the extent that the value, which could have been contributed by the staff members could be determined, it should be interpreted as additional costs of web 2.0 project implementation to the company. He considers the time value model to be the best bet for costs related to IT department, as shown below.

Equation 4.2:

$$\text{Work hours} \times \text{Hourly wage} = \text{Implementation time cost}$$

The results of the study, from a TCO approach, reveal that costs escalated to an amount of 2 000 000 instead of the purchasing price of €250000. These additional costs were determined using opportunity costs principle.

2.6.2.1 Installation and implementation

A case study monetised time value that relates to IT staff's time allocated to the implementation of the system while away from their normal daily productivity zones. The IT department team of ten members worked for three months installing and implementing the system instead of being in their value creation areas. The opportunity cost was considered to be equal to the three months output (valued in salary terms) that they should have produced had they been in their normal duties as well as the forgone valued added. The assumption, using industry averages is that they worked for 8 hours during sixty-seven days and that each staff member's value added that is forgone is ten percent.

JOB	A:Number of People	B:Annual Wage	C:Annual results B + (10%)	D:Implementation costs C x (3/12)	E:Maintenance costs C x (3/13)	E:Total costs D+E
		€	€	€	€	€
IT Director	1	70,000	77,000	19,250	0	19,250
Application manager	2	50,000	55,000	13,750	13,750	27,500
Security engineer	1	40,000	44,000	11,000	0	11,000
Software designer	2	32,500	35,750	8,938	8,938	17,875
Database administrator	2	37,500	41,250	10,313	10,313	20,625
Webmaster	1	45000	49,500	12,375	0	12,375
Network administrator	1	25000	27,500	6,875	0	6,875
TOTAL	**10**	**300,000**	**330,000**	**82,500**	**33,000**	**115,500**

Table 2.4: Web 2.0 installation and maintenance costs of a synonymous company. Source: Mangiuc (2009:82)

2.6.2.2 Maintenance

Maintenance monetised the value of time that IT staff spent while maintaining the system away from their daily production zones. Maintenance was scheduled for six months.

JOB	A:Number	B:Annual Wage	C:Opportunity costs B + (10%)	D:Implementation costs C x (6/12)
Enterprise 2.0 Director	1	60,000	66,000	33,000
Application manager	1	50,000	55,000	27,500
Security engineer	1	40,000	44,000	22,000
Database administrator	1	37,500	41,250	20,625
Maintenance technician	1	20000	22,000	11,000
TOTAL	**5**	**207,500**	**228,250**	**114,125**

Table 2.5: Web 2.0 maintenance costs of a synonymous company. Source: Mangiuc (2009:82)

2.6.2.3 Employee training

This monetised the value of time that employees spent in training as opposed to their normal daily activities. Following the implementation process, ten members of the IT department were deployed to train staff members on the use of web 2.0 tools for a three-month period. The following table summarises the costs that were attributed to IT members spending of time on training instead of their normal duties for three months.

JOB	A:Number of People	B:Opportunity Cost	C:Total Cost B x (3/12)
IT Director	1	77,000	19,250
Application manager	2	55,000	13,750
Security engineer	1	44,000	11,000
Software designer	2	35,750	8,938
Database administrator	2	41,250	10,313
Webmaster	1	49, 500	12,375
Application trainer	1	30, 000	7,500
TOTAL	**10**	**332,500**	**83,125**

Table 2.6: Web 2.0 training and familiarisation costs of a synonymous company. Source: Mangiuc (2009:82)

2.6.2.4 Employee adoption

This involved the monetisation of the value of time spent by employees while trying to familiarise themselves with the tools. The final step of web 2.0 implementation was that of familiarisation by staff members with the new technologies. The cost attributed to this is the forgone productivity for that day or two. This again interrupted their normal daily engagements. Nonetheless, the following formula was used to determine daily value contribution for the time when an employee was not able to attend to his normal tasks that is forgone as additional cost to web 2.0 concept.

Equation 3.3:

$$\text{Number of employees} \times \text{Yearly Average Value} \times \frac{1}{\text{Business days}} = \text{Added Value}$$

The 5 000 staff members contributed an annual average value added of €27, 500 and 230 business days. The following amount of €597.826 was computed. To cater for two days, this amount is multiplied by 2 to achieve €1.195.652. The total costs of web 2.0 concept of the German based company are summarised the table below.

COST TYPE	COST VALUE (€)
Blogging platform	50,000
Wiki platform	100,000
Social network platform	100,000
Total acquisition costs	**250.000**
Installation & implementation	115 500
Maintenance	114 125
Employees training	116 125
Employees adoption	1 195 652
TOTAL WEB 2.0 COSTS	**1 791 402**

Table 2.7: Web 2.0 total costs of a synonymous company. Source: Mangiuc (2009:82-83)

The above discussions lead to the following conclusions: First, additional variables are needed in order to carryout cost computations. Second, such variables might differ according to different organisations, the type of tools adopted and the strategy of incorporation. Third, TCO solves the problem of cost underestimation that is most probable if only purchasing costs are considered. The Magiuc (2009) case study discussed above shows that the total costs were about ten times the purchasing costs. This is a holistic approach to cost, which highlights areas of unnecessary expenditure where cost reduction techniques can be focused. Further conclusions are that the centralisation of all IT resources like hardware and software, enabled by web-based computing, is one key strategy to achieving the cutting of costs and reducing of time involved in maintenance and installation. Another solution may be to centralised system administration and troubleshooting (Laudon & Laudon, 2014: 227).

The TCO approach is, apart from the identification of costs, also useful in determining the benefits of systems. The table below displays some of the benefits of technology that were identified from the use of the TCO technique even though it is not clear how the technique was used for this purpose. The table is also expanded to show the way such benefits may affect elements of the financial statements.

Costs	Implications to the elements of financial statement	Implicated Financial Statement
Hardware	Decrease in non-current assets	SFP
Telecommunication	Decrease in PPE and operational expenses	SFP and SCI
Software		
Services	Decreases in intangible assets costs	SFP
Personnel	Decreases in operational expenses	SCI
	Decreases in wages and salaries	SCI
Tangible benefits		
Increased productivity	Increases in revenue	SCI
Lower operational costs	Reduction of operational expenses	SCI
Reduced workforce	Reduction in salaries	SCI
Lower computer expenses	Reduction in equipment	SFP
Lower outside vendor costs	Lower liabilities to creditors and reduced outflow of cash	SFP
Lower clerical and professional costs	Lower operational expenses	SCI
Reduced rate of growth in expenses	Increased income	SCI
Reduced facility costs	Reduction in non-current assets costs	SFP

Table 2.8: Costs and benefits of information systems. Source: Laudon & Laudon (2014: 227)

Another cost cutting motivation is to increase the ratio of income to cost. Total Costs of ownership is preferred as a technique for controlling costs by evaluating the relationship between expenditure on certain resources and reductions in other costs. It can also be used to predict future costs. For example, if the costs to design are known today, a prediction of the number of times an organisation will need to redesign the system could allow for a decent estimation of future costs (Schneider, 2014:334).

2.6.2.5 TCO and Open source tools

The general believes that there are no costs to obtaining open source web tools. Whereas some tools are indeed free to acquire, the mistaking of open source with free of charge is normally made without an accurate understanding of the meaning of 'open source' in the field of information systems. Open source means that upon paying a certain certification fee, the user earns the right of access to the source code of a system, which awards him the right to contribute to the additional makeup and features of the system *via* the web. That is why the opposite of open source is proprietary software

whereby the original programming and its modification are exclusively controlled by the originator of the system (Opensource.com, 2014). It has already been mentioned that the ability to permit users collaborative functionalities in online-based projects is one of the features that are intrinsic to web concepts.

While it is true that there are various free web applications that are available on the internet, this study focuses on those that charge significant fees prior to acquisition and beyond. Some of the costs associated with free technologies are incurred when integrating the technologies with existing organisational systems. Nevertheless, free technologies are not preferred by organisations that desire continuous technical support from developers and, for that reason, proprietary tools still dominate the market of learning technologies (Unal & Unal, 2011:20). Even the issue of free-of-charge systems is overruled by the dominant understanding that the strength of commercial tools over free ones is high security and availability of 'audit-related facilities' (Mangiuc, 2009:85). Although they do not mention the figures, Bradford *et al.,* (2007:306) note that there are massive costs that are directly related to the acquisition of open source LMSs, such as Sakai and Moodle. In some cases, such costs are more implied than specified. For example, Apereo Foundation (2016) pronounces on their website that they have a range of 'commercial affiliates' whose function is to assist member institutions with the commercial supply and support of Sakai LMS.

Even though TCO is considered to be the technique with the most potential for evaluating both direct and indirect costs of educational technology, Katsifli (2010:45) remarks that it has not been found to be useful in determining the indirect costs associated with student and academic staff users. However, Manqiuc's (2009) approach to costing web 2.0 sought to include all participants, especially staff members, in its adoption and usage. Literature shows that the complexity of measurement within the educational spheres lies in that web tools are used in informal and unequal ways. Another limitation of the TCO model is that it reflects one constituency of information needed to evaluate an investment, which is cost. Therefore, other accounting models that have the capabilities of estimating the income ration of the analysis must complement it (Laudon & Laudon, 2014: 569). The table below is a summary of the variables that used to determine total costs of systems.

Infrastructure component	Sources	Cost component
Hardware acquisition	Katsifli (2010:45); Laudon and Laudon (2014: 227).	Purchase price of computer hardware equipment, including computers, terminals, storage and printers.

Software acquisition	Gartner Inc. (2016); Katsifli, 2010:45; Laudon and Laudon (2014: 227); Klonoski (2008:5).	Purchase or license of software.
Installation and implementation	Laudon and Laudon (2014: 227); Klonoski (2008:5); Mangiuc (2009:82-83).	Cost to install computers and hardware.
Training	Gartner Inc. (2016); Laudon and Laudon (2014: 227); Mangiuc (2009:82-83).	Cost to provide training for information systems specialists and users.
Support	Gartner Inc. (2016); Katsifli (2010:45); Laudon and Laudon (2014: 227); Klonoski (2008:5).	Cost to provide ongoing support, help desk, and so forth.
Maintenance	(Schneider, 2014:333)	Cost to upgrade the hardware and software
Infrastructure	Laudon and Laudon (2014: 227); Klonoski (2008:5).	Cost to acquire, maintain, and support related infrastructure, such as networks and specialised equipment (including storage backup units).
Downtime	Gartner Inc. (2016); Laudon and Laudon (2014: 227).	Cost of lost productivity if hardware or software failure cause the system to be unavailable for processing and user tasks.
Space and energy	Laudon and Laudon (2014: 227).	Real estate and utility costs for housing and providing power for technology.
Customization	Katsifli (2010:45); Klonoski (2008:5); Schneider (2014:333).	Modifications to make a system suitable
Design	Schneider (2014:333).	Creating a new system internally.
Adoption	Mangiuc (2009:82-83).	Staff acceptance and familiarisation.
Opportunity cost	Kaske, Kügler & Smolnik, (2012: 3905); Mangiuc (2009:82-83).	Forsaking the next best alternative.

Table 2.9: Variables of TCO of technology

2.7 Challenges associated with web technologies

Although web tools have some positive effects, some studies do discuss the issues that are considered problematic to adopting institutions. On the one hand, the Engagement report on social

media is unequivocal that social media platforms should be adopted *"because they pay off"* (Elowitz & Li, 2009:6), while on the other, Kaske et al., (2012:1) ask the question, *"Does the hype pay off?"* in their study on social media. In addition, Ross (2009:4-5) warns against the web 2.0 *'hype'* and the temptation to jump in blindly just to become the first adopter without careful consideration of the challenges and opportunities. It is a fact that many universities are afraid of being left behind. Therefore, a considerable number of web technologies are being incorporated but not used to their potential (Armstrong & Franklin, 2008:3). Another problematic issue is the conflict of interest that seems to exist between the rest of the business stakeholders and management at large. The employees and clients' excited view the tools is usually dampened by management, who would want proof of the financial wealth that the technologies bring to the organisation. In addition, most organisations adopt the tools without any proven returns that will flow to the institution. The situation is aggravated by the reality of the informal nature of web 2.0 concept that make the accepted qualitative benefits dependent on the inherent abilities of staff members and not necessarily on a holistic organisational approach (El-Sayed & Westrup, 2011:5-6).

Web tools depend on internet connections, which means that the problems with broadband connectivity can inhibit its functionality (Grosseck, 2009:480). This is particularly true in the South African context where infrastructure support is not as efficient as in the developed world (Armstrong & Franklin 2008:2). In addition, the liberality with which internet programs can be utilised appears to promote everything from professional to amateur contribution of internet sites and content. Therefore, a lack of stringent security can make the internet a source of instability to organisations owing to uninformed and valueless contributions at the expense of time and money (Grosseck, 2009:480). Professionals often view social platforms as blurring the line between professionalism and the lack thereof, which affects respectability and integrity (Armstrong & Franklin, 2008:2). Researchers Hough and Neulands, (2013:605) warn that with the use of web 2.0, students and lectures should constantly be aware of the vulnerability of important information on public domains. Indeed, some institutions feel that their most valuable information is vulnerable and cannot ascertain their level of security. They see web tools as a source of uncertainty to some degree, which also changes the organisational culture that some institutions are not so ready for. Issues of privacy are both pressing to lecturers and students alike because of the need to re-develop new pedagogical frameworks that will blend with new technologies – these can be tedious to universities.

This study, however, takes the stance that the benefits of web tools outweigh the potential problems. Web tools are a growing phenomenon in universities and their benefits should be investigated. Admittedly, there is a need to address these issues, and yet the risks and issues mentioned above are relatively easy to control within the university context. For example, the formalisation of web tools

within the institutional LMS contributes to a more controlled and safer way of engaging with the internet. The security problems are limited by access control through passwords after registration (Hough & Neulands, 2013:605). The problems of infrastructure, connectivity and support can be balanced by universities' provision of additional human and financial resources to learning with technology instead of devoting such resources to some state-of-the-art infrastructure whose value is diminishing at the side of growing utilisation of the web space by students.

2.8 Chapter summary

This chapter described the web concepts with the view that its accurate conceptualisation permits proper identification of the right tools and allows for a proper determination of their benefits. According to the discussions in this chapter, the benefits of web tools can be divided into quantifiable and unquantifiable financial benefits. The chapter noted that the quantifiable financial benefits contribute to the reductions in an organisation's operational costs. They also contribute to reduced spending on fixed assets that consume space and generate additional expenses. The reduction of operational costs is the main contributor to profitability that can be investigated within the financial statements. These kinds of effects can only be realised if there is a clear strategy that guides an organisation through a holistic utilisation.

This chapter also emphasised the fact that costing plays an important role in determining benefits from the resources. It is logical to think of how valuable an item is by comparing it with the cost. However, costing should be considered not only as a function of the obvious purchase value because that approach results in underestimation. As a result, other variables that have cost implications to the value chain, were noted in the chapter. These must be determined so that the benefits are compared with a more accurate cost figure. Nonetheless, a consideration of the opportunity cost principle suggests that it is almost impossible to conclude that the acquisition of any web tool will not yield any cost to an organization.

A summary of key issues discussed in this chapter is as follows:

- The point of departure in evaluating the financial benefits of web tools is to study the change in the main operations of the adopting organisation. The implication of this statement is that there will be no ability to detect the financial benefits if web tools are not used proficiently and holistically.
- The financial benefits of cost reduction have an implication on profitability within the statements of comprehensive income and financial position, which in turn implies positive ROI. If expenditure on operational assets is reduced, and profitability improves through operational cost reduction, these related factors affect ROI positively.

- The determination of cost of web tools is not as complicated as that of financial benefits because the former can be more readily found in source documents. However, purchasing costs are a limited measure of technological costs.
- Total Cost of Ownership is a more accurate measure of technological costs even though such costs are not normally accepted in financial statements as costs of assets. Total Cost of Ownership can be extended to determine the reduction in costs and potential effects in the statements of financial performance and position.
- The value of costing is also for the accurate classification of resources in the statements of financial position and comprehensive income. Web tools are part of the non-current assets of organisations.

The following chapter focuses on the accessible web technologies used for educational purposes.

CHAPTER 3: ACCESSIBLE WEB TECHNOLOGIES IN TEACHING AND LEARNING

3.1 Introduction

The major focus of the previous chapter was on defining various generations of web technologies and describing the evolution that has characterised these web implements. The chapter went on to discuss the subject of costs associated with the implementation of web technologies. Although most studies focus on the effects of web technologies from a private sector perspective, this chapter examines ways in which they are changing the game in education and in particular the evolution of e-learning. The chapter mainly discusses the tools' contextual practices in education, well aware that, as noted in the previous chapter, benefits can only be harnessed by universities if web tools are institutionally accepted and utilised. The chapter also considers the LMSs in relation with how various web technologies have been incorporated to increase the proficiencies and dominate in modern educational technologies.

3.2. Web technologies within the educational context

The traditional e-learning in the higher learning context is being reshaped to the extent that it is becoming a hub for all web tools just as it has been for virtual learning (Jordaan, 2015:47). The transformation that web 2.0 has brought to e-learning has meant that the term learning 2.0 is sometimes employed (Brown & Adler, 2008:32; Dunlap & Lowenthal, 2011:17). The assumption that e-learning is being reshaped by online educational systems and the reality that web technologies are transforming online educational systems compels us to consider much of today's educational technology environment as web based. The defining characteristics of generational web implements are publicity, interactivity, content creation and interconnectivity of people and applications. Therefore, for the purpose of this study, web technologies are ***all web-based implements that allow publicity of information, content sharing, an inclusive environment of participation and collaboration in content creation, and interconnectivity of human and non-human participants for the transformation of the core business of higher learning.***

There are numerous ways in which various web tools can be used to transform teaching and learning operations. The table below summarises such acknowledged practices.

Web tool	Educational usages
Blogging	▪ use blogs for real-world writing experiences ▪ pull class blogs together into one area for easy tracking ▪ quickly offers feedback to students, and between students ▪ students use peer networks to develop their own knowledge ▪ update new information such as homework and assignments

	▪ using comments in blogs can encourage students to help each other with their writing, and get responses to a question without getting the same answer twenty times etc.
Microblogging	▪ classroom community, exploring collaborative writing, reader response, collaboration across schools, countries, project management, assessing opinion, platform for metacognition, conference or as part of a presentation or workshop, for reference or research, facilitating virtual classroom discussion, creating a learning experience, a Personal Learning Network ▪ use for dissemination of teachers' publications and materials, locating original sources of ideas and quotes, allows for very focused and concrete feedback to students to refine their thinking and improve their skills, fostering professional connections, informal research, for storytelling, follow a professional, get feedback on ideas, event updates, live coverage of events, build trust, build a community etc.
Wikis	▪ use for student projects, for collaborating on ideas and organising documents and resources from individuals and groups of students ▪ use as a presentation tool (as e-portfolios), as a group research project for a specific idea, manage school and classroom documents, use as a collaborative handout for students, writing student created books and journaling ▪ create and maintain a classroom FAQ, as a classroom discussion and debate area, a place to aggregate web resources, supporting committees, working parties and university projects etc.
Photo / Slides Sharing	▪ share, comment, and add notes to photos or images to be used in the classroom ▪ inspire writing and creativity, create a presentation using the photos ▪ use tags to find photos of areas and events around the world for use in the classroom ▪ post student presentations to an authentic audience and get feedback from around the world, share professional development materials and have it available anywhere, anytime, to anyone, post presentations of special events.
Video Sharing	▪ video professional development on own terms, create own subject specific videos with students, use video sharing sites to find videos on current issues etc.

Syndication of content through RSS	▪ professional development, time saving; updated information in teaching area ▪ information coming from constraining sources, sharing work with other educators ▪ RSS feeds can potentially replace traditional email lists, reducing email overload ▪ RSS feeds can be used to keep course specific webpages current and relevant etc.
Social Bookmarking	▪ create a set of resources that can be accessed on any computer connected to the internet, conduct research and share that research with peers ▪ track author and book updates, groups of students doing a classroom project sharing their bookmarks, rate and review bookmarks to help students decide on usefulness of resources, setup a group tag in order to share educational resources ▪ use one del.icio.us account between a number of different subject specific educators in order to share resources with each other etc.
Social Networking	▪ event support and continuation, team and community support, aggregation of social media applications, personal learning environments etc.
Other tools	▪ instant messaging increases the sense of community and accessibility which is required for collaborative learning, VoIP can promote international collaborations and understanding, use calendars to make calendar events, homework, anything you want available on mobile devices connected to the Internet ▪ survey and polls, online diagrams and web-based word processor, on-line spreadsheet, social search, mind mapping; virtual worlds - virtual conferences and seminars, team meetings and collaboration spaces, simulations etc.

Table 3.1: Educational usages of web 2.0. Source: Grosseck (2009:479)

3.3 Web-based learning management systems

The continuing developments in technology have pushed personalised learning to the frontline (Severance, Hardin & Whyte, 2008:48), thus making an assessment of the impact of web technologies within the prevailing pattern of institutional LMSs imperative. Formerly, LMSs were utilised to drive a one-way goal of availing study material to students. This is an arrangement that has dominated electronic delivery of educational material known as e-learning (CUT: 2015-2020, e-learning strategy). This notion, as per the previous discussion on web technology progression, fits into web 1.0. Traditional LMSs were phased with the thread of going out of market when web

technologies were gaining momentum. The response by LMS professionals was to integrate personalisation and collaboration ennoblements, thus resulting in different generations of web technologies unwittingly replacing traditional LMS functionalities with web-based features (Brown, 2010:6). Katsifli declares in concurrence that *"Each of the main commercial Learning Management Systems (LMS), as VLEs are often called, are now incorporating Web 2.0 features. Having such tools in the VLE means that they are all available in a single place, with reduced support costs and simplified access. Because use is member restrictive (such as for example, to those undertaking a course), control of licensed resources is also significantly simpler, reducing concerns of inappropriateness"* (Katsifli: 2010:10, 11, 51). Therefore, it should be expected that the current LMSs in higher education are web-based tools because they are accessible through the web and incorporate a diversity of modern web tools.

The discussion below focuses on the renowned LMSs, the Blackboard. A brief discussion on other LMSs, which are comparatively less popular, is also made.

3.3.1 Blackboard Learning Management Systems

The company, Blackboard LLC, founded in 1997 by two educational consultants, Matthew Pittinsky and Michael Chasen to provide online technical and educational direction, offers this well-known LMS, Blackboard. Their main objective was to transform educational material like syllabus, study guides, academic notes and reference sites into web-based documents. From 1998, Blackboard LLC started merging with some of its competitors, such as CourseInfo LLC, a supplier of course management systems; Promethius, also responsible for online educational material; MadDuck Technologies; SA Cash and Asset Transaction Company and Campus Wide Access Solutions Inc. as a strategic business move (Bradford *et al.,* 2007:302). Another merger, which aimed at gaining a competitive advantage within the same educational technology fraternity, was with its notable competitors WebCT and Angel (Bradford *et al.,* 2007:302; Brown 2010:3; InsideHigherEd. 2010). The consequential company after these successive mergers is Blackboard Inc. As a result, they are reported to have attracted massive investment and have become responsible for about eighty percent of online content in North America, and twelve million users in about sixty countries world-wide (Bradford *et al.,* 2007:302).

Blackboard Inc. offers two main streams of online-based products. These are the Networked Transaction Environments (NTE) and Networked Learning Environments (NLE). The NTE, on the one hand, is the commercial suit that provides support for businesses and universities to manage their financial information and accounts for students, academic and non-academic staff. It allows online accessibility of stakeholder transactions within and outside the campus (Unal & Unal 2011:3). The NLE, on the other hand, is focussed on educational facilitation through online exchange of educational content, communication and assessments (Bradford *et al.,* 2007:302-304).

The following discussion focuses on the NLE. Researchers, Unal and Unal (2011) conducted a study on usability of Blackboard against an open source LMS called Moodle. The following figure displays the standard Blackboard course layout followed by an explanation of the key features and functions.

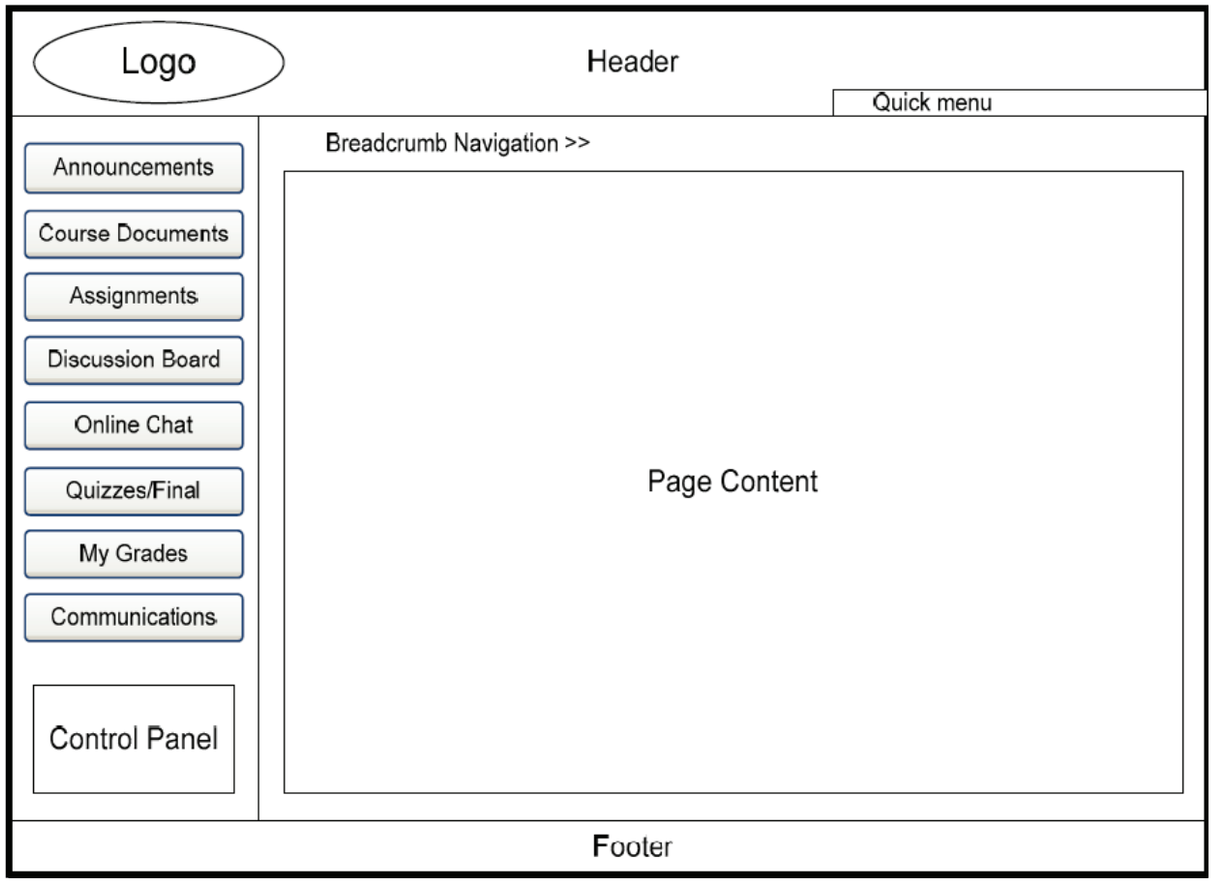


Figure 3.1: Blackboard Learning Management Systems. Source: Unal and Unal (2011:26)

As depicted in the figure above, Blackboard has a fixed format that is administered by an instructor in charge of the subject. The content interface's left-hand side has a navigation panel that has original functions to which an instructor may add more content according to subject needs. The standard layout of the interface cannot be changed even though system enabled additions can be made. It is an instructor's prerogative to control what students see and have access to (Unal and Unal, 2011:25). This means that the extent of use of the system depends on the lecturers' ability.

The following discussion focuses on the key features of Blackboard LMS.

3.3.1.1 Announcement

The Announcement function is one of the most important and highly utilised functions within web-based educational technologies. It enables facilitators to keep students up-to-date on course related and other important information. Information publicised through announcements includes datelines for assignments, tests, examinations and any other subject related issues. The announcements can be available permanently or within certain specific time frames according to the choice of the

facilitator or instructor. An instructor may also choose to send an announcement directly to a student's email through the email function that is synchronised to the announcements function (Unal and Unal, 2011:27). Therefore, the announcement function fulfils the responsibility of subject related information publicity (Education technology, 2017). This also indicates that the extent of its usage leads to the replacement of traditional ways of information publicity and the attributable costs.

3.3.1.2 Course documents/content

This function allows lecturers to avail all subject related material online in the form of notes, audio and videos for students. It retains material for students and lecturers and permits downloading or reflection on their study material without the limitation of time and space. This means that material and information on the system can be accessed anywhere, on and off campus, and at any time as long as there is internet access. At the same time, an instructor may also choose the date from which material can be available for students to access. They may also edit information on course documents (Unal and Unal, 2011:28). Thus, an instructor without access and not using content sharing through online educational platforms will have to use manual processes and more resources to address the needs of many students. Hence, availing content material on the web enables an instructor to address various learners with minimal resources and efforts. In this way, one online resource replaces various physical resources being made available to many users.

3.3.1.3 Assignments/Assessments

"The Assignment Manager in Blackboard provides users with an area where course assignments can be posted, related files uploaded with comments, and grades published" (Unal and Unal, 2011:30). A research carried out on a USA based South-Western University computer literacy course noted that the most useful features of blackboard were its ability to give assignments, subject related documents and gradebook (Martin, 2008:138,144). Unal and Unal (2011:30) confirm these features functioning processes and significance in their statement explaining the associated process that, *"To submit an assignment in Blackboard, participants access the online Assignment Activity page, upload their assignment file(s), check that the file(s) are correct, and submit the assignment. Once the assignment has been submitted, participants are able to make changes (e.g., add another file or delete the file and upload a revised version) until the due date"*. In addition, the use of online assignments clearly means less handling of manual documents and procedures for both facilitators and students.

The latest conception on Blackboard 9.1 considers assessment to be the main feature within which assignments and other functions are subsumed (Education technology, 2017). This means that the benefits of online assignment cannot be isolated from those of online assessments. Unal and Unal (2011) note further that online assessment facilitates timely feedback on tests, with students

appreciating that feedback includes both the acquired marks and an online file of marked assignments with marks, comments and a review from an instructor.

3.3.1.4 Discussion boards

They are controlled online media that facilitates the exchange of dialogue between lecturer in charge of a subject and students on academic and subject related topics. The students can also use the discussion boards to provide feedback to their lecturers on certain subject areas that were not understood in class. The discussion boards can also be used to allow student to student discussions on subject or course related matters under the virtual oversite and control of an instructor (Unal and Unal, 2011:27). A further observation by Unal and Unal (2011:27) states that respondents showed that *"In BlackBoard, in addition to how many messages total, it shows how many new (un-read) messages per forum. It was helpful to have how many messages are new / unread for each forum. In addition, BlackBoard allowed marking "read" messages as "new/unread". BlackBoard allowed editing a post anytime…. A spell-checker was available in BlackBoard".* Hence, depending on the facilitator's intentions, discussion boards can be utilsed as assessment tools or to facilitate collaboration among users (Education technology, 2017). The discussion boards indeed fulfil any of assessment or collaboration functions depending on the context and in that sense, the benefits would be similar to those that follow the replacement of manual assessment procedures.

3.3.1.5 Collaboration and Communication

One of the most praised strengths of web-based technologies, especially the second generation of web tools, is that they enable a collaborative environment. Online educational tools now incorporate functions that allow a virtual environment of interaction among users. As a result, students can engage in collaborative projects in groups previously selected by an instructor who has the ability to moderate discussions by filtering important information and participants to collaborative assignments. There is also an archive feature that can be used to investigate all historical collaborations and communications done on blackboard. In addition, an email function is linked to the online collaboration task where students can choose to send emails to each other, or their respective group, or the entire class or lecturer directly from blackboard environment. Finally, Blackboard allows students to create online profiles similar to social networks to enable personalised communication and identify participants (Unal and Unal, 2011:27).

3.3.1.6 My grades

This feature allows lecturers to setup marking criteria for student's submissions of assignments and tests. Feedback from assignments may be given to students through incorporated email function that allows personalised feedback or through student's login into blackboard. In addition, students can also use it to track their own progress. My grades function also provides scores to students after an assignment or test has been marked or upon submission in cases where automated marking has

been designed by an instructor in charge of the subject (Unal and Unal, 2011:32-33). Therefore, this function is part of the assessment group of tools within Blackboard (Education technology, 2017) and it eliminates the manual processes of marking, publishing marks and giving feedback to students.

The above discussion shows that the main features of Blackboard are the announcements, content area, assignments, discussion boards, online chats and my grates. As indicated in the figure below, these and other features are used within Blackboard to fulfil the core functions of Information Sharing, Content Management, Assessments, Collaboration and Communication and Management responsibilities. These major functions are handled by Blackboard within the teaching and learning environment and can be sub-divided into a number of specific activities. The tools that can best fulfil those activities and the core functions they represent are identified at that subdivision. Moreover, Blackboard is in itself a web-based platform that has its own intrinsic features. However, it incorporates other tools (like Blogs, wikis, mashups, podcast) which exist on the web independent of the LMS environment.

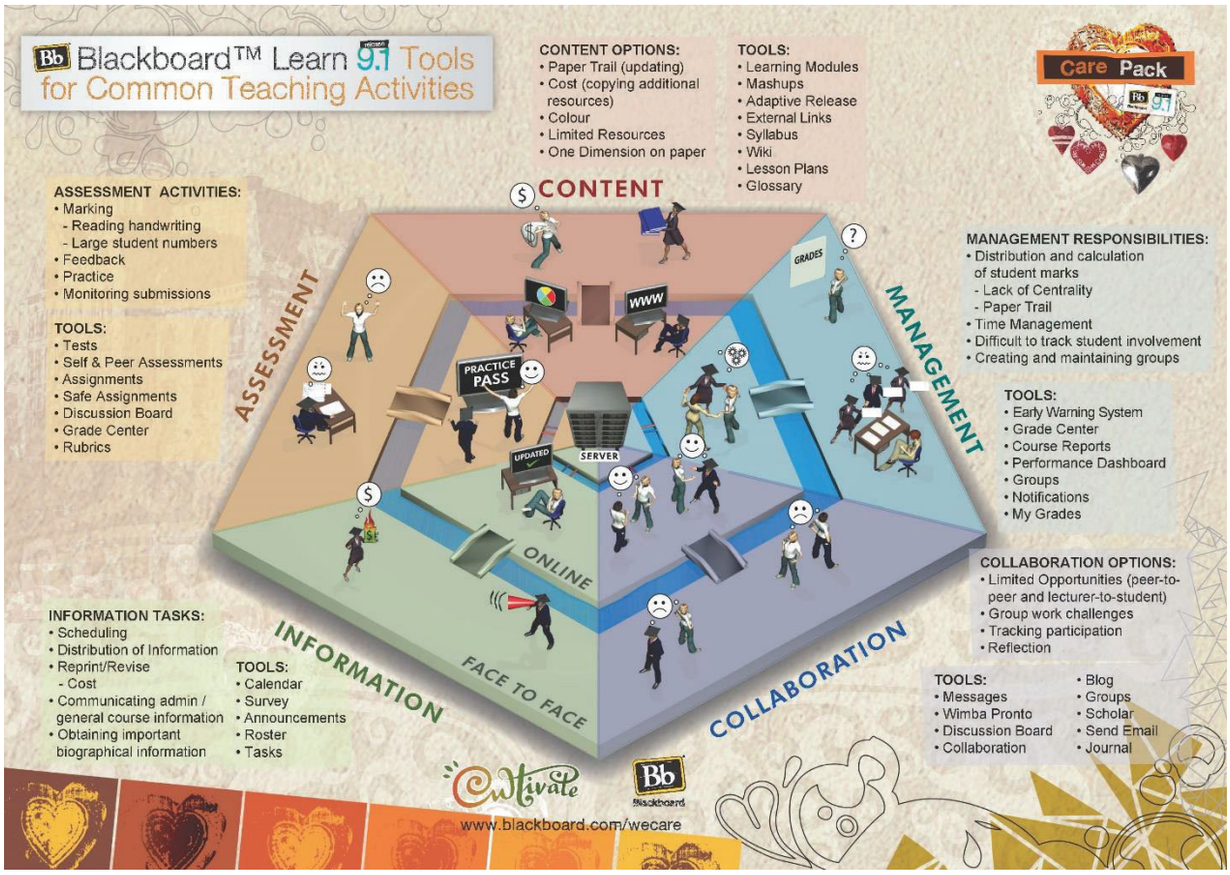


Figure 3.2: Blackboard Learn 9.1. Source: Education technology (2017)

3.3.2 Blackboard patterns of use

A study by Whitmer *et al.,* (2016) on the *"Patterns in Blackboard Learn tool use"* in North American institutions evaluated how specific functions within Blackboard are utilised. The types of

utilisation by institutions were distinguished by 'clusters'; supplemental, complemental, social, evaluative and holistic clusters. The study first explains the percentage number of courses that fall within each cluster. It secondly explains the time as a percentage of class time that key Blackboard functions are utilised. Lastly, the amount of time that students spend utilising certain Blackboard functions is seen as an indicator of the courses' level of online integration.

3.3.2.1 Supplemental patterns

Some institutions still rely heavily on traditional ways of facilitation. These institutions use web based LMS as a support tool to their traditional ways. In other words, users may or may not find the tools useful depending on their perceived benefits to fulfilling their responsibilities. In such situations, one will find that there is an insignificant time of interaction between users. Furthermore, a web-based tool is heavily entrenched with content material from the instructor's flank. Fifty-three percent of courses under the survey fell under this cluster. It was found that about fifty-eight percent attributable to class time is devoted to availing course content, twenty-two percent is devoted to gradebook, and seventeen percent to announcement. Assessments, including assignments and discussion boards, accounted for very low scores. This way of function fulfils a one-way publicity role previously attributed to web 1.0 competency and possesses a limited approach that does not capture the benefits of web tools.

3.3.2.2 Complementary patterns

A complementary way of using of Blackboard is another step beyond supplementary usage. At this level, an LMS is formally used as another way of facilitation although it does not replace the traditional methods of facilitation. Tools like announcements increase significantly compared with supplementary usage. Online interaction is relatively high through the use of discussion boards and assignments. Twenty-four percent of courses under the survey fell under this cluster. It was found that about sixty-six percent was attributable to class time is devoted to availing course content, fifteen percent is devoted to posting of marks, twenty percent to announcement. Assessments and discussion board account for eleven percent while assignments and all other engagements each accounted for eight percent. Considering the capabilities of web tools, including those of Blackboard, complementary patterns allow a balanced utilisation for the benefits of web tools to universities. Hence, universities need to carefully plan on the kind of activities that should be replaced to support the operations that cannot be changed – all these for the benefit of an institution and all its stakeholders.

3.3.2.3 Social patterns

This is a pattern in which a significant forty-four percent attributable to class time is spend on discussion boards where students interact with each other on course related matters. However, only a small number of courses (11%) were found within this cluster, thus showing that the advantages

of online education that depend more on an architecture of participation by various users are still not harnessed. This observation of limited course participation means that a traditional classroom environment and one-way facilitation are still central. The inference from such settings is that the resources (time, financial and human) are not be used efficiently. Instructors spent much time (51%) availing their course content on an LMS and in that way showing that online interactions between lecturers and students are limited even though such interactions are observable between students' use of discussion boards.

3.3.2.4 Evaluative patterns

This is the level at which Blackboard is used mainly as an assessment tool for students. According to the study, only ten percent of the courses under survey used this tool significantly. Furthermore, instructors of that ten percent of courses that use the assessment tools spent forty-nine percent of class time designing tests and responding to students' questions. Although the availability of course content is lower than other clusters, it still has a significant percentage (42%). Reliance on online evaluations suggests an increasing level of participation and user involvement on Blackboard from the student's point of view. Therefore, the growing level of assessment using web tools is one of the most proficient utilisations that bring a further set of benefits. Nonetheless, very few universities have these patterns of use.

3.3.2.5 Holistic patterns

Holistic patters increase the level of online course accessibility measured in terms of the amount of time that students appear to spend on a web-based LMS. In the study under scrutiny, most students spent more time (67%) on assessment while the time spend on accessing content declines to thirty-three percent. Discussion boards accessibility is still as low as six percent. It appears that within the holistic cluster, there is increased level of engagement between lecturers and students and the system itself through assessments. However, the level of engagement through discussion boards is still low and thus, indicating that the classroom environment is still considered the main source of facilitation in this cluster.

3.3.3 Benefits of using blackboard

Although the subject of benefits of web tools is reserved for later discussions, those that relate to Blackboard are mentioned here. The following five main benefits of blackboard are discussed by Bradford *et al.,* (2007).

3.3.3.1 Increased availability

Accessibility of blackboard to users is not limited by place or time. The fact that Blackboard can be accessed on the internet from anywhere and at any time indicates that it is a web-based tool. The implications and potentials that this notion holds for institutions are worth assessing. Educational

material that could otherwise be accessed on campus and in class should be uploaded to the web portal *via* ***Content management*** function. Effective use of this feature saves the institutions on costs associated with printing and stationery. Lecturers and students do not have to be on campus to access and upload educational material, thus assisting one to save on time and costs associated with having to be always on campus. This also offers staff the time and freedom to engage in other value creating responsibilities. The use of tools such as discussion ***boards*** and/or ***online chats*** can also replace consultation hours by keeping communication going between students and lecturers on the web. Once more, the resulting effect could be time saved and devoted to other value creating activities by staff members. Finally, the ***Announcements*** feature can also replace faculty notice boards that otherwise contribute to printing and stationery costs.

3.3.3.2 Quick feedback

This is realised mainly during assessments or submission of assignments. Blackboard has the ***My grades*** function that is normally embedded with automated feedback after students' submission of their work on the web portal. Which means that Mygrades is able to award marks to students immediately upon submission as well as give feedback for students. Evidently, this offers benefits of saving stationery and printing costs. These timeous responses can lead to a smooth running of operations and avail human, financial and time resources elsewhere. It means that there will be a reduced need for a physical classroom environment for feedback purposes especially one that uses printed feedback material.

3.3.3.3 Improved communication

The use of functions such as ***announcements, my grades***, and ***discussion boards*** makes the dissemination of information to students much easier and less costly. For example, a lecturer that is caught up somewhere away from the campus to the extent that they cannot facilitate a class, can communicate directly with the students via Blackboard. Here the lecturer can postpone the class, give assignments or homework, conduct a virtual classroom (online) through discussion boards or online chats, or upload subject related materials in the form of videos, audio and linkages to other educational sites. In addition, an emailing function that sends information directly to the student's personal email accounts increases the chances of communication reaching intended users. This email feature can also be used to communicate feedback involving assessments or tests, and to notify students on course or faculty related matters.

3.3.3.4 Tracking

Blackboard allows the lecturer to track students' use of the tool. A lecturer is able to view online the number of students who would have accessed the information posted or those who have had a chance to respond to the test or assignment. This feature can also indicate the last time a student was online. If a lecturer has allowed for more than one attempt to the test or assignment, the lecturer

in charge will also be able to track the number of attempts made by each student. These features make course management easy on the side of the lecturer and may protect a lecturer from possible student complaints concerning tests, as it provides a transparent platform for the observation of students' online actions.

3.3.3.5 Skill building

Skill building refers to additional qualities that users, both lecturers and students can pick up through prolonged use of the tool. Time management is one such skill that can be enhanced. The Blackboard tool has features that allow students to respond to their assignment and make submissions within the set time boundaries, failure of which results in the rejection of submission or identification as a late submission. It may also be used to enable transparency in marking and the provision of feedback because all submissions can be marked without possible human error that is related to physical marking of papers. ***Course calendars*** can also enforce a sense of responsibility for students by allowing them to be in tune with their course or subject important dates.

3.3.4 Moodle Learning Management System

This is an open source LMS that was developed in 2001 by Martin Dougiamas that is now available in over hundred countries. Unlike blackboard which has a fixed interface and is divided into sections, the layout of Moodle is not fixed. The LMS is divided into three flexible compartments with the weekly format arranged and altered every week within a specified start and end date. The figure below shows the weekly format, which is available for use by lecturers for a maximum span time of a week. A lecturer reconfigures the format according to that week's plan in the week that follows. There is no difference between the weekly and the topics format except that in the latter, each week is called a topic. Finally, the social interface is designed to enable a free environment of engagement (Unal & Unal, 2011:26).

Most of the features available on Blackboard are available on Moodle but with few differences mainly in names. The main difference however is that Moodle does not have a permanent interface. Instead of having announcements feature, noodle has a news forum on each module. Every student who is registered for a subject is automatically subscribed on the news forum, which is in principle similar to the announcement feature on Blackboard. Like on Blackboard, this feature is also integrated with user emails to enable learners to receive timely information. The email facility allows students to send their replies directly into the news forum. However, students can still reply directly through logging on to the program with both approaches being subject to the control of the lecturer, who may limit student's responses.

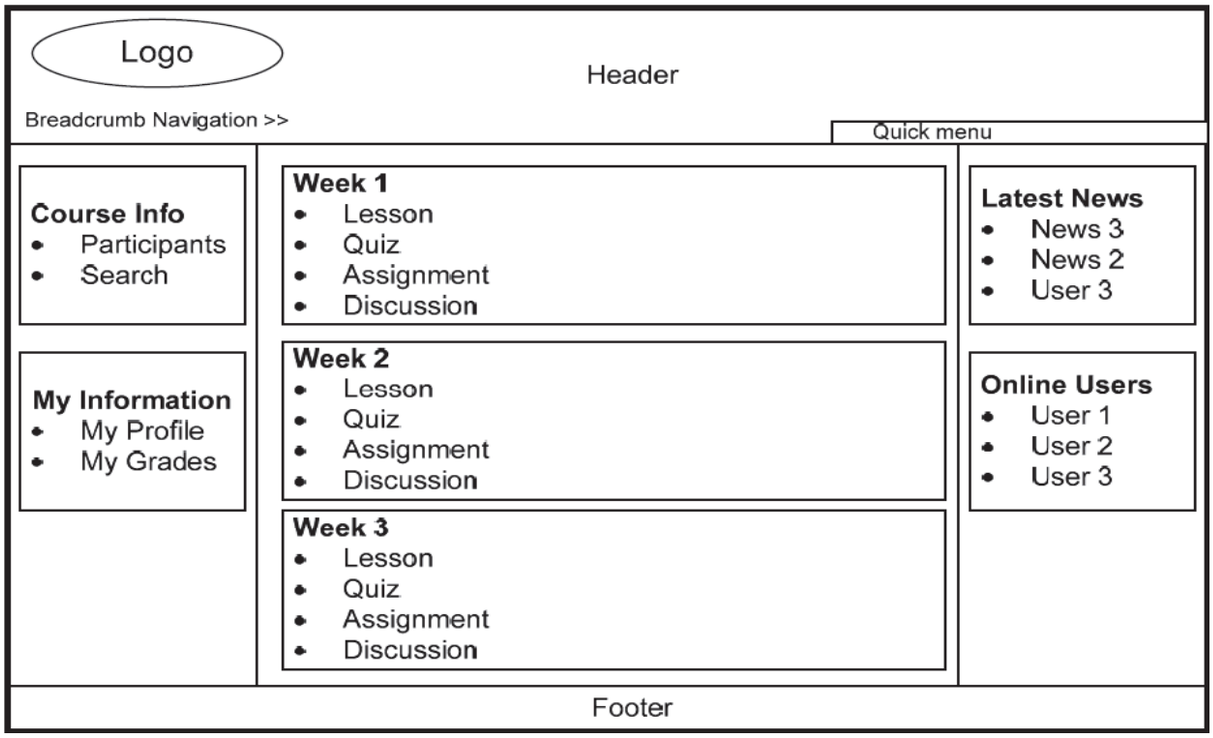


Figure 3.3: Moodle Learning Management System layout. Source: Unal and Unal (2011:27)

A further feature of Moodle is that it uses lessons instead of delivering course content through course documents. Students on both blackboard and Moodle upload assignments through the assignment feature and view their assignments later through My Grades. The My Grades function enables the students to review if the assignment fits the required specifications, if not, they can effect some changes until the dateline for submissions. The LMS also has discussion forums, which fall under the control of lecturers and allow students' academic participation on certain subjects. When necessary, lecturers can hide previous comments from students to allow free contribution from other students. Both Moodle and Blackboard allow student to student collaborations in the form of online groups. A lecturer can create groups that will work on assignments together. Members of the group can also exchange material online and can also work on one document through a wiki tool. Again, a lecturer reserves the right to keep students in groups or take them out (Unal & Unal, 2011: 29). The similarities and differences between Blackboard and Moodle are shown in the following table. The differences are however in the naming of the feature even though the functions are similar.

Blackboard	Moodle
Announcements	News Forum
Course Documents	Lessons
Assignment Manager	Assignment/Activity
Discussion Board	Discussion Forum
Collaboration Tools	Collaboration Tools

Communications	Participants
My Grades	My Grades

Table 3.2: Comparison of Key features in Moodle and Blackboard. Source: Unal and Unal (2011:26)

The University of Kwazulu Natal has been using Moodle since 2010 with the purpose of enabling instructors to upload notes, issue out assignments to students, create interactive exercises, make announcements and hold online discussions. Nevertheless, the challenges of the platform, from learner perspective, has been lack of technical support, which has made system adoption and usage problematic (Bagarukayo & Khalema, 2015:173).

3.3.5 Sakai Learning Management System

The idea of Sakai was developed in the USA by the following institutions, University of Michigan, Indiana University, Massachusetts Institute of Technology (MIT), Stanford University, University of California, Berkeley and the Foothill Community College, in collaboration with a non-profit making organisation called Jasig. Sakai became fully functional in the year 2005 and was built on Java programming language. It was named after Iron Chef Hiroyuki Sakai of the University of Michigan in recognition of his university as the main role player. Nonetheless, all the involved institutions joined the strengths of their own educational technologies with the intention of improving education by migrating from the first-generation e-learning environment to take advantage of modern web tools (Apereo Foundation, 2016).

The Sakai project was managed by Sakai Foundation at its inception. The administration and support were transferred, in 2012, to the Apereo Foundation. The Foundation's principal mission is *"to assist and facilitate educational organizations which collaborate to foster, develop, and sustain open technologies and innovation to support learning, teaching and research …Sakai is an open, flexible, feature-rich platform for learning, teaching and collaboration that develops organically from within higher education to address dynamic needs of a global community. As an open source solution, Sakai is also a contributory experience, where people come together to make great ideas into a reality for the entire community"* (Apereo Foundation 2016). Hence, the mission indicates that Sakai is a collaborative tool that allows for organic evolvement of knowledge within the progression of different web generations.

Sakai was built as an open source system that allows interoperability and integration with other already existing institutional technologies including those that emerge over time within institutions. Organisations can customise it to meet individual, departmental, institutional needs and those that are subject or course related. For example, a lecturer may create a group for students that he or she will be sharing material with, or for online class discussions or collaborative idea generation. The

use of Sakai has gone global. Its use stood at 1.25 million students in the USA in 2007 and by a global total of four (4) million students found in more than four hundred and fifty (450) institutions. The University of Cape Town (UCT), the University of South Africa (UNISA) and North-West University (NWU) were reported to be working together since 2007 in improving Sakai's features and extending its benefits (Isaacs, 2007:20).

3.4 Global perspectives on web tools

The fundamental motivations for the global adoption of web tools are perceived welfares rather than well researched or and user informed motivations. Armstrong and Franklin (2008:12) state that the basis for adoption of web tools is that students will continually expect that they will be served with tools that are common to all of them. A comparable view is held by Bosch (2009:197-198) in the observation that traditional methods of facilitating education are becoming obsolete because the modern generation of learners needs to be served by the tools that they have a daily affection with. Another reason is that permitting online accessibility of education with web tools strategically enables users with dynamic skills. In particular, web 2.0 tools provide a range of new possibilities that were not available with previous online tools. For instance, Bennett, Bishop, Dalgarno, Waycott and Kennedy (2011:524) reflect that *"The emergence of Web 2.0 technologies has provided new opportunities for creating and sharing content and interacting with others"* In the words of Steve Hargadon (2008), *"Web 2.0 is the future of education"*.

The usual force behind academic staff utilisation appears to be self-motivated rather than through management's top-down direction. Armstrong and Franklin (2008:1, 2) found out that lecturers generally use the tools that they are more comfortable with and those that targeted students are already using. The main basis for use is both student competency and the potential benefits to learners. This is in spite of the existence of institutional policies, rules and regulations allowing for their take-up and provision of procedures for their usages. The lack of authority in such policies that guarantee institutional wide acceptance contributes to individualistic adoptions. In addition, Armstrong and Franklin (2008) indicate that both lecturers and students need a well-functioning and supporting infrastructure to achieve a more proficient usage of web tools such as online collaborations and content sharing. These infrastructure establishments are available as key enablers in the developed countries unlike in developing nations where their absence is still a major impediment. Nonetheless, Whitmer, *et al.,* (2016) note that there still exist best practices in some universities in spite of the general poor utilisation of web tools. Such practices may be within one university, within one or few courses, or at least in one or few subjects. Therefore, Whitmer, *et al.,* (2016) suggest that there is need to investigate such cases so that they may be used as exemplary situations for other courses or institutions.

The implementation of web technologies in higher education worldwide is based on the need to cut costs among other things (MacKeogh *& Fox* 2009:149). Likewise, Grosseck (2009:480) mentions that the advantages that web tools afford to higher education, include, the reduction of costs. Seemingly, cutting of costs is one benefit that cuts across both the educational and private sector. Conversely, Katsifli (2010:7) laments the fact that there is no sufficient proof in research that web-based tools reduce costs in higher education and that various studies consider the *'economies of scale'* as a complex issue. This argument may be related to the fact that most studies only make claims without singling out the amounts of cost reduction and the calculation techniques used. Nevertheless, a case study by Klonoski (2008) also cited by Katsifli (2010) shows that some educational institutions have reaped benefits in the reduction of costs in data administration and new overall advancements. The only amount of cost reduction mentioned is that of technology acquisition.

3.5 South African university context

Dlalisa and Van Niekerk, (2015:2, 3) considered the challenges of inadequacy in human resources and infrastructure in relation to the increasing demand for higher education and thus, recommend that SA universities should consider web technologies as a compulsory cost-effective method that will make learning accessible. Nonetheless, while the limitation of resources is mentioned as an issue that points to web technology as an alternative, the financial welfares of web tools in education are not so explicit in literature. Much attention in SA, as the world over, is given to the enhancement of learning than financial efficiency. For example, a study by Thinyane (2009:413) advocates, in congruence with Armstrong and Franklin (2008), for the use of web tools in the country as an instrument that will enhance learning in view of the nature of student population. Web technologies are becoming inseparable to education to the extent that lecturers have to acquire the skills on how to incorporate the technology in their daily engagements if they are to remain relevant (Hough & Neulands, 2013:604; Penzhorn, 2013:57). It appears that the enhancement of learning for the benefit of learners is viewed as a goal that can be achieved without financial efficiency in education. Inadvertently, this attitude seems to encourage achievement of the core business of universities that is not financially controlled. However, the scarcity of resources being faced by various universities is a clear indication that quality education should no longer be pursued without a keen financial outlook of things.

3.5.1 Emerging technologies in South Africa

Emerging technologies are described by Veletsianos (2010:3) as 'tools', 'concepts', 'innovations', and 'advancements' that are used by educational institutions in self-directed ways and for meeting different educational needs. This reality is achieved through web technologies for the transformation of education. Veletsianos (2010) views the transformative abilities of web tools as

learning that is beyond the singular control of a facilitator because it is not time nor space bound. It affords students the ability to become active participants in content creation and facilitates the transition to dynamic learning that is student focused and continuous beyond normal daily classroom confinements. Williams and Gray (2009:105) note a further transformative aspect in their statement that web tools are instrumental in making education as open and available as possible to all potential users of content. The web tools facilitate the movement from a lecturer-centred LMS to an interactive education system by creating a virtual environment of educational engagements. Gachago *et al.,* (2013:98) note the existence of various web technologies in their study conducted to evaluate the concept of emerging technologies in twenty-two (22) SA IHLs. The concept of 'emerging technologies' indicates that the evolving nature of the internet tools (Schneider, 2014:7) often embraced in the private sector, also holds true in the educational field. Moreover, the education field's view of these technologies is similar to the private sector stance on two ways, which are that, firstly, they are technologies that function in concert to serve specific web concepts, and secondly, they are mostly utilised in individualistic ways.

3.5.2 Acceptance of web technologies in South Africa's higher education

The acceptance and utilisation of web technologies in SA universities is, in a way similar to the global trends, based on individuals and their personal fondness and perceived benefits rather than an all-inclusive institutional acceptance (Thinyane, 2009:406–414; Gachago *et al.,* 2013:94, 94). Some universities have their LMSs integrated with web tools that they use mostly as formal institutional systems and also have web tools that are used in ad-hoc ways. It is still common, even among universities that have formal institutional LMSs, to find those that allow lecturers the liberty to utilise platforms such as blackboard in liberal ways. For example, the University of Free State (UFS) states in a brochure on "*Learning with Technology at the UFS*" that students should be mindful of the fact that blackboard LMS which is used to avail 'study material' and 'assessment related to the courses and modules' is subject to the lecturer's choice of use (UFS, 2014). The reasons for uneven use of web tools were long considered by Armstrong and Franklin (2008:5) to be both lack of experience in using them for teaching establishments since they were new and the reality that universities had not yet established procedures that could govern their broad-spectrum implementation. The same explanations still exist in recent literature. For example, in a doctoral thesis Lehmkuhl (2014:4), laments at the lack of proper frameworks for understanding web 2.0 and considers these as a limiting factor to taking full advantage of their use.

Literature indicates that students are influencing the tone of higher education in SA. Armstrong and Franklin's (2008:1) consideration that the global lecturer practices are motivated by student's habits, is an observation that is also evident within the SA context. A survey carried on four SA UoTs by Ramdeyal (2014:77, 84) reveals that web tool usage and acceptance is wide spread among

students. Lecturers were, however found to be reluctant because of their perception that web tools are chaotic devices than enablers to education. Therefore, in many cases the opportunities afforded by web tools remain dormant owing to this disparity between learners, and the sceptical academic staff. There exists a gap between students, who have positively embraced technologies such as IM, WhatsApp, blogs and other online interactions, and the academic staff who regard the tools as time wasting and disruptive. Hence, when lecturers were asked to rate their frequency of usage of web tools, the results show tools that are not web based such as power-point topped the list while real web tools like blogs, social media and the ability to share educational material through videos and audios were used less frequent. Social networking and academic information search are typical examples of online activities between students and lecturers at institutions where web tools are the main sources of information sharing and access. Based on these findings, a conclusion was reached by Ramdeyal that academic staff still needs more orientation on institutional needs of the tools and how to use them. The student utilisation is not without glitches either, because as the study reveals, they do not understand institutional objectives although they show more apt attitude (Ramdeyal, 2014:77-99). Therefore, it can be expanded further that all end-users need further induction in order for institutions to experience the beneficial use of web tools.

The following discussions focus on various examples of web technology utilisation as presented in available literature.

3.5.2.1 University of Pretoria (UP)

The University of Pretoria uses the newest version of blackboard LMS (Version 9.1) (Bon De Schryver, Hossana Twinomurinzi & Jordaan, 2011:7; Jordaan, 2015:45; Penzhorn, 2013:57—73). It has also introduced the Blackboard mobile learn to enable the accessibility of the LMS through smart phones especially for distant and part-time students. UP had, prior to the introduction of blackboard mobile through version 9.1, tried mobile communication with part-time students through SMS facilities (De Schryver, Twinomurinzi & Jordaan, 2011:7; Penzhorn, 2013:71). A note-worthy example of how web tools function within Blackboard at UP is presented in the research by Penzhorn (2013:57-73) on the Information Literacy (IL) subject. The research reviewed the effectiveness of IL subject and sought to infuse it within the social media and allow students the ability to become contributors of knowledge based on the constructivist paradigms held within the subject.

University of Pretoria introduced the IL course to equip all students with the required information sourcing skills. The subject imparts the skills to learners on how to make decisions on relevant information for their needs. The course also equips students with skills on how to locate information using the right social media tools, and how to use that information for their immediate educational and subsequent corporate needs. Student collaboration and interaction within themselves and with

lecturers is encouraged using blackboard blogs that facilitate online discussions on given subjects. For example, at the beginning of one semester, the following questions were posed to students by means of a blog: *"Why is it important to become information literate? and What are the characteristics of an information literate person?"* The answers were amalgamated to provide a pathway for further teaching engagements. Although the classroom environment is normally used to introduce a topic, most of the information is made available on a blog, which allows students to respond to questions via blackboard. Furthermore, social media tools, such as Facebook and twitter were created to form current student groups. Facebook and twitter allow all students enrolled for the IL subject to post comments and questions as a response to announcements and assignment guidelines provided by the lecturer. Social bookmarking allows students to find other relevant educational content form UP library and share it with other students. Each student is also required to use a blog to explain his/her choice of a social bookmarking site. Marks are allocated to the students on the quality and arrangement of a blog. The IL students also use tools such as RSS feeds, Photo, image and video sharing. In an exercise on RSS feeds, students create subject discussions of their own personal but educational interests by subscribing to main databases of their choice. Finally, students search for pictures and videos from the internet site. They then consolidate this material with previous information from the lecturer. The large number of students enrolled for IL subject make traditional assessment tools seem impractical. As a result, the alternative has been to use multiple choice questions to save time and reduce the work load. This method is not always effective on its own, and therefore, Blackboard and blogs are used for group and peer assessment using in-built guidelines provided by the instructor. These findings indicate that institutional LMSs are not the only tools available to serve learners within SA universities, as there are other web technologies, which supplement formal platforms and, in that process, enable flexible offerings of pedagogy.

Another survey by Jordaan (2015, 45-60) which was conducted on a community-based project of undergraduate engineering students reveals more on the utilisation of web tools at UP. The Engineering Community-based Project module proved to be potentially difficult to coordinate and assess as it was not included in the university curricular and owing to the subject high enrolment of about 1 795 students in 2015. Therefore, students were allowed to use blackboard collaborate for submission of their reports and reflections on their service experiences. The study's student respondents found blackboard collaborate as easy to learn and useful to their learning. Blackboard collaborate also allowed students to do their work and make submissions at their own pace. Another benefit is that Blackboard collaborate acts as a permanent repository of the submissions for later retrieval if need arises. However, students still felt that face-to-face interactions with lecturers would still be helpful for clarity of certain aspects of their project. Therefore, the above findings indicate that the increasing number of students makes it difficult to serve traditional ways of facilitation,

thus making web tools helpful in serving huge crowds that would be otherwise costly or impossible to address using traditional methods alone.

3.5.2.2 Tshwane University of Technology (TUT)

The current Blackboard platform at TUT, was introduced in 2011 and given the institutional name, 'MyTutor'. The platform, which was introduced as a replacement to the 'electronic campus' LMS, enables instructors and students to exchange assignments, notes and grades. The university also has additional platforms for the online distribution of educational videos. For instance, 'TUT4life' is a medium that allows students to access their mails and wireless internet while two other systems enable students to access their grades and for lecturers to store instructor information (Bagarukayo & Khalema, 2015:173). This confirms that web tools have been progressively replacing traditional notions of e-learning. In addition, traditional LMSs are becoming a hub for web-based tools in higher education in order to remain relevant.

3.5.2.3 Durban University of Technology (DUT)

A survey by Dlalisa and Van Niekerk (2015:2) shows that DUT also has a blackboard LMS following worldwide trends. The intention of this implementation was to create an open and dynamic student driven learning environment. However, since its adoption, both targeted users (students and lectures) seem reluctant to use the system owing to reasons such as lack of knowledge, lack of general computer expertise and the impediment of age. The problem of uptake is much more prevalent among older students, especially those between the ages of 41 and 50. This indicates that the LMS is being underutilised. Additional reasons for the underutilised include poor functionality of the system, inability of the support staff to respond with speed to technical problems, oldness of their blackboard version and lack of user contribution in system acquisition. Meanwhile, as previously discussed in the literature, latest LMSs including blackboard have been experiencing the transformation of newest web concepts, hence Dlalisa and Van Niekerk (2015) suggested that DUT needs to upgrade the system from the old version and incorporate the newest forms of technologies that improve user experience.

3.5.2.4 University of Cape Town (UCT)

A study by Ssekakubo, Suleman and Marsden (2012:255) focused on the successful implementations of Sakai at the UCT. Their study reveals that the main LMS at UCT is Sakai, which has been given the institutional name 'Vula'. All of the respondents in their study had access to the platform via smart phones although most preferred desktops. In Addition, students at UCT use a Facebook page to share educational material and thus, reap the benefit of accessing both the academic and social world at the same time. Other students use Vula to get in touch with each other especially during the holidays, while those obligated by classroom requirement hold academic related subject's communication. The significant role of Vula is noted in reported incidences of

students exchanging material like notes, and reminding each other about assignments, datelines and venues.

A further interesting observation is that UCT learners appear to access Facebook more frequently than Vula. This is ironic as Vula has similar features such as chatting and discussion forums. Nonetheless, this finding arises from the reality that Facebook, unlike Vula, enables students to link with students of different levels of study, which is particularly helpful for junior students seeking to share experiences with their seniors (Bosch, 2009:193). Therefore, the finding that students at UCT are fond of social media than formal LMS, suggests that students prefer a leaning environment that is unrestricted and entertaining. However, one might also note that formal educational facilities are normally controlled and accessible after academic registration, which leads to more student usage and familiarity with informal applications such as Facebook.

Some students view Facebook as a tool that allows them the freedom to ask questions in an environment of anonymity than in a sometimes-intimidating classroom setting. Some lecturers say that they also use it to get feedback from students and to respond to some questions. This allows them to use the classroom environment more effectively because they get to focus on relevant issues. Thus, the uncontrolled and free online interactions make it easier for students to relate to lecturers during classroom engagement. As a result, Facebook breaks traditional barriers to communication that include fear (Bosch, 2009:193). In addition, a significant use of wikis and blogs between supervisors and post-graduate students was noted. One of the observations was that students would take notes and record all other engagements with supervisors during their meeting and then put them up on a wiki. Wikis allow for more online interactions that permit reworking and improvement of the research material (Armstrong & Franklin, 2008:88). These findings about the UCT context, where web technologies encompass formal LMS and other freely available social media tools, reveal an interesting picture. The observation from the picture is that as much as formal LMSs may be available within universities, it is not advisable to restrict learning to those formal platforms only, as the existence of both the formal and informal arrangement appears to encourage flexible learning.

3.5.2.5 University of Western Cape (UWC)

University of Western Cape's KEWL 3 is an e-learning platform whose use of the web 2.0 technologies managed to transform the universities' Traditional LMS. Examples of web 2.0 programs found in KEWL 3 are blogs, wikis, podcasts, mashups, open Application Programing Interface (API) support, building communities, and messaging and social networks. Although KEWL 3 was introduced in SA as a strategy to move e-leaning towards web setting it has maintained its traditional make-up. However, the integration of web tools into its functionalities sought to create an individual student-centred education. Its programing architecture allows it to merge with useful

educational technologies that emerge out of the internet. For example, it is possible to assimilate an online live-presentation from another blog into another educational blog on KEWL3. KEWL 3 also allows UWC lecturers to design online audio content trough podcasting and to broadcast for students' access. This method allows podcasting to be synchronised with SlideShare for presentations and integrated with blogs (Armstrong & Franklin, 2008:86, 87).

A project called the Rip-Mix-Learn was used to evaluate the web technologies on assessment and contend generation at the UWC. The findings noted that some courses used wikis to create online content. Students were able to add content as well as apply online changes while lecturers tracked changes. Students also used Wikis to share their personal experiences with regard to the online content facility. The Rip-mix-learn aims to enable students to build-up their own online cloud of educational material, including lecture records using wikis, as a response to the slower open 'courseware project'. Wikis can also be used to encourage inter-varsity collaborations. For example, the universities (UCT and UWC) conducted a workshop on Open Educational Resources, where, prior to the date of the workshop they incorporated their information on a wiki and later edited with participants during the workshop (Armstrong & Franklin, 2008:86, 87).

3.5.2.6 University of Stellenbosch (SU)

The SU is reported to have WebCT as their current LMS (Bagarukayo & Khalema, 2014:172). There was little consultation with intended users such as lecturers before its introduction, such that it did not receive a wide acceptance and usage. Bagarukayo and Khalema, (2014) note that SU had about 24 000 students in the year 2013 and these were taught mainly through the traditional face to face class setting, although it is mandatory that all instructional material be available on web platforms. All respondents of the study agreed to have access to online tools mainly for assignment submissions. Lecturers also upload academic 'simulations' for students. Another survey study by Hough and Neuland (2013:594) shows that sixty-nine percent (69%) of SU student's access web platforms within the campus. Student's use of web tools is reported to be about three to four hours per week. The statistics, in a context where modern web tools contribute to accessibility that is not restricted to campus boundaries and operational hours, show that SU has a limited use of web tools that is possibly unattractive to the today's learners. Moreover, WebCT is an archaic LMS that was in use before the strategic business merger with Blackboard, which explains why its accessibility is limited.

3.5.2.7 University of South Africa (UNISA)

University of South Africa offers distance learning to its students. They have an Electronic Delivery System (EDS) available through institutional intranet, which is used as an online platform to avail study material such as textbooks and other helpful material to students. Moreover, the EDS also enables online staff and students to have academic interactions, such as submissions of assignments

and feedback, which is also serving as an integral part of assessment. In addition to the mentioned benefits, the impediments of distance to accessing study material are reportedly reduced by unmentioned web tools. A study survey that compared UNISA with SU found out that part-time students perceive web tools as more rewarding to their education than full-time students, even though full-time students at SU have regular access to web tools than UNISA part-time students. This is because part-time students do not have the benefit of regular and close proximity access to on-campus resources. Both types of respondents use these technologies as a means to share information and create online profiles. The same percentage of students (69%) from SU and UNISA access educational material through web platforms. However, it is important to note that SU students access the university material from the campus, while UNISA students access material from off campus. The limitation of the study under review is that it does not divulge which web 2.0 tools are used. However, it is clear that both SU and UNISA have the traditional WebCT tool that enables lecturers and students to send and receive academic content (Hough & Neuland, 2013:594).

3.5.2.8 Rhodes University (RU)

Rhodes University formalised a social media strategy in 2013 that aimed at enabling faculty level research through liaison with the library. One key area where web 2.0 is reported to be functional is in enabling the sharing of information between the library and university faculties. The university library has six members, who use two or three of the social media platforms such as Facebook, Twitter, RSS feeds, Wiki and the Staff blog. These liaison staff members are each responsible for assisting one faculty and its departments with information search. They use twitter to post specific academic topics to the faculties that they are each assigned to. The use of twitter is noted as having improved the communication between the library and departments. Another benefit is that academic staff enjoys an open platform that enables them to share their expertise, which has resulted in better relations between the academic staff and the librarians. The librarians are continuously at par with the global community as far as latest information is concerned (Owusu-Ansah *et al.,* 2015:34-35).

Facebook usage at RU promotes interactive communication between the library and students. The same six staff members are responsible for putting up posts and responding to comments. Rhodes also used RSS feeds to establish a link with research-based sites, such as Ebsco, Emerald, and ScienceDirect, which continuously feed the researchers, especially the senior ones, with the latest research output in their fields. There is also Staff wiki and blog that seek to harness interactive communication but are currently only a one-way traffic from at least fifty percent (50%) of academic staff. Rhode University realised that these tools are mostly operated by students beyond the standalone computers, but using the latest handsets, and thus equipped its academic staff with such tools as iPads, Samsung Tablets, Kindles, ePads to put them on the same level with the intended student users.

The use of web tools at Rhodes has led to other unforeseen arrangements that are costly to the institution. For example, Rhodes University implementation of its e-strategy forced the institution to equip staff with new handsets; furthermore, it became apparent that some staff members needed training to operate both the handsets and web tools. Rhodes also has Master of Business Administration (MBA) students who are studying on part-time bases and so the institution loaded e-books to the library resources and offered the students ASUS mobile devices to use for accessing the e-resources. Such changes led to further challenges and these include the need for a new kind of expertise at the university to cater for all students satisfactorily. The university also planned to start a Facebook group that aimed at addressing the problems that students encounter when trying to utilise online content (Owusu-Ansah, *et al.,* 2015:34-35).

There are other challenges that affect the adoption of web tools. These challenges involve the competency of intended users in utilising the tools. Competency of intended users depends on the intended users' history with the computer world. This is further affirmed by a study conducted by Thinyane (2009:406–414) on first year students of RU and University of Fort Hare, which revealed that the acceptance of emerging technologies depends on accessibility of computer equipment prior to joining higher learning. According to the findings, some students from disadvantaged schools who did not have computer resources, failed to find the tools useful for their learning. Such students prefer older functionalities of the internet like 'emails' and 'web browsing' instead of the web 2.0 tools such as wikis, blogs and podcasting. Although the study shows the technologies that students have access to, it does not show their practical educational usages.

3.5.2.9 University of Kwazulu-Natal (UKZN)

Armstrong and Franklin (2008:86) state that UKZN has been using Online Learning Services (OLS) as open source systems. The authors do not state how it is being used nor the nature of the benefits are reaped Bagarukayo and Khalema (2015:173) note further that UKZN has been using Moodle from 2010 mainly for instructors to upload notes, issue out assignments to students, creating interactive exercises, and to create announcements as well as hold online discussions. As it already noted, Moodle is one of the open-source LMS that are taking the centre stage in today's educational technology setting (Bradford *et al.,* 2007:306). Nevertheless, the challenges of the platform from learner perspective, is that it lacks technical support. This aspect has made system adoption and usage very difficult (Bagarukayo & Khalema, 2015:173). Therefore, the benefits of online platforms, which include unlimited access beyond organisational physical and operational time boundaries, are inhibited by lack of smooth connectivity. This will translate into to an inability to reduce operational costs such as stationery and printing.

3.6 Chapter summary

Even though many studies do not pronounce LMSs as web tools, a range of functionalities, such as collaboration and participation hosted within LMSs are indicative of this reality. The chapter revealed that various generations of web technologies have become the defining attributes of web technologies in education. The observation, however, is not generalised to the view that the LMSs at every institution perfectly meet the requirements of a web concept. A further observation is that, research on web technologies should encompass LMSs because that is where most of the tools are being incorporated to formalise the use of web tools. Although the progression of the web has seen much development until the fourth generation of web tools, research is dominated by web 2.0 tools, which appear to be in use more than other ensuing generations of web tools. In fact, the previous chapter has revealed the fact that conceptualisation and definitions of the other generations is still not yet agreed upon within the existing literature.

The chapter also noted that all web technologies must have the **WEB AS A PLATFORM** of accessibility and operation. The web as a platform only highlights that there is a certain level of integration of available subjects but does not explain how the web tools are being used. For that reason, five patterns of use (supplemental, complemental, social, evaluative and holistic clusters) describe the kind of subject integration within an LMS like Blackboard. In addition, the implementation of web technologies within the higher learning environment is dominated mainly by institutional LMSs such as Blackboard, Sakai and Moodle, which meet this requirement. At the same time, universities in SA do not use these institutional systems unaccompanied. There are various other social media tools that they make available for students and lecturers to allow for an unrestricted and flexible learning environment. The chapter indeed noted that these additional tools can be utilised outside an LMS and incorporated within. The main functions that web tools perform in education can be summarised as Information Publicity (1), Content Management (2), Assessment (3), Collaboration and Communication (4) and Management (5). Within these functions specific tools fulfil multiple teaching and learning tasks. When they are used proficiently, the web tools within and outside an LMS have the ability to alter how things have been done traditionally.

It is clear from the above discussion that Blackboard is the most dominant LMS globally and here in SA. The chapter noted that a proficient utilisation of Blackboard functions leads to a better grasp of the inherent benefits. Blackboard does allow for interactivity and content contribution by both students and lecturers, which means that education can be more participative if facilitated through a skilful use of this LMS. The chapter also noted that web tools in education are meant to transform education from being a one-way communication to a platform that allows user involvement between the intended users. The presence of collaborative abilities in content creation is thus, concluded as an indication that the progression of web generations has already affected educational tools and

thereby adding greater potentials to teaching and learning Nonetheless, the use of LMS to drive a one-way publicity agenda undermines the observed benefits. Hence, institutions need to take full advantage of web-based tools by using them for interactive and collaborative purposes, which will yield an extensive replacement of traditional and costly operations.

The following chapter focuses on the financial practices that hold the potential to measuring financial benefits of web technologies within SAUs.

CHAPTER 4: THE POTENTIAL TECHNIQUES AND FRAMEWORKS FOR MEASURING FINANCIAL BENEFITS OF WEB TECHNOLOGIES

4.1 Introduction

Having made an in-depth discussion of the nature of web technologies within the educational context in the previous chapter, this chapter focuses on the techniques from management accounting and other fields, which hold the potential for measuring financial benefits of such technologies. Capital budgeting and ROI techniques are normally employed in management accounting field to determine whether a project is worthwhile in terms of profitability and cost reductions. The chapter considers the successes and limitations of such techniques in evaluating IT and web-based projects and in doing so pays attention, first, to capital budgeting techniques and second, ROI techniques. Lastly, the chapter reviews the case study approaches that have been used by other researchers to measure the benefits of various generations of web technologies.

4.2 Capital budgeting methods

Capital budgeting techniques, which are known as investment appraisal methods, involve sourcing out investment opportunities, estimating the potential financial benefits and matching them with the expenditures (Els, Erasmus and Viviers, 2014:161-62). According to the same authors, the purpose of capital budgeting is to assess how scarce resources are going to be affected by an investment. This study considers web technology expenditures as spending on economic resources that are expected to last within an organisation for many years (Linsey, Katsifly and Gipps, 2008:27), which fits into the definition of non-current assets (Niemand *et al.,* 2006:17; Cloete & Marimuthu, 2015:17, 82-85) and therefore fitting to be understood as investments. The fact that capital budgeting is widely used for assessing the payback of investments over multiple periods (Horngren *et al.,* 2008:818; Laudon &. Laudon, 2014: 569) means that its value can be extended to evaluating the financial impact of LMSs over a long period of use. Capital budgeting in organisations is propelled by the fact that during the lifetime of an investment it may not be possible to switch to another opportunity (Els, Erasmus and Viviers, 2014:161-62). Therefore, the ability to evaluate the benefits is of paramount importance.

The focus of capital budgeting, unlike that of financial accounting's determination of profitability, is on the life-time of a project. Financial accounting employs the SCI, which focuses on the current and historical period. There is value in calculating profitability for the current accounting period, especially for businesses that base performance bonuses on current financial information, yet such accounting information should be supplemented by a project life-time determination of profitability. This is because capital projects may sometimes upset present organisational profitability, while at the same time their future outlook holds massive financial value. Financial accounting uses the accrual system to measure performance, which considers current profitability to include income that

has not been received. Therefore, capital budgeting techniques consider actual cash flows over multiple periods (Horngren *et al.,* 2008:818-19). Considering the differing focuses of the two approaches to profitability, it may be inferred that their strengths may be combined in evaluating the impact of web technologies, otherwise an organisation might have to choose the most relevant tools according to its objectives. For the current study that strives to look at the benefits of web technologies in retrospective, financial statements may be reviewed for behaviour of operational costs and profitability over a specific period of time. Furthermore, capital budgeting may be used to predict the future benefits. But then again, one may still use historical information to apply some of the capital budgeting techniques as will be seen in subsequent discussions.

4.2.1 Time Value of Money

Any measurement that considers future cash flows must incorporate the time value of money (TVM) principle. The essence of TVM is that there is more financial value to receiving cash flow sooner than later. That is because cash received speedily can be reinvested to earn another interest. A good investment is that which yields the benefits sooner. So, the TVM principle conceives that the longer it takes for a cash flow to occur, the lesser its value would be to an organisation. Therefore, the present value (PV) technique attempts to estimate an accurate value of a future amount in today's terms. This process is known in accounting as discounting back, which is the same as calculating the present value of expected inflow(s) using a specific interest rate (Horngren *et al.,* 2008:818-19; Schnieder, 2014:337). Thus, the principle of TVM is needed in determining the future value that an organisation gets from an investment. However, if the value is measured in retrospective, then TVM becomes irrelevant because the actual benefits are known.

The ensuing discussion unpacks the six steps involved in capital budgeting.

Equation 4.1

$$PV = FV(1 + i)^n$$

Where, PV = Present Value, FV = Future value, i = interest and; n = number of periods

4.2.2 Identifying all possible investment alternatives

This identification process involves the sourcing of all necessary investment opportunities that have the potential to achieving organisational goals (Horngren *et al.,* 2008:819). A business or organisation has to develop an open mind at this stage. It has to consider all potential strategies, including those that are not necessarily in line with its immediate operations. A range of alternatives may include a choice of product line, new markets to switch to, a choice between alternative acquisition strategies of assets, and investment in other organisations. An organisation might have to consider the potential benefits that are in line with organisational long-term objectives, even if a certain route is not necessarily paying back soon enough (Els, Erasmus and Viviers, 2014:161).

4.2.3 Determining the relevant cash flows

The essential principle underlying capital budgeting is that capital projects raise both inflows and outflows of cash. Usually, cash outflows consist of the immediate cash payment(s) mainly at the acquisition of an asset or commencement of an investment. In addition, cash inflows are generated in the form of additional revenue or operational costs saved. The positive residual amount after comparing the inflows and outflows is an indication that a project is financially worthwhile and should be undertaken (Laudon & Laudon, 2014: 569). For the current study, the main cash inflow should be considered to be cash saved. There are numerous studies that mention operational cost savings as a benefit to usage of web technologies (Mangiuc, 2009:77; Barnes *et al.,* 2010:4; Sahd & Rudman, 2013:40-41; Schniederjans, Cao & Schniederjans, 2013:914; Mungofa & Peter, 2015:62;). Nevertheless, those that go a step further to determine the actual amount saved have not been realised.

4.2.4 Determining the company's cost of capital

An investment is worthwhile only when the return to the company exceeds the cost of capital. A successful evaluation of an investment should determine profitability and consider the source of cash. The cost of capital formula displayed in equation 4.2 below considers the method of financing an asset or investment acquired. If an asset was acquired using capital such as share equity, then the percentage return must exceed the amount of percentage interest and dividends. Furthermore, an asset acquired through debt must generate a return in excess of interest on long-term debt after removing taxation. The weighted average cost of capital technique (WACC) combines both the equity and debt financing considerations in calculating the cost of capital (Els, Erasmus and Viviers, 2014:161, 341-43). It follows that it is imperative, during the evaluation of the financial benefits of web technologies, to know the method of financing the acquisition. This aspect may also be seen as another proof that universities should plan to benefit financially, considering that the cost of financing an asset goes beyond just a purchasing price.

Equation 4.2

$$WACC = K_e V_e + K_p V_p + K_d V_d \div V_e + V_p + V_d$$

Where:

$\boldsymbol{K_e = Cost\ of\ ordinary\ shares}$

$\boldsymbol{K_p = Cost\ of\ preference\ shares}$

$\boldsymbol{K_d\ After\ tax\ cosy\ of\ debt}$

$\boldsymbol{V_e = Value\ of\ ordinary\ shares\ (book\ or\ \ market\ value)}$

$\boldsymbol{V_p = Value\ of\ preference\ shares\ (book\ or\ market\ value)}$

$\boldsymbol{V_d = Value\ of\ debt\ (book\ or\ market\ value)}$

4.2.5 Evaluating the project

This step involves an intensive financial evaluation of a project using capital budgeting methods such as Average Return (AR), Pay-Back period (PBP), Discounted Pay-Back, Net Present Value (NPV), the Internal Rate of Return (IRR) and profitability index (PI) (Els, Erasmus and Viviers, 2014:169; Laudon & Laudon, 2014: 569; Schnieder, 2014:337). The same methods are also known as ROI techniques for the reason that they evaluate the benefits reaped from expenditure on an IT project. Opportunity cost is part of the consideration of ROI techniques. The evaluation of a project should help determine if the financial value returned exceeds all expenditure including opportunity cost (Schnieder, 2014:337). The principle of TVM is present in DPB, NPV, IRR and PI, while excluded in AR and PBP (Els, Erasmus and Viviers, 2014:121).

4.2.5.1 The Average Return

The AR method compares the initial amount of cash paid into the investment with the relevant averaged cash inflows over the life-time of a project. A feasible project is marked by AR that does not exceed the cost of capital. The main advantage of the AR is that the calculation is easy to perform. Its main disadvantage is that it ignores the TVM principle. The reality that it uses average values means that it cannot capture the possible fluctuations in cash flows (Els, Erasmus and Viviers, 2014:165-166). The implications of AR for web technology inquiries may be positive or negative. These implications may be positive if a measurement considers past performance of web tools, to which the inability of AR to consider TVM will not be a problematic issue. If AR is used to measure web tools, it will be to calculate how long it takes for the cash inflows to cover the cash outflows. Alternatively, the negative side of AR is its inability to calculate fluctuating cash flows that are possible through web technologies. For example, it should be expected that savings in operational costs by web tools would not be in equal amounts. However, a simple AR would determine if the costs saved by using the tools could be said to have exceeded the cost of acquiring the tool itself. The AR calculation may be done using the equation 4,.3 below.

Equation 4.3

$$AR = \frac{\left(\sum_{t=1}^{n} C_t\right) \div n}{C_0} \times \frac{100}{1}$$

4.2.5.2 The Pay-Back Period (PBP)

The payback period technique is used to determine the amount of time in years it takes until a project's net cash flows recover the initial investment amount in full. The purpose of PBP is to highlight the expected amount of time until the project breaks even. The procedure for this calculation is to add all net cash flows until they make up an amount a little lower than the initial expenditure. After that, the remaining portion of the amount that is necessary to break even is

determined by the equation 4.4 below. The intention by management is to accept those projects that take a shorter period before the initial expenditure is recuperated. Those projects that take a longer period, especially when compared with other alternatives, are considered as highly risky. Alternatively, shorter paybacks are indicative of easy cash conversion potential. The advantages of PBP are that it is simple to perform, a good highlight of potential risk areas, and a litmus test for highly liquid projects. However, the PBP ignores the cash flow implications that follow the breakeven period. This makes it a highly risky technique for measuring profitability because it focuses on short-term profitability potential as an indicator of an investment value. Like the AR, it does not consider the TVM, which means that the amount of cash flows that it utilises is short of the value maximisation principle (Horngren 2008:829; Els, Erasmus & Viviers, 2014:167-68). Nevertheless, for this type of study, PBP has the potential to determine how long it may take for the cash inflows (measured mainly as cash saved) to cover the initial investment expenditure.

Equation 4.4

$$\text{PBP} = Years\ before\ recovery + \left(\frac{\text{Unrecovered cash flow at begining of the year}}{\text{Cash flow during the year}}\right)$$

4.2.5.3 Discounted Payback Period (DPB)

The DPB only capitalises on the shortcomings of both AR and PBP namely the consideration of TVM (Horngren *et al.,* 2008:831). Although the principle is the same between PBP and DBP, the DPB considers discounted cash flows in calculating the time it takes for the payback to occur. The cost of capital idea is central to the process of discounting. The amount of future cash flows is divided by the discounting factor to achieve the present value of cash flows. Although the procedure capitalises on the weaknesses of PBP and AR, it still has some similar shortcomings. It only focuses on cash flows until payback time and ignores what happens beyond. The use of this technique does not make it possible to determine profitability beyond the date of payback period. Therefore, in evaluating a project using DPB, management runs the risk of throwing away a profitable project because the calculation ignores the size of an investment. At the same time, the size of an investment base cannot be ignored during the evaluation of competing projects because it highlights profitability of a specific expenditure (Els, Erasmus &Viviers, 2014:167-68).

4.2.5.4 Net Present Value (NPV)

The NPV technique utilises the principle of TVM in evaluating a project. Therefore, it strives to compare present values only. The initial investment, which is at present value is compared with the sum of expected cash flows that have been converted into the present value. A project that has a total sum of all inflows at present values greater than the initial investment should be accepted. If a project's NPV is equal to the initial investment, management might have to debate further about the implementation of the project. Some might view the project as having the potential to increase the

scale of the business even though it might not able to create a positive NPV. The benefits of this technique are that it meets the value maximisation criteria through the TVM principle. The TVM is considered to be the most accurate measure of profitability than with AR, PBP and DPB owing to the reality that it considers the lifetime of a project and all cash flows (Horngren, 2008:821; Els, Erasmus and Viviers, 2014:170). There exists an agreement that the NPV principle has more value than the AR, PBP and DPB, however, that value begins to fade once one starts considering that the present value principle is not such a compulsory technique for a retrospective study. Taking out the present value relegates the NPV to a simple comparison of cash inflows and outflows and yet a measurement that is forwards looking needs an accurate determination of planned savings, hence the NPV is compulsory. The NPV calculation is achieved by using the equation 4.5 below.

Equation 4.5

$$NPV = \sum_{t=1}^{n} \frac{C_t}{(1+i)^t} \qquad C_0$$

4.2.5.5 Internal Rate of Return

The internal rate of Return calculation shown in equation 4.6 below is similar to the NPV in that it compares the initial investment with the cash flows that a project will generate. Unlike the NPV, the IRR attempts to find the discount rate that brings all net cash inflows and net cash outflows to zero. If that IRR is greater than the company's cost of capital, the project is considered valuable. However, a project whose IRR is less than zero is rejected. In addition, a project whose IRR is equal to the cost of capital is not expected to yield the NPV even though it might expand the business 'scale'. Therefore, the decision to undertake or not undertake the project will habitually be the result of further deliberation by management (Horngren *et al.,* 2008:823; Els, Erasmus & Viviers, 2014:172).

The calculations of both NPV and IRR do not consider the source of funding as does the WACC. They also ignore the accrual principle of accounting (Horngren *et al.,* 2008:823). Furthermore, the calculation of IRR has few problems, especially when evaluating complex cash flows. It is impossible to compute the IRR of a business venture that is expected to generate positive and negative outflows during its life-time. The IRR is also incapable of evaluating a project that has fluctuating cost of capital in which case the NPV is preferable. An internal rate of return can lead to a rather exaggerated view of returns because it paints a picture that cash flows are reinvested using the rate of return. However, it is more prudent to assume that cash will be reinvested on the basis of cost of capital (Horngren *et al.,* 2008:823; Els, Erasmus & Viviers, 2014:172).

Equation 4.6

$$IRR = \sum_{t=1}^{n} \frac{C_t}{(1+IRR)^t} - C_0 = 0$$

4.2.5.6 Modified Internal Rate of Return (MIRR)

In spite of its challenges, the IRR is still preferred over NPV by some managers, especially those who favor the percentage outlook of return. The problem encountered by IRR when multiple cash flows are involved is solved by the MIRR which converts all cash flows into a single amount at the beginning of a project (time zero) while all the positive inflows are converted into one cash flow at the end of the period of investment. The calculation of the MIRR, as shown in Equation 4.7, involves a comparison of the present value of cash outflows that is discounted using the cost of capital with the future value of a project's cash inflows at the end of the project's lifetime. The MIRR is therefore the discount rate that yields the present value of outflows that is equal to the present value of future inflows of cash flows (Els, Erasmus and Viviers, 2014:179-80).

Equation 4.7

$$PV\ Cash\ inflow = \frac{FV\ of\ cash\ outflows}{(1+MIRR)^n}$$

4.2.5.7 Profitability Index (PI)

The Profitability index is a measure of the profitability of every single value of the initial investment amount that is achieved by using the calculations suggested in the Equation 4.8. It is also known as the profit investment ratio or value investment ratio. It is vital for organisations that have limited investment capacity to capture a cost-effective investment opportunity (Els, Erasmus and Viviers, 2014:181). Thus, if the PI is less than one, then a project should be rejected because it will yield a return that is lower than the initial investment. Therefore, an acceptable PI should be above one. If it is equal to one, it may be accepted on the basis of the potential it has on enlarging the organisational scale. Furthermore, management prefers PI mostly because it highlights the value created per every component of investment.

Equation 4.8

$$PI = \frac{PV\ of\ future\ cash\ flows}{Initial\ investment}$$

4.2.5.8 Accrual accounting rate of return

"*Accrual accounting rate of return is an accounting measure of income divided by an accounting measure of investment"* (Horngren *et al,* 2008:831). The fomular for measuring AARR is displayed in Equation 4.9 below. The similarities the AARR shares with the ROI principle compelled the above-mentioned authors to state that they are the same. Managers use an AARR designation to compute the profitability of a project while the ROI designation is used while evaluating the divisional performance. However, the difference in the components of the calculation is also observable. The "*increase in expected average annual operating income"* that forms the numerator component is different from the actual operating income component of ROI. A project should be undertaken if the return exceeds the AARR expressed in percentage form. The AARR also has similar attributes to the IRR in that both compute the percentage rate of return, the difference is in the way the AARR measures the rate of return by using the operating income after accruals while the IRR and NPV use cash flows and TVM (Horngren *et al.,* 2008:831-33, 975).

Equation 4.9:

$$\text{AARR} = \frac{\text{Increase in expected average annual operating income}}{\text{Net innitial investment}}$$

Various critical observations can be discerned from the above discussions. Techniques like AR and PBP are normally criticised for their inability to consider TVM. However, ignoring TVM may not be an impediment to measuring financial benefits of web implements of a retrospective study. This means that the ability of techniques like NPV, IRR, PI in capturing the TVM is beneficial for a study that is forward looking, that is, one which predicts the future benefits of a project. However, because AR does not capture fluctuating cash flows, it certainly has limitations in capturing inflows of ad-hoc implementations whose financial impact may not be constant. The idea that web tools are implemented in ad-hoc ways (Armstrong and Franklin, 2008:5; Lehmkuhl, 2014:4) has been explained in the previous chapters. This highlights that the establishment of an approach that can average fluctuating cash flows might make the AR and PBP useful in financial evaluations of web technologies. Hence, this study motivates for an approach that measures the benefits of web technologies both retrospectively so that techniques that can predict the future may be possible.

The general procedure of capital budgeting considers actual cash flows. The problem is that there are no direct or related cash receipts in the context of university's use of web concepts. If financial returns are measured, in cases where an asset was purchased or developed to produce measurable units to be sold at a tangible price, then perhaps the measurement of such benefits would be straight forward. For the present study, it would imply that the pricing of higher education is the function of careful cost analysis, and that cost would have to include the cost of offering education through

technology. On the contrary, a study by Smit (2011: 223) indicates that while the pricing strategy of higher education should be inclusive of all costs involved in offering pedagogy, various institutions, including CUT, still apply arbitrary pricing strategies that are not professionally nor systematically determined. At the same time, the fact that capital budgeting utilises cash saved as a type of cash flow, means that the idea may be borrowed in determining the numerator component. In particular, the NPV stands out as more useful in this regard because of its ability to measure fluctuating cash flows. Nevertheless, its usefulness is only possible when web tools are optimally used to allow for a noticeable impact. Yet it should be underscored that the underutilisation and isolated practices around educational web tools (Armstrong & Franklin, 2008:3-4; Badenhorst, 2015:2-3; Bagarukayo & Khalema, 2015:168; CUT: 2015-2020, e-learning strategy) will render it impossible to detect and measure their financial impact. The last two of the six steps of capital budgeting process are the following:

4.2.6 Decision making

Here, the feasibility of a project, as determined in step 4 above, is not a singular determinant of whether a project will be undertaken or not. There is still another process of decision-making that considers both profitability and availability of enough capital for a project. Hence, some profitable projects may have to be deferred to another time if there is little capital (Els, Erasmus and Viviers, 2014:162).

4.2.7 Following up

The starting of an investment opportunity also calls for a continuous process of assessing the performance of the project. This continuous assessment is necessitated by the idea that the feasibility of a project is based on assumptions about the future which are subject to change. It may be that a project, initially perceived as profitable based on certain conditions might change an investment's profitability to the negative or positive if such conditions, such as demand for a certain product, change. In that case, the necessary adjustments will have to be made to cater for the change (Els, Erasmus and Viviers, 2014:162).

4.3 Return on Investment (ROI)

Return on investment is a technique that determines financial benefits related to a specific investment expenditure (Horngren *et al.,* 2008:975). Expenditure on assets can be viewed as an investment because it has an inherent potential to contribute some financial benefit. Therefore, ROI is the financial enquiry on the breadth of a benefit in relation to the resources used to gain it. This makes the use of operating income alone as a measure of performance, without benchmarking it against the expenditure on assets (as financial statements do), a limited approach because it would not indicate the level of efficiency in the use of the assets. Thus, the ROI technique is preferred because it is inclusive of other contributor variables, such as revenue, costs and investment, to

profitability (Horngren *et al.,* 2008:975; Els, Erasmus & Viviers, 2014:75;). Furthermore, Botchkarev and Andru (2011: 245-69) state that there are four approaches to the ROI technique, which can be considered while evaluating web technologies. Each of these techniques are discussed below.

4.3.1 The traditional ROI

The traditional ROI is a straightforward formula that compares tangible financial benefits with expenditure. This customary formula assesses the performance of existing business ventures in order to identify the key areas that need necessary adjustments. The formula is less complex because the values used can be easily proven through official papers and source documents. Sometimes the formula as shown in equation 4.10 (a) considers the difference between financial gains from an investment and the cost of an investment, divided by the cost of the investment.

Another formula displayed as equation 4.10 (b) only considers gains from an investment divided by the cost of an investment (Botchkarev & Andru, 2011: 245-69). On the one hand, some businesses use operating income, while others use net income for the numerator component. On the other hand, some businesses opt for total assets for the denominator, while others use total assets minus current liabilities to derive net assets. Vigario, (2007:546) suggests that the denominator component in the determination of the expenditure component should be limited only to assets that have been instrumental in creating the income for the period in question. A strategy to improving ROI should focus on increasing the numerator component, which businesses normally do by growing their revenue or decreasing the investment expenditure (Horngren *et al.,* 2008:975; Els, Erasmus & Viviers, 2014:75;). The direct calculation of either ROI appears to oversimplify the calculation by suggesting that the income component is simply the function of the asset component. This is done without a clear validation method that supports such assumptions. The mere fact that an organisation has assets does not mean that all assets are committed to generating income. Although it has been suggested that assets involved in the generation of income should unilaterally form the denominator component of ROI (Vigario, 2007:546) the procedure for such a delineation is not provided.

Equation 4.10:

$$\textbf{(a)}\ \text{ROI} = \frac{\text{Gains on Investment} - \text{Investment expenditure}}{\text{Investment expenditure}}$$

$$\textbf{(b)}\ \text{ROI} = \frac{\text{Income}}{\text{Investment}}$$

The following tables are a summary of typical denominator and numerator components of the traditional ROI of Information system. When comparing the two tables, using equation ‘a’, ROI is computed to be 15.5%. The ROI calculation may range from negative one hundred percent (-100%) of the amount invested, which means that the project would have resulted in the loss of all the

money invested. Zero percent (0%) return means that a project would have generated no financial benefits, while an above ROI is unlimited or infinite (+∞ %) and may reach any amount of positive return possible (Botchkarev & Andru, 2011: 251).

Cost Component	Description	Sample Amount
IT Infrastructure	• Software/Licenses: initial and annual maintenance. • Hardware: provided a system was developed in-house. • Hosting: provided a system was delivered as SaaS.	$100,000 - $75,000
Labour	• Direct operating expenses: salaries and wages plus benefits for full time equivalent positions mostly attributed to IT units. • Consultant Services: Installation, configuration, software customisation, and integration that requires skills not available within IT units.	$230,000 $150,000
Training	• IT personnel training by a third party. • Program area end-user training by a third party.	$10,000 $15,000

Table 4.1: The denominator components of ROI. Source: Botchkarev & Andru (2011: 251)

It seems relatively easy to calculate costs than the benefits of web technologies. However, according to Schneider (2014:337-338) this automatically contributes to the overrating of the denominator (expenditure) in the equation, which in turn leads to an inaccurate ROI becoming a basis for project evaluation and decisions. The discussion on total costs of technology has already highlighted the possibility that even relevant costs are normally underestimated. This is because the evaluation of financial models in IT related projects habitually ignores costs related to other social elements such as the 'disruption' of the organisation's normal operations. There are other costs involved in training users and preparing the entire organisation to receive new tools. New systems have both positive and negative effects on the organisation's daily production but financial models normally ignore these effects. The same assumption is relevant with regard to financial benefits, where the use of a direct measurement approach using assets can yield an underestimation or overestimation of the financial returns. Therefore, there are benefits such as the ability to make timely decisions and development of new expertise that financial models run short of estimating (Laudon & Laudon, 2014: 570).

Return Component	Description	Sample Amount

Cost Savings	Reductions in direct operating expenses: Salaries and Wages plus Benefits.	$210,000
Cost Avoidance	Avoiding employing additional staff to operate previous systems: Avoidance of additional salaries and wages.	$140,000
Increased revenues	Increased sales, or sales margins.	$50,000
Revenue enhancement	Additional revenues were gained due to better targeted marketing.	$250,000
Revenue protection	Known penalties avoided because of compliance with regulatory requirements	$20,000

Table 4.2: The numerator components of ROI. Source: Botchkarev & Andru (2011: 251)

4.3.2 Return on Investment Extensions

The extensions are a further development of the traditional ROI. They are principally predictive in nature, even though they may draw on past performance. As a result, the return includes the TVM principle for cash flow projections, which also means that the level of complexity is higher than in the previous calculation because of some level of uncertainty that the future holds. Therefore, some proof can be offered for the values used in the calculation especially if there are some official documents to back up the predictions. However, a margin of error should always be catered for because the future cannot be flawlessly predictable (Botchkarev & Andru, 2011: 251).

4.3.3 Return on Investment Virtualisation

Virtualisation considers both the tangible and intangible benefits. The singular contribution of the virtualisation of ROI is its attempt to quantify intangible benefits and the calculation model factors in both the present and the future aspects into the measurement. It follows then that the possibility of error increases further at this level because of increased difficulty to justify the values used to quantify virtual benefits. That is because there are no accounting records that could serve as source documents to capture such benefits. Therefore, the measure is considered a highly subjective one (Botchkarev & Andru, 2011: 251). A ROI can be used successfully in evaluating the various waves of technology as the traditional tool faces limitations that warrant for some modifications or the development of new tools. So, although the virtualisation of ROI has the potential to include all contributor variables, the challenge with it is its subjective determination of variables.

4.3.4 Return on Investment Imitations

Imitations increase the approaches that are erroneously termed ROI simply because they have some effect to an organisation following (not as a result of) the commencement. Those who follow this path do so in order to take advantage of the reputation that the phrase ROI enjoys in the evaluation

of projects (Botchkarev & Andru, 2011: 245). The table below summarises the four stages of ROI that have been discussed.

	Traditional ROI	ROI Extensions	ROI Virtualizations	ROI Imitations
Formula	$ROI[T]=\frac{\sum_{I} FinRet_{(I)}-\sum_{J} Cost_{(J)}}{\sum_{J} Cost_{(J)}}\times 100\%$ *FinRet* – Financial Return	$ROI[E]=\Im\{ROI[T]_{est},t,Risk\}$	$ROI[V]=\Psi\{ROI[E],\$B\}$	**Subcategory 1.** Use the ROI term for the measures, which have little or nothing to do with ROI. The purpose is to cash in on the seemingly positive credibility of the ROI term. Typical for this group of measures is an understanding of the ROI as "any benefit". **Subcategory 2.** Paradoxically enough, this group attempts NOT to use the ROI term (at least in the titles). They actually use ROI method (or very similar) under different names claiming that they've over-come the ROI deficiencies/ limitations (e.g. their measures are multi-dimensional). Can be based on ANY Return / Benefit / Impact. Retrospective and Predictive
Measurement	Profitability is based on tangible currency.	Profitability is based on currency approximations.	Profitability based on a mix of "hard" currency, currency approximations and monetized valuations of intangibles.	
Time frame	Retrospective (based on past performance).	Retrospective (past) and Predictive (future).	Retrospective (past) and Predictive (future).	
Accuracy level	As precise as accounting records are	Uncertainty increases due to estimation errors.	Indeterminate. Open to subjective perceptions and interpretations.	
Accountability and transparency?	Accounting records (official financial documents or accounting systems) are used as sources of cost and return data. Full transparency and accountability.	Certain level of accountability may be preserved, if cost and return estimates are included in the planning financial documents and periodically reviewed. Limited transparency due to the subjectivity of predictions.	Data used in calculations (especially Returns) is not recorded in the official accounting systems. Prone to uncontrolled subjectivity.	

Table 4.3: Return on investment taxonomy. Source: Botchkarev and Andru (2011:250)

4.3.5 Return on Asset (ROA)

The ROA concept uses an approach that is similar to the one for ROI. Its main purpose is to focus on the contribution of assets instead of all investment. As shown by equation 4.11 below, it is a calculation of the contribution of operational assets to profitability, which is based on the assumption that an accurate measure of a company's income contributed to by assets is the net income (Els, Erasmus & Viviers, 2014:75). In their corporate finance book, Els, Erasmus and Viviers (2014) mention that there is a possibility of measuring the profitability of a specific asset item within the SFP. They argue further the importance of a careful analysis of relevant profit figure, which is a direct consequence of that asset item. They also mention that, it is essential to evaluate causality factors when evaluating profitability. This indicates the need to determine whether a

negative or positive change in ROI can be attributed to a negative or positive change in either assets, or profits or both.

Equation 4.11:

$$\text{ROA} = \frac{\text{Profit after taxation}}{\text{Average total assets}}$$

Two approaches of manipulating the ROA are mentioned by Els, Erasmus and Viviers (2014:75) although they do not offer the practical application of the second: The first one is a ROA calculation that has been modified by adding back finance cost after taxation (equation 4.12 below) to the profit after taxation. This approach removes the financing strategy of the business from the computation. The measureable financial influence that finance costs have on ROA can be determined by comparing two approaches to ROA which are one that includes finance cost and another which precludes them. The second approach involves the calculation of ROA after eliminating both financial assets from the total amount of assets and the income of these financial investments from the profit after taxation. This exclusion from the normal ROA can highlight the efficiency of operational assets alone in contributing to the profitability. It can further indicate the profitability of financial assets when compared with the normal ROA.

Equation 4.12: After tax finance cost = finance cost X [1-tax]

Hitherto, there is no provision for the measurement of ROA at a more subdivided level of asset within the non-current assets. The only computation that comes close is that of Property Plant and Equipment (PPE) turnover ratio but it only highlights the number of times PPE is able to generate revenue. It is a subdivision of the Total Asset (TA) turnover ratio (Els, Erasmus and Viviers, 2014:78). Therefore, the existence of a possibility to measure returns on PPE category (non-current assets) means that a measure that would subdivide the technique to include an item like an LMS within the total assets, to which the PPE turnover ratio only rims around, is not a farfetched idea.

Equation 4.13a:

$$\text{TA turnover} = \frac{\text{Turnover}}{\text{Average total assets}}$$

Equation 4.13b:

$$\text{PPE turnover} = \frac{\text{Turnover}}{\text{Average PPE carrying value}}$$

4.3.6 *DuPont* method of profitability analysis

Return on investment computation can be analyzed further by splitting the equation in an approach called *DuPont* method of profitability analysis (Horngren *et al.,* 2008:975). The *DuPont* method, named after the company which implemented it, is reported to have gained formal acceptance in

accounting between the years 1960 to 1970 (Botchkarev & Andru, 2011: 247). It evaluates revenue in terms of the investment, and income in terms of revenue. The two considerations multiplied together are equivalent to the ROI (Horngren *et al.,* 2008:975) as shown in equation 4.14 below. According to Vigario (2007:545), the rationale behind the *DuPont* method is that *"profitability is the function of sales, earnings and cost of sales"* and *"turnover is a function of sales, fixed assets and working capital"*. This approach makes it possible to attribute a change in ROI or ROA to specific components within the financial statements. The assumption undergirding *DuPont* is that it takes efficient spending on assets to contribute to a positive increase in ROI. Efficient spending can be achieved by eliminating unnecessary expenditure on assets. In addition, an increase in revenue will contribute a positive change in ROI (Vigario, 2007:545; Horngren *et al.,* 2008:975; Els, Erasmus and Viviers, 2014:78;).

Equation 4.14:

$$DuPond \text{ method of profitability analysis} = \frac{\text{Revenue}}{\text{Investment}} \text{ X } \frac{\text{Income}}{\text{Revenue}} = \frac{\text{Income}}{\text{Investment}}$$

Consider as an example; A division at company Y, which uses operating income as a numerator in calculating ROI. Assuming also that the same company has a target ROI of 30% on a certain project, with total revenue of R1 200 000, total assets of R1 000 000 and Operating income of R240 000. It is clear, from using the current information that, the company has not achieved the target ROI as shown in the following table.

	$\frac{\text{Revenue}}{\text{Investment}}$	$\frac{\text{Income}}{\text{Revenue}}$	$\frac{\text{Income}}{\text{Total Assets}}$
Using the present information	$\frac{\text{R1 200 000}}{\text{R1 000 000}}$	$\frac{\text{R240 000}}{\text{R1 200 000}} = 1.20 \text{ x } 0.20$	0.24 = 24%

Table 4.4a: DuPont method of profitability analysis. Source: Horngren *et al.,* (2008:976).

The following alternatives are the result of a manipulation of the denominator and numerator components until the desired ROI is achieved. It means that a company management may employ strategies that either reduce the cost of an investment, or increase the income in order to achieve a required ROI. This suggests that the singling out of the total amount of technologies out of total assets can enable the performance of the DuPont analysis under different scenarios in order to expose the behavior of ROI/ROA.

Manipulation of variables	$\frac{\text{Revenue}}{\text{Investment}}$	$\frac{\text{Income}}{\text{Revenue}}$	$\frac{\text{Income}}{\text{Total Assets}}$
Decrease of assets, (e.g. receivables) keeping revenue and operating income per unit value (Rand) of revenue constant	$\frac{\text{R1 200 000}}{\text{R800 000}}$	$\frac{\text{R240 000}}{\text{R1 200 000}} = 1.50 \text{ x } 0.20$	0.30 = 30%

Increase revenue (e.g. selling more) keeping assets and operating income per rand of revenue constant	$\frac{\text{R1 500 000}}{\text{R1 000 000}}$	$\frac{\text{R300 000}}{\text{R1 500 000}} = 1.50 \times 0.20$	0.30 = 30%
Decrease costs (e.g. careful spending) to increase operating income per unit value (Rand) of revenue, keeping revenues and assets constant	$\frac{\text{R1 200 000}}{\text{R1 000 000}}$	$\frac{\text{R300 000}}{\text{R1 200 000}} = 1.50 \times 0.25$	0.30 = 30%

Table 4.4b: DuPont method of profitability analysis. Source: Horngren *et al.,* (2008:976)

A *DuPont* analysis can also be carried by combining information from other ratios. This means scrutinising a change in ROI or ROA through other related ratios so that the improvement or deterioration can be attributed to an improvement in either the income component or asset component. For example, if the ROA in year 2 decreased from that of year 1, the causality of that change can be evaluated by comparing the net profit margin with total asset turnover. If the net profit margin has improved while the total asset turnover has decreased, then a negative change in ROA is attributed to a decline in total asset turnover. One might even add that a specific change in the TAT can be traced using the PPE turnover ratio. A change in the net profit margin can also be traced by analysis of Tax burden **(profit after tax ÷ profit before tax),** Interest burden **(Profit before tax ÷ Earnings before interest and tax (EBIT))** and EBIT margin **(EBIT ÷ turnover)** (Els, Erasmus and Viviers, 2014:92). Other investment performance measures that are used in conjunction with the ROI in management accounting are Return on sales (ROS), Residual Income (RI) and Economic Value Added (EVA). Return on sales is the income-to-revenue ratio isolated from the DuPont profitability analysis (Horngren *et al.,* 2008:975).

4.3.7 Residual Income

Residual income is the income that remains after deductions of the cost of the investment. It is a calculation of divisional profit after taking into consideration the reduction of interest expenses for the utilisation of divisional assets (Vigario, 2007:545). The difference between ROI and RI is that the ROI concentrates on a percentage, while the RI makes use of a real amount of income. The fact that RI is calculated to an actual amount makes it more desirable than ROI. Another shortcoming of ROI is that it ignores projects that have economic value potential of the organisation as a whole by concentrating on divisional performance.

Equation 4.15:

$$\text{RI} = \text{Income} - (\text{Required rate of return X Investment})$$

Let us assume for example that the same division at company Y is considering a project that will expand its operating income by R160 000 and total assets by R800 000. The ROI to the company as a whole is that of the expansion itself, which is 20%. However, the divisional ROI is 22.2% (Horngren *et al.*, 2008:975-977).

Pre-expansion ROI	$\frac{\text{R240 000}}{\text{R1 000 000}} = 24\%$
Post-expansion ROI	$\frac{(\text{R240 000} + R160\ 000)}{(\text{R1 000 000} + R800\ 000)} = \frac{\text{R400 000}}{\text{R1 800 000}} = 22.2\%$

Table 4.6a: Pre and post expansion calculation of ROI. Source: Horngren *et al.,* (2008:977)

If the norm within the organisation is to judge divisional performance based of ROI, this particular division has underperformed. Nevertheless, the use of RI to evaluate the same division's performance shows that, the division will have performed well as indicated in the calculation in Table 4.6b below. Both techniques are useful in comparing an organisation's divisional performance over a financial period. The objective of RI is that if an organisational division continues to have residual amount that is greater than the cost to the investment, that investment is worthwhile (Horngren *et al.*, 2008:976-977).

Pre-expansion RI	$\text{R240 000} - (12\% \text{ X R1 000 000}) = R120\ 000$
Post-expansion RI	$R400\ 000 - (12\% \ X \ R1\ 800\ 000) = R184\ 000$

Table 4.5b: Pre and post expansion calculation of RI. Source: Horngren *et al.,* (2008:977)

4.3.8 Economic Value Added

The EVA was developed in 1993 (Vigario, 2007:552) by Stern Stewarts and Co. with an intention to measure authentic economic contribution to a company (Botchkarev & Andru, 2011: 265). It is the same as RI (Vigario, 2007:552; Horngren *et al*, 2008:977) except that the EVA uses slightly different variables. In addition, RI uses profits after the cost of capital (interest) while the EVA goes a step further to include profits after taxation as equation 6.16 (a) shows. The RI calculation also considers the required rate of return while the EVA's calculation incorporates the weighted average cost of capital (WACC). The weighted average cost of capital must exclude taxation as equation 4.16 (b) demonstrates because interest costs are tax deductible, and it must be multiplied by total assets minus current liabilities instead of the total assets only.

The purpose of the EVA is to consider whether projects are valuable, and have an after-tax operating income that exceeds investment expenditure. It motivates organisational management to strive to achieve more returns using the same capital assets instead of intensifying investment expenditure (Horngren *et al*, 2008:977-978). Hence, the EVA is suitable for measuring the value of public companies because it is based on shareholders' interest. However, it is difficult to measure the economic benefits of information systems using EVA just as it is with other financial models (Botchkarev & Andru, 2011: 265).

Equation 4.16a

EVA = After-tax operating income – [weighted-average cost of capital x (Total assets – Current liabilities)]

Equation 4.16b

After tax interest rate = Interest rate X (1-Tax rate)

Equation 4.16c

After tax operating income = Operating income X (1-Tax rate)

4.4 Case study attempts at measuring web technology ROI

The following case studies focused on ROI attempts in the area of web-based technologies. They are also symbolic of the virtualisation approach to ROI that was discussed earlier. Virtualization is deemed necessary in cases where systems generate benefits that cannot be assigned a monetary value especially for lack of source documents (Botchkarev & Andru, 2011:249, 251, 257, and 263).

4.4.1 Web 2.0 ROI computation model

In 2009, Mangiuc (2009:74-87) performed a ROI calculation on GoodWater Inc. At the time of the study, the company had about twenty offices spread across Germany with over five thousand employees and serving over nine thousand customers with network services. Some of the pressing issues that led to the adoption of web tools were that: the company was growing so rapidly especially in terms of clientele, which doubled up during the two years prior to the study. This growth posed challenges to the employees in that they could not respond timeously to the huge numbers of daily emails. Moreover, the retrieval of work-related documentations from a server that holds more than one million records in diverse formats was also becoming increasingly difficult.

The following implementations were carried out in response to the challenges. A **blog** (1) was introduced for every head of department and all top management personnel in order to enable cost-effective sharing of information and communication with employees. At employee level, **RSS readers** (2) were installed to facilitate the accessibility of information and announcement from management blogs. A **wiki** (3) was used at department level to allow accessibility of information from the company database and flow for current projects and other daily operations. An additional **wiki** (4) was used at company level in order to allow efficient management of employee information such as network and computer name, contact information such as phone number and email address, and corporate achievements and incentives, time plan, positions and functions within each department and company as a whole. Lastly, a **social network** (5) enabled employees to create a virtual environment where they could engage each other on work related issues. The following five steps were determined as a procedure to assessing ROI:

First step: determine the cost of web 2.0 platforms. This step has already been described in a section on determination of cost. Sufficient to say, it is not as difficult to assess the cost of web technologies as it was for the financial benefits.

Second step: identifying the level of implementation of web 2.0 tools (as suggested also by Bughin and Chui, 2010). Web 2.0 tools were implemented within a nine (9) months period. An assessment was made over a five-month period and the results are as displayed in the table below.

Internal level wiki	250 wiki entities	200.000 pages and documents
Customer level wiki	A customer-oriented wiki	
Internal level Blogs	120 internal blogs	>15.000 posts
Public blogs	20 public blogs	
Employee level Social network	2 900 active accounts	Daily basis

Table 4.6: Evaluation of web 2.0 usages at a synonymous company. Source: Mangiuc (2009:81-82)

Third step: identifying the objectives of web 2.0 tools at that level of implementation. There exist several studies that consider ROI as a possible measurement to previously set objectives (KPMG, 2008:1, Mangiuc, 2009:79; Romero, 2011:147; Gilfoil& Jobs, 2012:644;). However, the implication from case study under scrutiny is that the objectives set need not be financial objectives. This is because it is possible to affect the financial wellbeing of an organisation without financial objective as a pre-requisite.

Fourth step: determine the extent to which prior transactions have been replaced by web 2.0 concept. Management had also envisioned that there would be a twenty-five percent (25%) decline in the number of emails exchanged within the organisation. The traditional emailing of documents and retrieval of information were replaced by wikis and blogs, while the announcement of important business information became powered by social networking. Communication with clients was also improved on weekly basis. A solid repository of information that fed the main business functions was established and thus, the time taken to retrieve information became reduced. Collaboration among employees at branch and department level also increased by twenty-five percent (25%) and this resulted in the improvement of collaboration among all company staff members.

Fifth step: focused on attempts to measuring revenue increases or expenditure reductions related to the period since web 2.0 implementation. Measuring the contribution of web 2.0 to the company, the extent of cost reduction was determined, and the opportunity cost principle used to allocate the saved cost as contribution to income. The objectives of the project were to improve the level of efficiency in communication and to increase the level of collaboration among the employees. An achievement of these objectives would make the project team assume that there would also be an

improvement in the level of revenue that is in direct correlation with the visualised goals. The incorporation of web 2.0 tools at "GoodWater Inc." saved the company €4100 determined as follows:

- There were 377 managers at "GoodWater Inc."
- Each manager spent an average of 30 minutes answering an email.
- The average revenue attributed to management's contribution was 40 000€

Therefore, the cost of responding to emails was considered using opportunity cost principle as the daily revenue contribution of each affected employee. Management contributed to the revenue of (€40 000) by responding to emails 30min in a day of 8hrs. Therefore, the amount of daily revenue achieved is the saved email per day costs. The elements are integrated into the equation 4.17 below to determine the operational costs saved.

Equation 4.17a

$$377 \text{ managers X} \frac{80\,000\ (40\,000 \div 0.5)}{230 \text{ x } 16} = 8200$$

Therefore:

$$\frac{8200}{2} = 4100€$$

The company wikis were used to replace the email facility that used to run daily activities. Employees no longer exchanged emails in order to get responses to employee related activities and while responding to clients. In addition, the company management decreased the number of daily responses to emails from thirty (30) to ten (10) minutes a day, which led to a financial daily saving of **€ 2 733** and an annual saving of **€628 590** (€2 733 X 230 days). Equation 4.18 below demonstrates how this was determined.

Equation 4.18b

8/0.1666666 (10min) = 48

$$377\ managers\ X \frac{80\,000\ (40\,000 \div 0.5)}{230\text{days x } 48 \text{ minutes}} = €2\,733$$

A wiki was built to facilitate quick daily retrieval of documents from the company server. The wiki sought to reduce the fifteen (15) minutes search that employees were subjected to and this resulted in the reduction of a normal daily search to eight (8) minutes. A calculation that considers that one employee makes about two searches per day and takes an average hourly wage of €12.5, presents total annual savings of €**1 533 333.** These servings **were** computed as follows:

Equation 4.18c

2 searches per employee: 8 X 2 = 16

$$2000employees\ X\frac{16}{60}X\ €12.5\ X\ 230days = \ €1.533{,}333.33\ /\ year$$

4.4.1.1 Customer communication improvement

Another wiki and social network were implemented to address communication problems that the company had with its customers. Customers would start using a wiki to lodge complaints or communicate with employees on their accounts. About 400 product innovations were posted in response to clients' direct requests or on a wiki. The wiki also enabled customer to customer communications on company products information. It is reported that over 300 customers used the social network and over 1000 customers were interacting with each other. Most customers displayed satisfaction and loyalty to the company and its products as a result of web platforms. Moreover, seventy percent (70%) of customers were willing to stick with the company products in comparison with forty five percent (45%) prior to web 2.0 implementations. The above expected customer retention, which is the result of customer communication improvement, resulted in an estimated **€650 000** increase in revenue for the company (Mangiuc, 2009:79).

4.4.1.2 Employee interaction improvement

GoodWater Inc. regards teamwork as a key strategy to successful innovation. Therefore, their web platforms are geared towards enabling valuable staff collaborations. The implementation of the web 2.0 concept came while the company was operating thirty projects. Management foresaw that the technologies would increase the ability to work in teams and add to the business value. An assessment that was made after six (6) months of web 2.0 project implementation, shows that the social network facility accommodated five hundred (500) employees, with twenty (20) teams having been formed out of which sixteen (16) were strictly based on social network. Each of the teams had its own wiki that allowed collaboration of all team members, with ten (10) of the sixteen (16) teams composed of interdepartmental employees. Therefore, the goal of achieving interdepartmental interactions was reached but that of intra-office collaboration fell short by twenty-five percent (25%). Out of 20 new intra-office teams, 6 which achieved improved collaboration means that there was an increase in collaboration. However, the increase is only 20% (6/30 X100) after putting the original 30 teams in perspective. GoodWater Inc. projected that only 10% (3 teams) of the teams would reach tangible financial results. The profits were estimated at **€250.000** per project and therefore only two of the sixteen teams would reach a total income of **€500.000** attributable to new tools (Mangiuc, 2009:79).

The following table is therefore a summary of monetary benefits achieved by GoodWater Inc.

BENEFIT DESCRIPTION	VALUE (€)
E-mail message number decrease	628 590
Increase in customer communication	650 000
Information retrieval improvement	1 533 333
Employees collaboration improvement	500 000
TOTAL VALUE	**3 311 923**

Table 4.7: Description of web 2.0 financial benefits of a synonymous company. Source: Mangiuc (2009:85)

Therefore, a ROI computation comparing the total costs and benefits of GoodWater Inc. web 2.0 project was performed, as shown below. The company also considered that for a project to be considered a success, the ROI should be above 20% of the cost of an investment.

20% of the investment	2 041 682€
Actual ROI computation	$ROI = \frac{€3\ 311\ 923}{€1\ 791\ 402} = 185\%$

Table 4.8: Calculating web 2.0 ROI of a synonymous company. Source: Mangiuc (2009:86)

Other benefits identified by the project were considered difficult to prove financially and yet the reality of their cost saving ability cannot be denied. For instance, the implementation of a social network meant that, the company could easily identify potential employees even before they could publicly announce a post. The new web platforms yielded the accessibility of potential employee profiles and a 15%increase in resumes. In addition, sixty percent (60%) of potential candidates were already members of the company network. Hence, the observation that web 2.0 tools lower the costs of recruitment even though it is not yet possible to quantify and justify the claim.

It is clear that this model makes a valuable contribution on how the opportunity cost principle can be used to evaluate web 2.0 financially. Moreover, it provides a starting point for determining new variables that can be used. However, what the model lacks is the verifiability of the claims within the financial statements. Especially because opportunity cost principle has no direct relationship to tangible cash, it is difficult to prove the contribution of web 2.0 to financial performance and position using this model. This difficulty arises from the fact that the opportunity cost principle is not displayed within the books of accounting even though it is a well-accepted and useful technique of management accounting. From this case study by Mangiuc, it is clear that web technologies' impact followed prior setting of clear objectives to the company. It was very clear from the beginning what tool will be used to replace what operation and therefore what benefit will be harnessed. Apart from the oblivious limitations, the above case is therefore one of the exemplary cases that show a practical approach to measuring the financial impact of web technologies. It provides a reasonable stance to suggest that if no technique can quantify the financial benefits of

technologies, an alternative to assessing such benefits could be a case study approach where the behavior of certain cost and profitability variables may be assessed following the implementation of web tools.

4.4.2 A framework for social media ROI

A framework for measuring social media ROI by Kaske, Kügler and Smolnik (2012: 3898 - 3899) draws from a combination of other formulae and concepts that exist in the financial and marketing fields. It is based on the assumption that social media tools contribute to organisations' profitability and more specifically leads to a positive ROI. The original framework, the Return on Marketing Investment (ROMI), was developed by Rust, Lemon and Zeithaml (2004:111-115) who, as shown in the diagram below, considered that expenditure (E) in marketing renders marketing an investment that has a positive impact on variables such as customer satisfaction. Since, customer satisfaction is a positive driver of Customer Lifetime Value (CLV), it means that an increase in CLV results in an increase in customer equity (CE) and ROMI. The implications of the framework are that management's choice of a marketing strategy should be based on expected financial benefits, which further means that organisational strategies that affect CE positively should be chosen. In marketing, financial returns are defined in relation to customer equity in comparison with the accompanying expenditure.

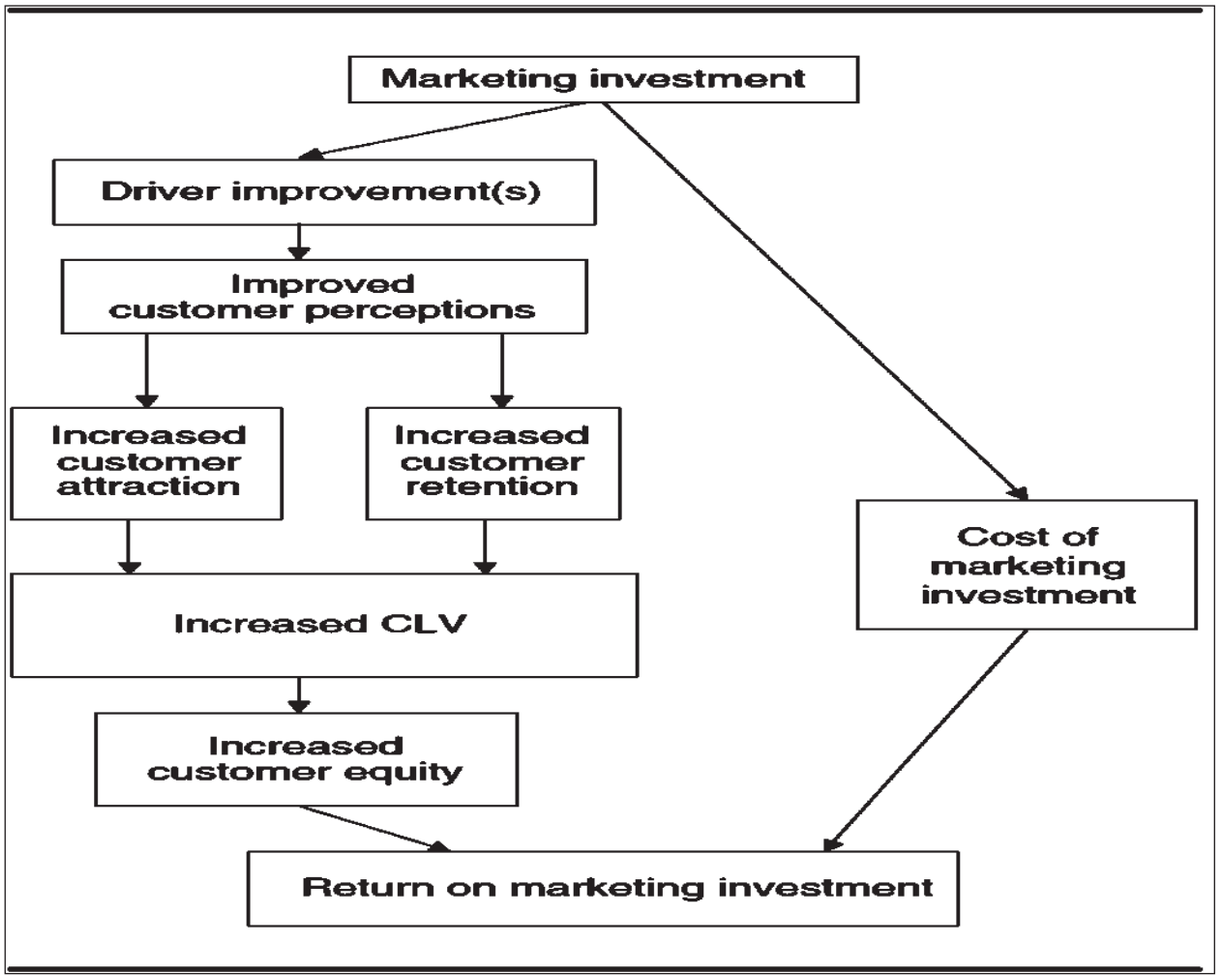


Figure 4.1: Return on marketing investment framework. Source: Rust *et al.,* (2004:112)

4.4.2.1 Customer equity

Customer equity is the *"value of potential future revenue generated by a company's customer in a lifetime. A company with high customer equity will be valued at higher price than a company with low customer equity"* (Business dictionary: 2016). Rust *et al.,* (2004:10) also define it as *"the total of the discounted lifetime values summed over all of the firm's current and potential customers".* The definition by Rust et al., (2004) is indicative of the much needed, yet slow paced transition by modern business from product focused to client focused strategies. They see '*Customers and customer equity'*, becoming the backbone of organisations rather than '*brands and brand equity'.*

4.4.2.2 Customer Lifetime Value

Customer Lifetime Value is an "*amount by which a person, household, or firm's revenues over time exceed the firm costs of attracting, selling, and servicing that customer" (*Berger & Nasr, 1998:18). The calculation model normally takes into consideration the expected net profit per customer for a certain period and active periods per customer, and discounts them to the present. The NPV concept is included in consideration of the fact that future values of customer equity and spending on social media are worth less in today's terms. Therefore, it is advised that a discounting factor that is unique

to a specific asset or organisation be determined to account for fluctuations in customer equity (Rust *et al.,* 2004: 114; Kaske *et al.,* 2012: 3898 – 3902).

It is therefore apparent that CLV is essential to determining CE because the CLV is achieved by determining a change in the CE. Largely, a technique to determining CE is the summing up of CLVs of all customers **(CE = Present customer's CLV + Future customer's CLV).** However, to avoid a long hassle of adding up all CLVs, the model simply calculates customer equity by determining the product of average customer's CLV and a number of customers for a certain period **(Average CLV X No. of customers/period).** The calculation is based on the supposition that social media has an influence on both CLV **(CLV = active periods per customer X profit per period and customer)** and the number of customers. Customer Lifetime Value is essentially the present value of profits from a customer throughout a certain lifespan. The calculation model below indicates that ROI is considered as an incremental change in customer equity that corresponds with a specific expenditure (Rust *et al.,* 2004:112).

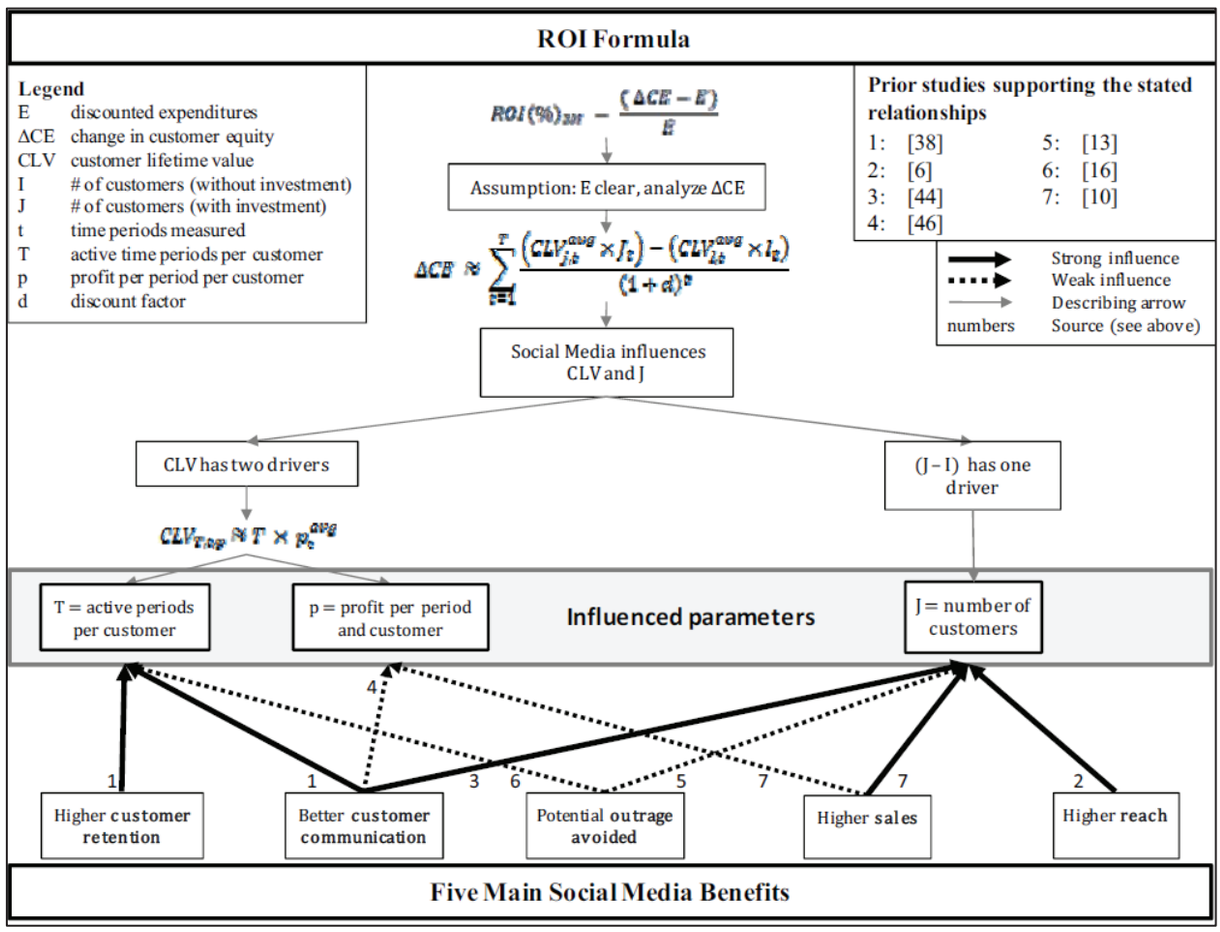


Figure 4.2. Social media Return on Investment. Source: Kaske *et al.,* (2012: 3898 - 3902)

The framework, just as the traditional ROI, reflects a less difficult determination of the expenditure component of social media. On the contrary, the determination of the benefits is not as straightforward and therefore five qualitative and quantitative benefits are a unique contribution of marketing related research. Analysis of a study by Kaske *et al.,* (2012:3904) on the benefits of social

media implementations results in the benefit drivers. such as perceived ease of measurability: 'greater reach', 'higher sales', 'better customer communication', 'higher customer retention' and 'potential outrage avoided'. First, the measurability of 'reach' is possible because of the programming of social media tools that make it easy to track online activities at no cost. There is a potential challenge involved in the estimation of sales that are a result of social media initiatives. That challenge relates to the determination of the cause and effect at a very specific level. To put it differently, this relates to what exactly initiated what. However, the solution to associating certain sales with specific social media tools lies in the potential of analytic toolkits. The other three variables have no immediate financial implications even though it is recommended that they should be considered when making social media project decisions. It should also be noted that social media benefits and drivers are also industry dependent. Nonetheless, the above-mentioned drivers have, to some extent, a positive influence on three dependent variables such as 'active periods per customer', 'profitability per period and customer' and 'number of customers' as depicted in the figure above, and the resulting benefit is a positive effect on CLV (Kaske *et al.,* 2012:3904).

Kaske *et al.,* (2012: 3903-3905) also offer some empirical results on twelve (12) international companies in order to demonstrate that there is profitability that is associated with social media. The study used online research to investigate the profitability of microblogs, social networks, video sharing websites and crowd sourcing websites. The study's results are displayed in the table below. As much as there is suggested ROI in those companies, there exists an inherent challenge of insufficient information that supports those claims. One reason that is prevalent here and in other studies (like Manqiuc 2009:87) is the reluctance of organisations to disclose certain financial data. Hence, Kaske *et al.,* (2012:3904) submit that there is a need for a study that will unravel all costs and benefits of social media projects without which, one may argue, that validation of their research is elusive.

Company	Industry	Platform	Description
Burberry (UK)	Retail	Crowd sourcing website	To entice customers to post their pictures wearing company clothing.
Dunkin Donuts (USA)	Food	Crowd sourcing website	Allows customers to create new donuts for Dunkin donuts.
Starbucks (USA)	Food	Crowd sourcing website	Enables clients to design and submit their product ideas.
Cisco (USA)	IT	Orchestrated (SecondLife, 3D Game, YouTube, Facebook, blogs, etc.)	Launch of a new router using only social media.
Dr. Irena Vaksman, Dentist (USA)	Dentist	Orchestrated (Facebook, Twitter, YouTube, LinkedIn)	To create a fresh customer base.

Domino's Pizza (UK)	Food	Orchestrated (Foursquare, affiliate marketing, superfans)	Social media platform that would contribute to the growth in revenue.
Lance Armstrong Foundation (USA)	Foundation (NPO)	Orchestrated (Blog, Facebook, Twitter, YouTube, Flickr)	Social media strategy that would encourage more financial contributions during a 2009 economic depression.
Dell (USA)	IT	Twitter	Use Twitter account to directly Incentivise more purchases (discounts, customer service).
Kogi BBQ (USA)	Food	Twitter	A twitter account that would update customers on delivery car whereabouts and business special deals.
Moonfruit (UK)	IT	Twitter	Online competition for MacBooks and iPods.
Blendtec (USA)	Food (supplies)	YouTube	Blender presentations using odd ingredients cross between an infomercial set and a small-time game show.
Tourism Queensland (Australia)	Tourism (state-owned)	YouTube (+Facebook)	Advertisements of jobs and allowing video posting from other parts of the world.

Table 4.9a. ROMI Overview of empirical examples. Source: Kaske *et al.,* (2012: 3905)

Company	Investment	ROI
Burberry (UK)	Expenditure related to website design and promotion.	7.5 million views globally, 1 million followers, 10% growth in revenue.
Dunkin Donuts (USA)	Cost of building website.	130,000 donut submissions 218,000 donuts created, 25,000 donuts posted on Facebook, 174,000 votes.
Starbucks (USA)	Costs related to 45 employees for website creation.	3 million monthly web viewers.
Cisco (USA)	An estimation of USD 20,000.	Saved USD 100,000, three appearances in times on press, 40 million online impressions 1,000 blog posts.
Dr. Irena Vaksman, Dentist (USA)	No monetary costs, only opportunity cost.	Attracted 320 clients within 5 months.
Domino's Pizza (UK)	Related IT infrastructure for online social media	Increase (61.4%) in revenue of associated with web presence.
Lance Armstrong Foundation (USA)	No monetary costs, only opportunity cost.	Raised USD 10.8 million. Facebook followers (800 000) forming a cancer community.
Dell (USA)	No monetary cost, only opportunity costs of Employees updating Twitter account.	1.5 million followers and more than $3 million sales from twitter fans. More than $1 million sales from the same fans over 6 months.

Kogi BBQ (USA)	No tangible cost, only opportunity costs of time taken to update twitter accounts.	80,000 followers and physical patronisation of 300 to 800 customers
Moonfruit (UK)	Expenditure of USD 13,500 for iPods and MacBooks.	Web traffic growth of 600%, 44,000 followers, double growth of signups, and first page of Google results.
Blendtec (USA)	Youtube/Google advertising.	Top 5 videos have > 5 million views within one month (Oct. 06) and raised revenue growth by 700% over 3 years.
Tourism Queensland (Australia)	The equivalent of USD 1.5 million set aside for social media.	34,680 job applications.

Table 4.9b. ROMI Overview of empirical examples. Source: Kaske *et al.,* (2012: 3905)

There are various conceptions of ROI formula and meaning which are a fertile ground for the loss of actual meaning and application (Botchkarev & Andru, 2011: 245). The view here is that the nature of accounting profession is partly the problem. Its rigid consideration of valid financial variables is a contributing factor to a slow progress in finding ways to measure the web tools' financial benefits. In fact, the accounting professionals lament the fact that all claims of ROI in social media originate from the Marketing field (Ross 2009:4). The fundamental problem is that the meaning of ROI for the two fields is in sharp contrast. For example, in the empirical study by Kaske *et al.,* (2012: 3905), ROI is judged as anything that results from a marketing strategy in use such as the number of followers, number of job applications and web traffic. However, management accounting prefers ROI as an amount that has immediate cash verification. At the same time, the marketing field is unrelenting in its push for ROI solutions (Ross 2009:4). As shown in the same case study (Kaske, et al) there is a constant development of methods and frameworks in this regard. What both fields seem to agree on is the fact that the financial contribution of web tools cannot be denied. However, they are both seeking acceptable quantification variables and strategies.

4.5 BACKGROUND TO THE PROPOSED CONCEPTUAL FRAMEWORK

The foundation for benefiting financially from web technologies, which is based on literatures analysis, is as follows:

One: **Understanding web concepts and identifying associated tools:** The importance of defining a web concept is key to identifying the relevant tools. A proper understanding of the concept assists in the identification of tools that serve a specific concept and its context. The understanding also allows for the utilisation of the web as a platform to replace costly traditional structures that depend on manual procedures.

Two: **Identification of contextual potentials:** Various studies (KPMG, 2008:1; Mangiuc, 2009:79; Romero, 2011:147; Gilfoil and Jobs, 2012:642) postulate that organisations should set measurable

financial benefits as means towards benefiting economically. This suggests that many organisations adopted the tools without clear plans or outlooks of what the benefit will be. The financial objective of web concepts is not a significant motivator for adoption in higher learning because universities have directed the use of technology towards enhancement of learning. However, ignoring the financial benefit, in the current global and local university context of resource shortages and escalating operational costs (Dlalisa & Van Niekerk, 2015:2, 3), is likely to affect learning in a negative way. As a result, this study proposes a framework that considers the **potential financial benefits of the tools** to universities together with contextual financial and resource shortage problems. However, a measurement of financial benefits at a later stage should not consider previously set objectives only as this creates the risk of missing the actual benefits, which may include those that would not have been apparent during web technology project implementation.

Three: **Combination of contextual hard and soft benefits:** A review of the literature suggests that the benefits of web technologies can be divided into immediate cash equivalent benefits and those that do not have immediate or recognisable cash value. The benefits that have immediate cash equivalents are mainly printing and stationery, communication and travel and transportation. Those that do not have recognisable cash value should be investigated and separated from those that have immediate financial impact (Mangiuc, 2009:79; Gilfoil & Jobs, 2012:642;). However, there is no point in trying to assess the financial impact of the tools e used casually by individuals within large organisations such as universities. Therefore, a plan to use the tools extensively should precede any attempt to measure the benefits. A plan to measure the impact of web tools should be preceded by a proper determination of whether there is an extensive utilisation that justifies such attempts. Thus, this study determines the manner and extent to which web technologies are utilised as a means to determine the possibility of success in measurement.

Four: **Replacement of contextual costs and benefits:** This involves an investigation of soft benefits. A thorough analysis of service unit operations before adoption of web tools will have to be made and compared with a period after (Gilfoil and Jobs, 2012:642). The financial outlook of operations prior to a web concept and after should be analysed and compared. The intention should be to investigate if there has been any change or improvement that could be attributed to a new system (Mangiuc, 2009:79). The additional value of this type of investigation is that it can help identify redundant operations.

Various universities have web platforms but these institutions have not made significant migrations of their core business to web platforms. This reality would mean that expenditure on the tools that have the potential to save costs can result in a doubling of the costs. This supposition is possibly true considering that many organisations implement web tools for fear of being left behind but without proper conceptualisation of the tools and their potential benefits (Armstrong & Franklin,

2008; Lwoga, 2012:93). However, this study is valuable for all types of institutions as it highlights the financial benefits for those with carefully planned practices with relative ease, and highlights too what those without good practices or redundant operations would be missing. The following theories also provide a basis for understanding the circumstances under which web technologies may benefit an organisation.

4.5.1 Resource-Based Theory (RBT)

According to the theory, the good financial performance of an organisation is related to the resources that it owns and their inherent capabilities (Bharadwaj, 2000). A distinction of resources and capabilities is that: *"Resources are inputs into the production process-they are the basic units of analysis. The individual resources of the firm include items of capital equipment, skills of individual employees, patents, brand names, finance, and so on"* (Grant, 1991:118). On the other side capabilities of an organisation should be understood as *"what it can do as a result of teams of resources working together"* (Grant, 1991:120). The theory elaborates that IT resources in particular are significant possessions that give an organisation a better financial performance, improve efficiencies and increased competitive advantage. IT infrastructure, human IT resources, and IT-enabled intangibles are the major divisions of IT resources. Organisations that possess these resources tend to perform well on performance indicators like profitability and cost efficiency. However, it is not mere presence of IT resources that automatically avails these benefits to an organisation, but the practical tactics that such an organisation utilises to take advantage of them will determine the extent and longevity of the inherent benefits (Bharadwaj, 2000). This means that the presence of IT resources mainly predisposes an organisation to some financial benefits instead of automatically realising them. In organisations where there are no devised strategies, this leads to the uneven spreading of technology across its functions and fragmented styles of utilisation (Bharadwaj, 2000). For a long time, organisations have forfeited the inherent benefits of available resources because of failure to link them with internal strategies. Formation of organisational strategies should be done by linking resources and their capabilities and this is the most important approach to profitability (Grant, 1991). The implication of these theory to the current study is that web tools are resources with specific capabilities like cost reduction. These capabilities can be properly harnessed provided organisations devise good strategies of supporting the core business.

4.5.2 Diffusion of Innovation Theory (DIT)

Diffusion of Innovation Theory holds that the successful diffusion of innovations is the effect of acceptance by intended users. These users are composed generally of 'innovators' and 'early adopters'- the people who are the first to utilise the technology right away at its inception. 'Early majority' and 'late majority' - are people who tend to adopt an innovation as it continues to evolve; and 'laggards' are those who remain as non-users of an innovation despite its implementation. The

theory further states that the determining factor of whether intended users will adopt an innovation is their perception of it (Wan der Zande, Gorter &. Wismeijer, 2013:1).

The DIT is a derivative of an Information Technology Diffusion Theory (ITDT). Resulting from the DIT, the ITDT theorises that the process of technology spread among users has the following generalities:

- There are some intrinsic and distinguishing features of an innovation like 'relative advantage', 'compatibility', 'complexity', 'trialability' and 'observability'. The level and speed of diffusion depends very much on how adopters perceive these things.
- The level of innovation differs among adopters and is characterized by unique personal traits like level of education and culture.
- The decision to adopt an innovation is born out of the extent at which one knows about it which leads also to the personal conviction that he/she has. Following from these two factors, one may decide to implement. Other influencing factors are external issues like first hand information that one has been exposed to through various forms of communication.
- There are other influential individuals within an organisation whose views and actions can lead to a wide and speedy institutional take-up of an innovation. This is especially true in cases where targeted adopters perceive that there are some existing commonalities between them and the influencers.
- It is normal to have a slow rate of diffusion especially among the first movers. The process begins to increase significantly as more people buy-in to an innovation as result of things like peer influence. Over time, the level of diffusion slows down as a result of a considerable number of adopters having exhausted it (Fichman, 1992)

Beyond such generalisations which are characteristic of an autonomous adoption, there exists another adoption norm like the managerial influence. Fichman (1992:2-3) contends that in practice, individuals do not always have the freedom to use or not use 'work-place innovations' because management of organisations habitually has a role to play in directing an organisation towards the adoption of innovations. Management normally influence adoption of innovations through issuing of clear mandates, reward systems and offering some incentives. Therefore, Fitchman (1992) recommends that studies on individual utilisation of new tools in organisational context should always consider managerial influences as a factor because of an inseparable role that it plays in technology take-up. To this study, a consideration of the ITDT together with RBT infers that a group of resources like web technologies that are properly and tactically diffused will guarantee that an organisation enjoys such intrinsic capabilities like better financial performance.

4.6 THE CONCEPTUAL FRAMEWORK

A technology or application can be classified as web technology if it has specific attributes that distinguish it from other technologies. Such attributes are recognised in this study as enabling features that permit the tools to make financial contributions that other technologies cannot make. Other tools can make similar contributions to those of web technologies, however, they can only do so to a certain limit. Thus, web implements have the potential to make further contributions of a similar nature and those that are unique to their status as web technologies. The financial benefits arising from the implementation of web technologies are considered in this study to be profitability and cost reduction effects. The study considers further that the determination of profitability and cost reduction attributable to web technologies can enable the ROI and some capital budgeting techniques. Therefore, the study also shows how web technologies should be classified within the SFP as denominator components to profitability ratios.

The figure below illustrates the way in which web technologies enable a web to become a new platform for carrying out the core functions of teaching and learning. To transfer some teaching and learning functions to a web platform automatically implies replacement of the previous manual procedures. Further implications of these replacements are that the costs related to the replaced manual procedures are reduced or replaced completely. This reduction or removal effect on operational costs means that the profitability of an organisation improves. Hence, the ascertainment of cost reduction and profitability would mean that some ROI and Capital budgeting techniques can be attempted. Nonetheless, an in-depth discussion on the concepts is carried out below together with the implications to the field work of the study.

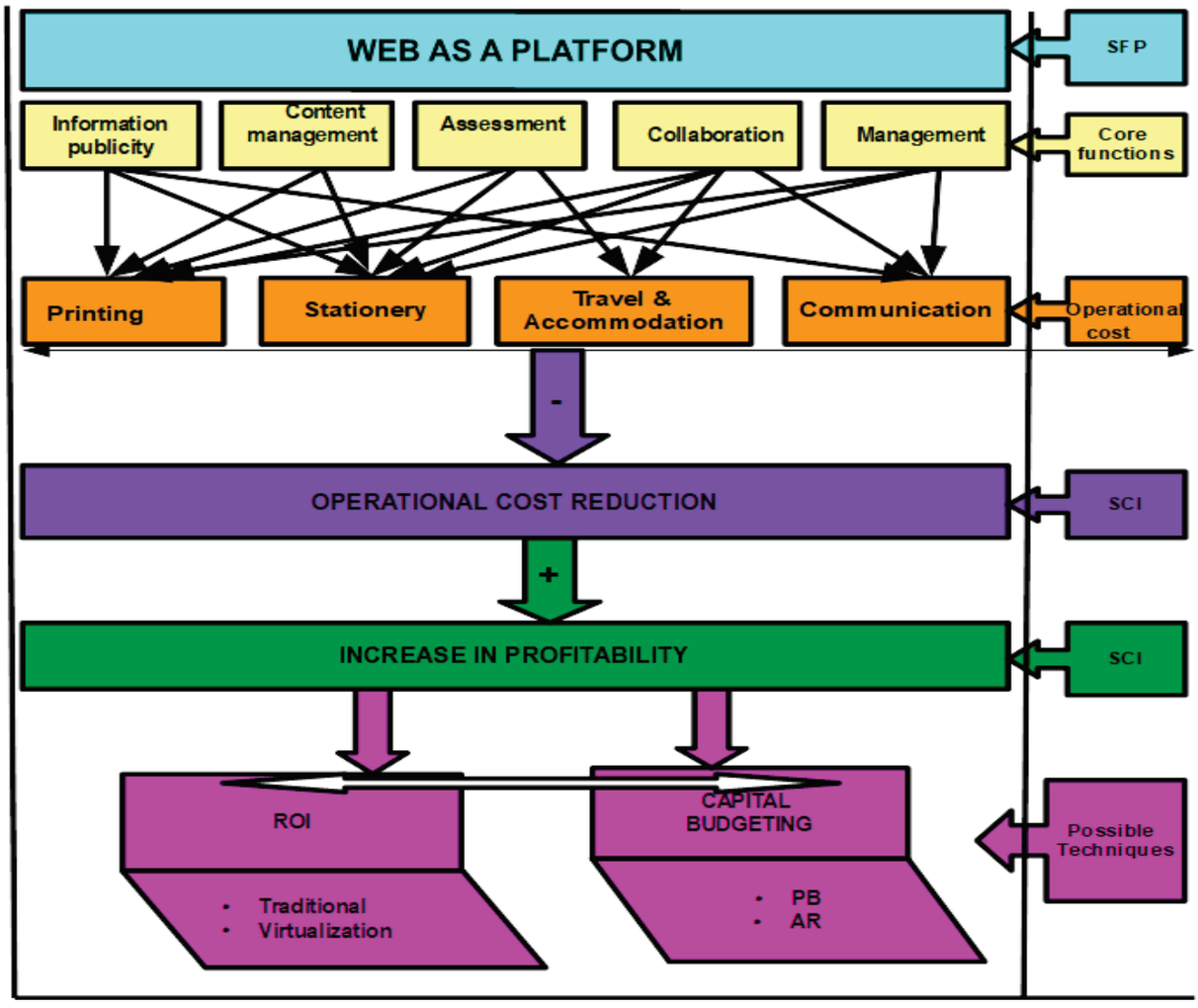


Figure 4.3: Profitability and cost cutting abilities of web technologies (Own compilation)

4.6.1 Definition of web technologies

Web technologies for educational purposes have been conceived in chapter 3 of the study as ***all web-based implements that allow publicity of information, content sharing, an inclusive environment of participation and collaboration in content creation and interconnectivity of human and non-human participants for the transformation of the core business of higher learning.***

The fieldwork of the study will therefore expose the types of web technologies implemented by the identified University and how they are being used in offering teaching and learning as the core business of the University.

4.6.1.1 Web as a platform

The main characteristic of a web tool for the current study is its ability to function on a web space to facilitate an organisation's core business beyond the limitations of space and time bound procedures (Getting, 2008). The implications of using the web are that organisations will in the long run depend less and less on physical infrastructure like buildings, furniture, equipment and vehicles to support their core business. However, the web as a platform does not indicate of how web tools

are utilised within a specific context. It only means that to some degree, some operational processes are carried out on the web (Getting, 2008; *et al.,* 2010:13). For teaching and learning environment this simply means there is a certain degree of integration which is just the first level of implementation of web tools. Therefore, the extent to which the core functions of Online Publicity, Online Content Management, Online Assessment, Online Collaboration and Online management (Education technology, 2017) are used should be explored to explain the nature of integration and the associated benefits. Various studies declare that web technologies contribute to operational cost reductions (Grosseck, 2009:480; Barnes *et al.,*2010:7; Hinchcliffe, 2010:26-31; Mohapatra, 2013:164), revenue and profitability increases (Mohapatra, 2013:164). Hence, the growth in web technology integration should result in progressive financial benefits. Moreover, the growing use of collaboration and participative utilisation should result in additional benefits that cannot be realised through mere integration. This suggests that, it will be important, within a university context, to determine if subjects are integrated to web platforms and assess what they are used for in order to predict the range of benefits that the tools will afford the university.

4.6.1.2 Web technologies as Non-Current Assets

Web technologies are recognised in this study as non-current assets within the SFP in line with the accounting conceptual framework (Kew & Watson, 2010:34; Cloet & Marimutu, 2015:17; Koppeschaar, Rossouw, Deysel, Sturdy, Van Wyk, Gaie-Booysen, Papageorgiou, Smith, Van der Merwe & Schmulian, 2015:197) which conceives that an asset is:

'*A resource that is controlled by an entity'.* An entity is considered as having control over an asset if it has obtained exclusive and lawful control over it and the date of access can be ascertained. Thus, Learning Management Systems, such as Blackboard Learn, are resources controlled by an adopting institution of higher learning (Parsons, 2006:1; Bradford, *et al.,* 2007:306, 313; Manqiuc, 2009:85,).

'As a result of past events': The past events that lead to the control of an assets are an institution's purchases of an asset, costs of obtaining a license or expenditure accrued while building up a program.

'From which future economic benefits are expected to flow to the entity': The future economic benefits can be in the form of income (including revenue), costs saved or any other financial payback that can be ascertained (Koppeschaar *et al.,* 2015:197). The contribution of web technologies in reducing operational costs and increasing income have both been established and implied in literature. The financial efficiency of an organisation depends on how an organisation's assets are being utilised to fulfill the core business (Cloete & Marimuthu, 2015:89). In line with the RBT, an accounting definition recognises assets as resources with specific capabilities. Hence, a

sound exploitation of web technologies leads to the implied benefits while poor utilisation will not permit any noticeable benefit.

4.6.1.3 Web technologies as intangible Assets

The reality that web tools are without physical substance and yet can be identifiable means that, they should be recognised as intangible assets meeting an identifiability criterion through distinguishable costs and legal right in accordance with ***International Accounting Standard (IAS 38)***. An assumption of financial benefits flowing to the entity may be through *'professional judgement'* or informed and substantive assumptions, demonstrated by *'market research', 'feasibility studies' or 'comprehensive business plan'*. Web tools can be likened to websites, which are recognised as intangible assets according to **IAS 38** (Koppeschaar *et al.,* 2015:717). The use of web implements will increase and replace physical assets and associated spending patterns only if organisations embrace the benefits offered by intangible assets. This can be achieved on condition that the associated expenses like depreciation will change too. Alternatively, web technologies might help orgainsations to avail their idling physical resources for other economically rewarding purposes. Nonetheless, web technologies' existence and ability to function beyond physical and time boundaries affords them the following functionalities which are not possible through other non-current assets.

4.6.1.3.1 Online Publicity of Information

Online publicity refers to the primary utilisation of web tools to make important information (but not academic content) available to intended users (Getting, 2008). Publicity is viewed in this study as the ability to communicate important information to students using announcements and online feedback on blackboard and other tools. Previously, universities depended on traditional notice boards for notifying students on matters such as tests and examinations, classroom postponement and others (Unal and Unal, 2011:27). These traditional practices meant that a printout would be placed on a notice board or other places where they would be visible to students. However, information communicated in this way is susceptible to loss or damage. At the same time, some intended users may see it after the given deadlines. A replacement of these practices with online publicity means that an organisation saves stationery and printing costs. Moreover, it increases the chances of effective and transparent communication (Choudhuri, 2014). Therefore, online publicity of information contributes to reduced stationery and printing costs. It also contributes to reduced communication costs. Online information publicity and the related tools may be conceived in ways presented in the table below.

Online Publicity of Information		
Description of functions	**Associated tools**	**Reduced costs**

▪ Distribution of information ▪ Communicating administration information ▪ Communicating course related information	▪ Announcements ▪ Calendars ▪ Surveys	▪ Reduced printing ▪ Reduced stationery ▪ Reduced communication

Table 4.10. Online publicity of information, tools and potential cost cutting effects

4.6.1.3.2 Online Content Sharing

Online content sharing refers to the use of web tools to share any subject related content with students (Unal and Unal, 2011:28). Although content sharing has been viewed as a function of publicity in private sector establishments, this study argues that the two should be separated because they perform significantly different functions in the educational sector. For instance, lecturers inform students on certain academic issues without sharing academic related content. Nonetheless, the sharing of academic content is a significant function that is done further to publicity functions. A university that does not use this feature depends heavily on printed material as a means to sharing things like study guides and study notes. Relying on online content means that the material is accessible beyond any physical and time boundaries. Therefore, online content sharing reduces the costs related to stationery and printing by the university faculties and their departments. Online content sharing and the related tools may be conceived in ways presented in the table below.

Online Content Sharing		
Description of functions	**Associated tools**	**Reduced costs**
▪ Sharing of study related resources like additional notes and study guides	▪ Learning modules ▪ Mashups ▪ External links ▪ Wikis	▪ Reduced printing ▪ Reduced stationery

Table 4.11. Online content sharing, tools and cost cutting potentials

4.6.1.3.3 Online Assessments

Online assessment refers to the issuing and grading of web-based tests, assignments, self and peer assessments, including plagiarism tools, marking rubrics and discussion forums (Education technology, 2017). The use of online assessments is one of the most valuable features in teaching and learning with technology, even though it appears to be the less utilised (Whitmer *et al.,* 2016). Feedback on online assessments can be set up for availability immediately after the test has been taken or later after an assignment is graded (Unal & Unal, 2011:32-33). It may be inferred that the utilisation of online assessments and feedback can replace many formative and summative

assessment procedures, which will in turn result in reduced stationery and printing expenses over and above those features that publicity of information and content sharing can affect. In the table below, online assessment and the related tools are demonstrated.

Online Assessments		
Description of functions	**Associated tools**	**Reduced costs**
▪ Formative assessments ▪ Summative assessments ▪ Giving feedback ▪ Marking ▪ Monitoring submissions	▪ Tests ▪ Self and peer assessments ▪ Assignments ▪ SafeAssign ▪ Discussion boards ▪ Grading centre ▪ Rubrics	▪ Reduced printing ▪ Reduced stationery ▪ Travel and transport

Table 4.12. Online assessments, tools and potential cost cutting effects

4.6.1.3.4 Online Collaborations and communication

The intended users within the web 1.0 context are consumers of content with no ability to contribute to existing content or creating any. Collaboration within the context of web technologies refers to the ability of web platforms to allow different users to be participants in content creation (O'Reilly, 2010:19). Apart from using web tools for sharing information online and uploading material, the more competent use of web tools is that which allows users to interact with each other or with the web tools (Whitmer *et al.,* 2016). Users may also work together on some projects or assignments using collaborative applications (Jordaan, 2015; Penzhorn, 2013). This means that online interactions and collaborations extend the benefits to beyond publicity and content sharing features and their contribution to lower printing and stationery costs. Users can work on a document online as well as contribute content online. Therefore, the lecturers' issuing of different forms of online evaluations to students allows students to interact with each other on projects and to contribute content. This means that a lecturer will not print out evaluation papers or handle a lot of paper work. Online interaction between lecturers and students further enables the issuing of students with feedback either immediately after taking a test or later. Another method of online interaction is through discussion forums, online chatting and blogs, which facilitate subject related discussions and reduce the need to share physical content material. Therefore, the use of online collaborations and interactions through assignments, tests, collaborative projects and other means contribute to reduced printing and stationery costs. Together with content sharing, the use of online collaborations and interactions, online discussions and video conferencing, contribute to reduced

communication costs and travelling and accommodation costs related to all other manual operations. The table below illustrates the function of online collaboration and the associated tools.

Online Collaborations		
Description of functions	**Associated tools**	**Reduced costs**
▪ Peer to peer interactions ▪ Lecturer to students' interactions ▪ Group work challenges ▪ Tracking participation ▪ Reflections	▪ Discussion boards ▪ Collaborative tools ▪ Blogs ▪ Embedded emails ▪ Video conferencing	▪ Reduced printing ▪ Reduced stationery ▪ Reduced communication ▪ Reduced travel and accommodation

Table 4.13. Online collaborations, tools and potential cost cutting effects

4.6.1.3.5 Online Management Responsibilities

Management responsibilities in the context of teaching and learning with educational technologies entail the administration and distribution of valuable student information such as marks and performance. Web tools can also enhance time management in teaching and learning through setting up reminders, the use of calendars and deadlines for submissions (Education technology, 2017). An institution that does not have this function relies heavily on public notice boards for the announcement of student marks, which has stationery and printing implications. It the table below, the core function of online management is demonstrated.

Online Management Responsibilities		
Description of functions	**Associated tools**	**Reduced costs**
▪ Calculation of marks ▪ Distribution of marks ▪ Time management	▪ Grade centre ▪ My Grades ▪ Course reports ▪ Performance dashboards ▪ Notifications	▪ Reduced printing ▪ Reduced stationery

Table 4.14. Online management responsibilities, tools and potential cost cutting effects

4.6.2 Financial benefits: Operational cost reduction and profitability

The fact that the use of web technologies cut costs related to traditional operational structures has been extensively discussed Profitability is another accepted benefit of using web technologies (Mohapatra, 2013:164). In this study, profitability is considered as a resulting effect of reduction in operational costs (Horngren *et al.,* 2008:975-976). Reduced operational costs contribute to increases in profitability (Kew & Watson, 2010:34). A combination of these two assertions, leads to the conclusion that a more efficient utilisation of web technologies results in to lower operational costs

and higher profitability. That is because a reduction in operational expenditure leads to an increase in profitability.

4.6.2.1 Profitability

An organisation is profitable if its total income can cover its total operational expenditure (Service, 2009:948). Profitability indicates that an organisation has greater chances of continuity and that it is efficiently utilising its assets whose primary responsibility is to generate economic benefits. In fact, one of the profitability ratios, ROA, helps to determine the efficiency with which assets are being utilised (Cloete & Marimuthu, 2015:89). This suggests that the assets of an organisation, such as web tools, should be utilised in a way that will achieve financial efficiency or face the risks of financial lack which might lead to its demise. Therefore, an organisation that adopts web technologies within a resource scarce environment stands a chance of achieving these goals.

4.6.2.2 Operational cost or expenditure

Operational expenditure is a *"decrease in economic benefits during the accounting period in the form of outflows or depletions of assets or incurrences of liabilities that result in decreases in equity, other than those relating to distributions to equity participants"* (Stegmann, Pietersen, Schalkwyk, Wesson & Kopperschar, 2007). In addition, Barker (2010:151) notes that, "*an expense is surely something that reduces profits"*. As such, reductions in operational expenditure lead to improvements in profitability. This view of expenditure is similar to management accounting's interpretation of cost as a financial value forfeited in order to achieve a certain objective (Niemand *et al.,* 2006:17; Horngren *et al.,* 2008:1033,). This study draws on these definitions in its consideration of costs as the monetary value, specifically the Rand amount, which can be attributed to offering or supporting the core business of teaching and learning within a university's faculty and department. It is at these levels that web technology's competencies in mitigating against shortage of resources is explored. Moreover, the increase or decrease of such costs must have a negative or positive impact on profitability (Vigario, 2007:4). A change in a specific cost (cost object) arises from a change within an inherent driver (cost driver).

4.6.2.3 Cost object

Cost object is an item, service, service unit or transaction that accumulates costs, the determination of which enables cost management decisions to be focused (Els, Walt, Wet & Meyer, 2012:15). Organisations manage costs by focusing their efforts only on those activities that customers perceive as valuable and through efficient management of cost drivers within cost objects (Horngren *et al.,* 2008:32). *A cost driver (also called a causal factor, cost generator or cost determinant) is any factor that affects total costs. That is, a change in the level of the cost driver will cause a change in the level of the total cost of a related cost object* (Horngren *et al.,* 2008:34). Furthermore, a cost driver can be considered as a legitimate determinant of cost if it is measurable and has a direct

connection with a specific activity (Els *et al.,* 2012:229). For example, cost drivers within research and development (R&D) unit may be the ***number of research projects, personnel hours on a project*** and ***technical complexity of projects***. A positive or negative change of any of these variables has a direct influence on the total costs of R&D as a cost object (Horngren *et al.,* 2008:34). This implies that the ability of web tools in modifying cost drivers should be determined in order to infer its cost cutting potential. Therefore, this study determines whether the specific variables are the cost objects whose cost driver behavior should be assessed over an extended period of time following the implementation of web tools.

4.6.2.4 Structural and operational changes of web concept

The implementation of web technologies within an organisation inevitably introduces some structural or operational changes. The financial implications of these changes should be probed. In doing so, Manguic (2009) suggests that the objectives of implementation should be studied, and followed by and analysis and comparison of the organisation's way of doing things prior to web technology implementation and after. Thereafter, the financial implications can be detected. Impliedly, the financial implications of web technologies can be assessed over an extended period following the implementation. Such effects will be the result of altered or replaced cost bearing procedures. An addition that the current study makes to Manguic's (2009) is that rather than focusing on the objectives only, the potentials and the actual effects should also be considered. This is because educational institutions do not necessarily plan to benefit financially (although the researcher argues that they should) from implementing educational technologies. Rather, their main reason is to enhance learning. A stance taken in this study is that as long as there are structural or operational changes within an organisation, there will always be a financial effect. At the level of potential change, the cost and income drivers unique to the organisation can be determined and investigated for a possible rise or decline over a certain period of time following the implementation of web technologies. Therefore, a behaviour of a driver will be expected to influence the total operational costs and total income of an organisation.

4.6.2.5 Selected operational costs

An approach used by Manguic (2009) to determine the financial impact of web technologies focuses on identifying what the web tools were implemented to achieve. After some reasonable time of implementation, Manguic (2009) measured a change in financial behaviour of specific costs within an organisation following the implementation of web tools. Borrowing from this approach, the following operational expenses will be conveniently investigated as dependent variables affected by the proficient use of web technologies. In other words, if web tools are implemented and used well within an organisation, the implementation should result in a decline in the following costs over an extended period of time. The opposite would mean that the University is not using web tools proficiently.

A proficient use of web tools is considered to be the growing utilisation of the core functions of web tools and not just subject integration. Ideally, the study has to investigate the relationship between growth in subject integration and cost behaviour of selected accounts. A further investigation will determine if there was growth in the utilisation of the core functions of publicity, content, assessment, collaboration and management and the behaviour of the selected accounts within the same period. However, all these approaches are relevant on condition that there exists an extensive and optimal use of the tools. A reduction in selected costs over a period following subject integration and growth in other core functions of web technologies can therefore be interpreted as an indication of the contribution of web technologies in replacing costly traditional and manual procedures.

4.6.2.5.1 Stationery and printing expenses

Web technologies replace stationery and paper-based procedures and their associated costs (Mangiuc, 2009:76-77). A consideration that combines printing and stationery is typical. For example, Bansal (2012) mentions that "*printing & stationery expenses include the cost of stationery items which are used daily in offices and the printed material for correspondence purposes*." He further gives the following examples as part of stationery and printing: *"business letter heads, business cards, envelopes, plain papers, rough papers, pins, staplers, punching machines, files, folders, pen, pencil, eraser, adhesive tapes, adhesive gum, paper weights, paper trays and other miscellaneous items of stationery.* Therefore, the following effects must be realised after the implementation of web technologies. Failure to realise these effects indicates that the web technologies are not being utilised to their maximum potential. If there is no constant growth of utilisation of web tools, this impact cannot be expected.

4.6.2.5.2 Communication expenses

Various web technologies are associated with cost effective dissemination of information for both internal and external stakeholder engagements (Sahd & Rudman, 2013:40-41; Schniederjans, Cao & Schniederjans, 2013:914). A case study by Manguic (2009) outlines how various web tools were implemented in order to achieve cost-effective communication between management and employees, and within employee to employee engagements. An institution may achieve this by replacing traditional ways of communication (KPMG, 2008:1, Mihai, 2009:81; Barnes *et al.,* 2010:7; Hinchcliffe, 2010:31; Bughin & Chui, 2010:1; El-Sayed and Westrup, 2011:4-5; Mohapatra, 2013:164). Telephone expenses are mentioned among the costs reduced owing to a proficient use of web technologies (Barnes *et al.,* 2010:4; Mungofa & Peter, 2015:62). The costs of communicating through web conferencing tools are very low in comparison with traditional strategies (Sahd & Rudman, 2013:41). Therefore, the above assertions lead to the conclusion that: following from the implementation of web technologies by a university, the total number of telephone calls and total communication costs must be reduced.

4.6.2.5.3 Travel and transport expenses

Travel expenses include all expenditure incurred by an organisation through travel movements while fulfilling organisational responsibilities. Travelling expenses include costs of accommodation and meals. Normally these kinds of expenditure are tracked through internal documents that offer guidelines such as cost per mileage and accommodation and meal invoices (businessdictionary.com: 2012). Web technologies also facilitate reductions in travelling (El-Sayed and Westrup, 2011:4-5) They assist organisations to cut travelling costs by creating a sense of closeness through online virtual meetings (Barnes *et al.,* 2010:4; Mungofa & Peter, 2015:62) and low-cost web conferencing tools (Sahd & Rudman, 2013:41). The above views from reviewed literature lead to the conclusion that a proficient utilisation of web technologies results in a reduction of the total number of travelling activities. In addition, the total costs of travelling and accommodation should decline.

4.6.3 Return On Investment and Capital budgeting

Return On Investment and capital budgeting techniques can be attempted after determining the above cost reductions and profitability effects of web technologies. However, before attempting these computations, it must first be established whether there has been a proficient use of web technologies that could have led to detectable benefits. The fieldwork of study can therefore be summarised as follows:

1. Investigating types of web technologies implemented and utilised by the University.
2. Assessing the quality of use for its potential to effect identified financial benefits.
3. Assessing the cost cutting and profitability effects of web technologies within the financial reports.
4. Determining the potential usage of capital budgeting and ROI techniques in measuring the financial benefits.

The researcher's interpretation of literature is that:

- The difficulty in measuring the financial benefits of web tools is a contextual matter which depends on the nature of operations that are fulfilled by use of the tools Therefore, the difficulty experienced in one organisation might not exist in another.
- Freestyle and fragmented adoption strategies contribute partly to the difficulty of measurement, which means that formalisation of the concept, especially through LMSs within the university context, might provide a good starting point for measurement attempts.
- The problems of measurement do not start with the qualitative nature of the variables, nor should it be blamed on poor utilization, but it must be related to lack of clear objectives and strategies prior to implementation. If organisations implement the tools impulsively, they automatically create the difficulty of adoption by staff members and the inability to assess the impact.

- The reality that the problem of soft benefits did not originate with web tools underlines that, the difficulty of measurement cannot be singularly attributed to web concepts. It provides for the conclusion that impulsive incorporation of technology is not a new problem. Organisations have always been buying in into technology for fear of being left behind or at least in order to be counted among those with the latest technology. This fact appears to also be true in the context of higher learning institutions.
- The concentration of IHLs on the benefit of the tools to learners (learner-centeredness) propels universities to automatically ignore the need to benefit financially. But this approach is not a desirable one considering scarcity of resources which also affects IHLs.
- Financial benefits can be measured based on costs saved and profitability impact to an adopting university. The extensive look at literature encompassing the concept of web tools (chapter 2) contextual abilities within IHLs (chapter 3) and the financial techniques that hold the potential to measuring the financial benefits (chapter 4) provide a sound background for investigating this phenomenon within a single university and to developing a framework for measuring financial benefits.
- The ability of an institution to capture the financial transactions as they occur is a necessary ingredient to assessing the impact of web technologies since inception and throughout their growth.
- The nature of the accounting field is part of the problem in its inflexibility to accommodate novel contributor variables to financial benefits.
- Case study approaches that assess impact over a certain period of time of use should be considered especially in cases where capital budgeting and ROI are not applicable. At the same time, whatever approach is used, it will still depend on the extend of use of web technologies in that organisation.

4.7 Chapter summary

The chapter unpacked the potential techniques for measuring the financial benefits of web technologies. The literature review enabled the researcher to conclude that the present management accounting techniques hold both potentials and disablements to measuring the financial benefits of web technologies. The potential of these accounting techniques is evinced by their previous success in other information systems projects. The impediment that they face has always been attributed to the fact that web tools produce soft benefits, which are difficult to quantify. Another view perceived lack of financial objectives as an impediment to assessing them. Further noted is that a limited and free style utilisation of the tools contributes a different kind of difficulty in measurement. Finally, the reviewed literature facilitated the formulation of the conceptual framework presented in this chapter. The next chapter focuses on CUT's context and the nature of the processes that run its core business.

CHAPTER 5: BACKROUND, CORE BUSINESS, POLICIES AND PROCEDURES AT THE CENTRAL UNIVERSITY OF TECHNOLOGY, FREE STATE

5.1 Introduction

The preceding chapter focused on the techniques from management accounting and other fields, which hold the potential for measuring the financial benefits of web technologies because of their noticeable reputation in measuring the paybacks of technology. The same chapter culminated into a conceptual framework of all literature that has been discussed to this end. The purpose of this current chapter is to outline the background of the University under enquiry and the context within which it uses all available technology. The main discussion of this chapter is the nature of the core business of the University that needs to be targeted with educational technologies. This chapter, which is aware of the threefold nature of the University's core business, focuses the strand of teaching and learning as one to which educational technologies can be seen as essential. Therefore, the essentials of teaching and learning, such as face to face contact sessions, assessments, sharing of notes and other educational materials, are discoursed through policies that govern such procedures.

The chapter also outlines the progression of the number of academic staff members, students and that of subjects from 2002 to 2017. The intention is to outline how the increase in demand for higher education, of the actual intake of students and that of instructional offerings necessitates the need to implement cost effective ways of managing the increasing workload. Hence, the chapter draws on the University Academic Workload model's idea that the performance of duties and utilisation of resources needs to be improved in line with new demands and resource consumptions. Lastly, the chapter considers briefly the Sustainable Development Framework as another university tool that has implications on the use of technology for teaching and learning.

5.2 A brief background of Central University of Technology

Central University of Technology is located within Central SA in the Free State Province. The main campus of the University is in Bloemfontein while the second campus in Welkom, which is situated about 155 kilometres away from the main campus. When it commenced its operations in 1981 it was known as Technikon Free State. Later on, the university was renamed CUT on 26 March in 2004 owing to the transformation instituted in the country's higher education landscape that witnesses all former Technikons being renamed Universities of Technology (UoTs). Nonetheless, the Technikon enrolled about 285 students on its inception and these were mainly registered for secretarial and art and design courses. The 2004 restructuring has resulted in the total number of students growing to 14 525 in 2014. In the same year, staff members comprised 764 full-time employees and 1 927 contracted on a part-time basis. The institutional name of the graduates, the *"practuandi",* affirms CUT's intention to produce highly skilled graduates that are vested with

practical experience and the ability to innovate and think forward instead of mere employability (CUT, 2017: Official calendar).

Furthermore, the CUT launched graduate attributes in 2014, which uphold the intention to reproduce unique graduate competencies. The founding idea is that every graduate from CUT must possess distinct attributes, most of which hold implications to the use of modern technology, gained while studying at the University. That is to say, students must have a pronounced and growing use of technology, especially for academic purposes, in order to achieve these ten graduate attributes. These attributes are:

- *"Sustainable development;*
- *Community engagement;*
- *Entrepreneurship;*
- *Innovation and problem solving;*
- *Technological literacy;*
- *Numeracy;*
- *Communication;*
- *Technical and conceptual competence;*
- *Teamwork; and*
- *Citizenship and global leadership"* (CUT, 2016 – 2020: Strategic plan).

5.2.1 Vision

The vision reads as follows: *"By 2020, Central University of Technology, Free State shall be an engaged university that focuses on producing quality social and technological innovations in socio-economic developments, primarily in the Central region of South Africa"* (CUT, 2017: official calendar; CUT, 2016 – 2020: Strategic plan).

5.2.2 Mission

To fulfil this vision, CUT intents to:

- *"Deliver high-quality appropriate science, engineering and technology (SET) academic programmes, supported by applied research;*
- *Engage with the community for mutually beneficial development;*
- *Promote access with success in attracting potentially successful students and supporting them to become employable graduates;*
- *Attract and retain expert staff members and support their development and wellbeing; and*
- *Forge strategic partnerships"* (CUT, 2017: official calendar).

5.2.3 Core Values

The following are the core values that CUT aims to distinguish itself with:

- *Customer service;*
- *Integrity;*
- *Diversity;*
- *Innovation; and*
- *Excellence"* (CUT, 2017: official calendar).

5.3 The core business of CUT

The core business of CUT is teaching and learning, research and community engagement (CUT, 2010 – 2020: Vision 2020 & Strategic Plan). This study focused specifically on teaching and learning offered by distinguished academic faculties. Teaching and learning at CUT encompasses facilitation of classes, consultation time with students, assessment of students, supplying students with study guides, curricula, syllabus and subject related notes. The foremost responsibility of lecturers is to interact with students in ways that promote the learners' ability to develop learning skills and individual proficiency. Primarily, teaching and learning transactions take place in a classroom or laboratory context depending on the nature of the subject. Staff members have the responsibility to encourage *'free discussions, inquiry and expression'* between themselves and students (CUT, 2017: Calendar).

5.3.1 Academic Faculties, departments and relevant programs

Teaching and Learning is facilitated by four faculties that are divided into various departments. The table below lists the University faculties according to the latest information at the end of the year 2018 (www.cut.ac.za).

Faculty of Management Science (FMS)	
Department of Accounting and Auditing	Cost and Management Accounting Financial Information Systems Internal Auditing
Department of Business Management	Human Resources Management Marketing
Department of Business Support Studies	Project Management Business Administration and Office Management and Technology
Department of Government Management	Public Management Community Development
Department of Hospitality Management	Hospitality Management
Department of Tourism and Event Management	Tourism Management

Faculty of Engineering, Information and Communication Technology (FEICT)	
Department of Built Environment	Construction Construction Management Quantity Surveying
Department of Civil Engineering	Civil Engineering Logistics and Transportation Management Hydrology and Water Resources Management
Department of Electrical, Electronic and Computer Engineering	Renewable Energy Technologies Computer Systems Electrical (Light Current) Electrical (Heavy Current)
Department of Information Technology	Computer Networking Information Technology
Department of Mathematical and Physical Sciences	Mathematics Statistics Physics
Department of Mechanical and Mechatronic Engineering	Engineering Technology: Mechanical Engineering: Mechanical Engineering: Mechanical
Faculty of Health and Environmental Sciences (FHES)	
Department of Agriculture	Agricultural Extension Agricultural Management
Department of Clinical Sciences	Radiography in Diagnostics
Department of Health Sciences	Biomedical Technology Clinical Technology Somatology Biomedical Technology
Department of Life Sciences	Dental Assisting Environmental Health
Faculty of Humanities (FH)	
Department of Communication Sciences	Language Practice and Media Studies Language Practice
Department of Design and Studio Art	Design and Studio Art Design Technology

	Fine Art Graphic Design Photography
Department of Language and Social Sciences Education	Economic and Management Sciences Language Education
Department of Mathematics, Science and Technology Education	Computer Science Natural Sciences Technology Mathematics
Department of Post Graduate Studies in Education	Postgraduate Certificate in Education (PGCE)

Table 5.1: Departmental and program divisions of CUT. Source: www.cut.ac.za

5.3.2 Number of courses per faculty

Table 6.4 below outlines the trend in the number of subjects offered by CUT faculties from 2002 to 2017. The table shows an increase characterised 1780 subjects offered in 2002 and 2082 in 2017. The increase implies the need to increase resources in order to meet the equally increased demand. A complementary flow chat (figure 5.1) shows that, although there have been fluctuations in the number of subjects over the years, the result by 2017 indicates an overall increase in the number of subjects.

FACULTY	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
FH	420	408							487	569	516	479	495	654	688	742
FHES	299	276	266	267	261	288	263	290	287	282	298	300	301	298	360	321
FEIT	321	339	911	845	709	695	677	632	335	318	331	331	378	515	514	607
FMS	740	819	1795	1567	1397	1210	1061	750	414	379	334	338	321	330	341	412
TOTAL	**1780**	**1842**	**2972**	**2679**	**2367**	**2193**	**2001**	**1672**	**1523**	**1548**	**1479**	**1448**	**1495**	**1797**	**1903**	**2082**

Table 5.2: Number of subjects per faculty since 2002 to 2017. Source: CUT, 2018: Archives

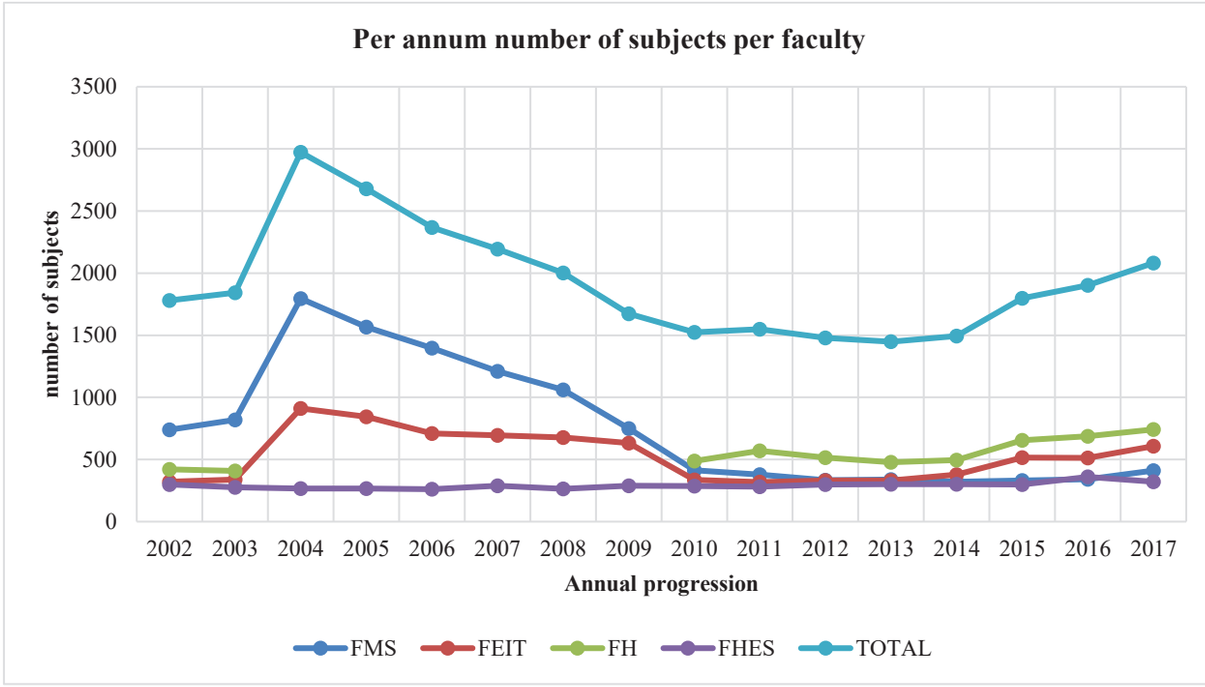


Figure 5.1: Number of subjects per faculty since 2002 to 2017. Source: CUT, 2018: Archives

5.3.3 Number students per faculty

There has been a high growth in student numbers from the year 2002 where the total number of students was 8 775 to 2017 with an 18 290-student population. This number confirms the fact that the demand for higher education has been escalating (Dlalisa and Van Niekerk, 2015:2, 3; USAF, 2016). Therefore, the academic workload in all departments has certainly increased, which potentially places pressure on the need to increase the resources that facilitate education. In fact, an examination of the graph in figure 5.2 shows that the total increase in the number of students has been significantly steep.

	2002	2003	2004	2005	2006	2007	2008	2008	2010	2011	2012	2013	2014	2015	2016	2017
FH	1325	1684							2616	2924	2976	3248	3670	3663	4317	4778
FEIT	1644	1939	3372	3280	3424	3592	3994	4537	4162	4149	4203	4353	4663	4618	4849	5536
FHES	892	932	967	951	1004	1033	974	1099	1146	1233	1284	1364	1560	1664	1752	1865
FMS	4914	6703	7756	6185	6123	5848	5954	6713	4941	4657	4522	4574	4636	4540	4852	6111
TOTAL	**8775**	**11258**	**12095**	**10416**	**10551**	**10473**	**10922**	**12349**	**12865**	**12963**	**12985**	**13539**	**14529**	**14485**	**15770**	**18290**

Table 5.3: Number of students per faculty since 2002 to 2017. Source: CUT, 2018: Archives

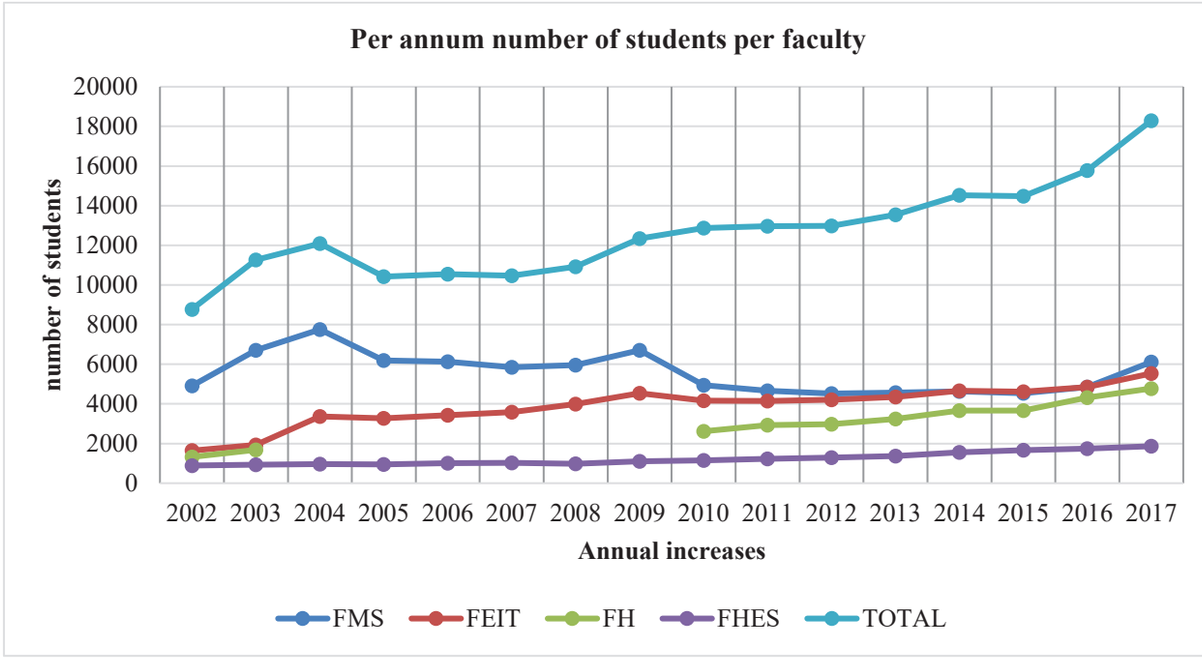


Figure 5.2: Number of students per faculty since 2002 to 2017. Source: CUT, 2018: Archives

5.3.4 Number of academic staff members per Faculty and department

Table 5.4 and figure 5.3 below show that the university has been experiencing some overall growth in the number of academic staff members. The faculty with the largest number is the Humanities, with Engineering and Information Technology in second, Management Science in third and the Health and Environmental Science Faculty in the fourth place. It would appear that the University has been responding to the increasing workload by growing the number of academic staff members, which also adds further operational expenditure in terms of salaries.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
FH	81	90	95	103	122	155	166	184	160	188	187	190	187	176
FHES	92	94	93	93	100	112	112	123	112	120	116	116	116	110
FEIT	101	92	94	90	111	112	124	120	126	135	142	155	170	166
FMS	124	108	111	102	101	103	111	127	120	111	107	107	104	122
TOTAL	**398**	**384**	**393**	**388**	**434**	**482**	**513**	**554**	**518**	**554**	**552**	**568**	**577**	**574**

Table 5.4: Number of academic staff members per faculty since 2004 to 2017. Source: CUT, 2018: Archives

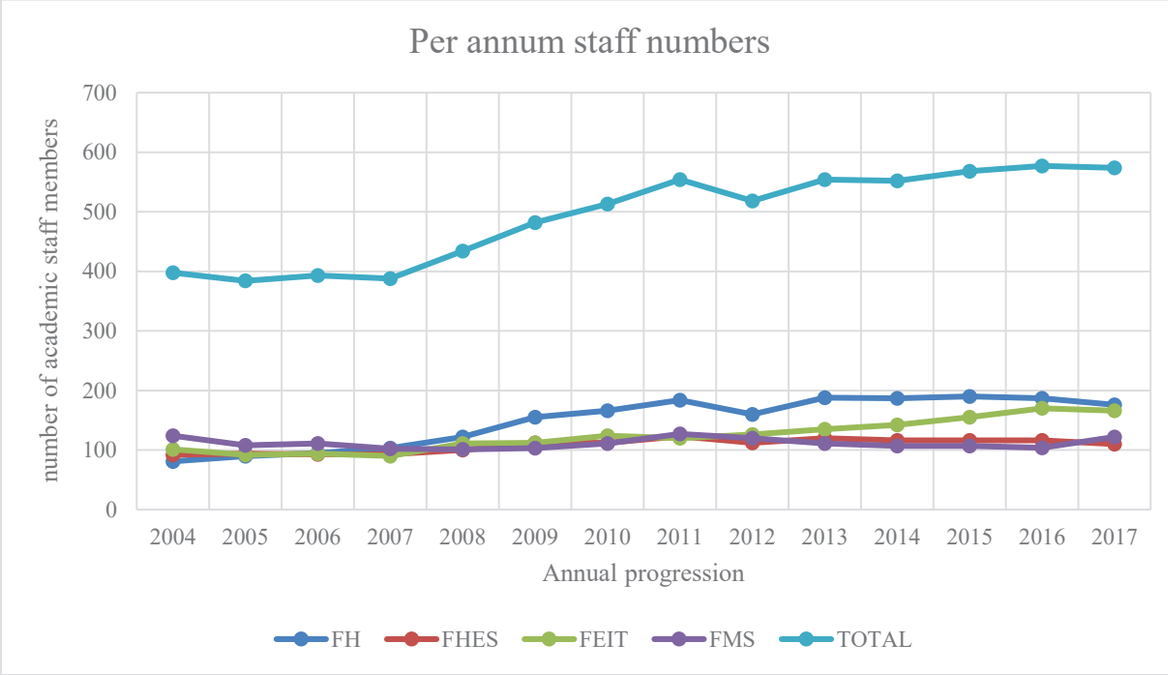


Figure 5.3: Progress in academic staff members from 2004 to 2017. Source: CUT, 2018: Archives

5.4 Teaching and learning centres/units

The Centre for Innovation in Teaching and Learning (CITL) is responsible for all innovations in teaching and learning and for preparing annual reports on the activities and progress made by the University within that domain. The centre fulfils all its responsibilities through four of its divisions namely, the Teaching and Learning, Curriculum Development, Work-integrated Learning (WIL) and Skills Development, and the Centre for e-Learning and Educational Technology (CeLET). The four divisions' functions are geared towards the appropriate implementation of the Teaching and Learning Plan of the University. Hence, the CeLET division, which is significant in this study, is responsible for the implementation of educational technologies and support within CUT campuses (CUT, 2014: Academic Development Support (ADS) Annual Report).

5.5 Policies and procedures regarding teaching and learning at CUT

The following discussions articulate the policies and procedures that regulate selected processes within teaching and learning. The section's main discussion focuses on assessment processes and how they are carried out as mandated by institutional policies and procedures.

5.5.1 CUT TEACHING AND LEARNING PLAN (TLP) 2014 - 2020

The CITL compiled the TLP as an instrument to forge the university's plans to strengthen teaching and learning as one of the components within its core business. The goals are presented below as they appear in the plan:

- *"Development of a supportive teaching and learning environment and CUT teaching and learning philosophy, and ensuring a student-centred approach to teaching and learning;*
- *Provision of enhanced access and participation as well as student retention;*

- *Enhancement of teaching and learning, assessment and moderation practices;*
- *Ensuring the distinctiveness of a CUT graduate through a set of graduate attribute;*
- *Provision of staff development and the enhancement of the scholarship of teaching and learning;*
- *Implementation of the Higher Education Qualifications Sub-Framework (HEQSF) and curriculum renewal;*
- *Creation of a technology-rich teaching and learning environment;*
- *Improving employability of CUT students through work-integrated learning (WIL) and career development; and*
- *Promotion of community engagement through service learning, by making it an integral part of the curriculum in the mainstream academic programmes"* (CUT, 2014 – 2020: teaching and learning plan).

5.5.1.1 CUT Teaching and Learning Philosophy

The University has adopted a worldview known as the Student-Centred Approach (SCA), which considers that all teaching and learning processes should be positioned in relation to students. A Student-Centred Approach seeks to enable students so that they can play an active role in the learning process. Thus, it measures every teaching and learning activity according to how it benefits the student as the key client. The purpose of SCA as conceived by the DHET, and cited by TLP is *"Curriculum development, especially the development of learning programmes and materials, should put students first, recognising and building on their knowledge and experience, and responding to their needs"* (CUT teaching and learning plan, 2014 – 2020). To that effect the SCA at CUT focuses on the following principles:

- *"Active versus passive learning. In active learning, students are involved, active participants versus passive, non-participants in their own learning; they learn by doing. This form of learning entails: solving problems, question-and-answer sessions, discussions, explaining issues, debating, and brainstorming. It entails a systems-based approach, resources-based learning, an experiential/personal relevance approach, and reflexive learning, to mention only a few activities.*
- *Deep learning for understanding versus surface learning.*
- *Responsibility and accountability by students versus responsibility and accountability on lecturers.*
- *Autonomous, independent students versus dependent students.*
- *Students as active participants and lecturers as facilitators and guides versus lecturers as the only holders of knowledge and the sole communicators and transmitters of knowledge.*
- *Students as decision-makers in learning versus passive recipients of knowledge.*

- *Emphasis is on what students do and achieve (activity and engagement) versus what lecturers do.*
- *Inductive learning is used by presenting students with challenging scenarios. It is inquiry-based, case-based, problem-based, and project-based in nature. It involves discovery and just-in-time teaching.*
- *Cooperative learning is emphasised, involving students in collaborative or team projects in solving problems"* (CUT teaching and learning plan, 2014 – 2020).

The table below is a summary of the SCA that CUT is working towards as it appears within the TLP.

Goal	Objective	Strategy	Responsibility	Timeframe
To implement a student-centred approach (SCA) to education at CUT.	Enhance the understanding of student-centredness at CUT.	Research/benchmark national/international trends on student-centredness. Introduce and adopt student-centred strategies to teaching and learning.	ADS ADS/faculties	Continuous process
	Promote the implementation of student-centred strategies at CUT.	Ensure the application of student-centred approaches to teaching and learning by faculties. Define CUT's philosophy for teaching and learning, and raise awareness of the philosophy.	ADS/faculties ADS	Continuous process 2013: Completed
	Create an environment supportive to teaching and learning.	Plan and implement large-class support initiative to improve student-lecturer engagement.	ADS/faculties	2013: Completed

Table 5.5: Student Centred Approach at CUT. Source: CUT, 2014 2020: Teaching and Learning Plan

The table shows that the SCA is the heart of all innovation in teaching and learning and thus influences some the CUT's objectives and strategies. Furthermore, responsibilities have been assigned that will lead the organisation towards SCA within specific time-frames. Some objectives also have clear time-frames within which they are meant to be achieved while others are framed as a continuous process.

5.5.2 CUT Assessment Policies and Procedures-2017

The policy on assessments (E/5.1) was implemented on 1 January 2017 and amended later on 7 November of the same year. The assessment of students' performance is a compulsory component of teaching and learning at CUT. The assessment procedure of 2017 was developed to outline the institutional rules, regulations, and procedure for assessments. Through it, the University intents to achieve assessment processes that adhere to the principles of high ethical treatment of students,

fairness in assessment and confidentiality and privacy. The policy enlists the following goals that should be achieved through assessments:

- *Establishing fair and sound procedures for assessment, and providing excellent assessment support services at CUT;*
- *Regulate assessment consistent to the statutory and professional quality assurance requirements*
- *Ensuring that the process of assessing students has educational value, in addition to being a means to determine whether a student should progress to the next level, or should be required to repeat a level;*
- *Ensuring that all assessment practices are aligned to the national higher education legislative and policy environment;*
- *Ensuring that assessment is an integrated process within the learning experience;*
- *Regulating recognition of prior learning (RPL) assessment;*
- *Regulating assessment within the context of work-integrated learning (WIL);*
- *Give effect and support to the institutional commitment to curriculum transformation towards outcomes-Based Education and Training (OBET);*
- *Ensuring that assessment remains an important quality-assurance mechanism; and*
- *Determining level of competence"* (CUT, 2017: Assessment policy; CUT, 2017: Assessment procedure).

5.5.2.1 Assessment concepts and procedures

The following concepts are explained within the assessment policies according to how the University conceives and applies them.

5.5.2.1.1 ***Assessment***

Assessment at CUT refers to a process that tests the students' knowledge and abilities. There are two main forms of assessment at CUT and these are formative and summative assessments.

5.5.2.1.2 ***Formative Assessment***

It is *"a process consisting of a variety of assessment opportunities such as written tests, assignments and presentations scheduled on an ongoing basis and structured as part of teaching and learning during a course or module" (*CUT, 2017: Assessment policy*).*

5.5.2.1.3 ***Summative Assessment***

Final assessment that covers the overall leaning outcomes of a course or module. This type of assessment is conducted by the AGU during June and November each year.

5.5.2.1.4 ***Re-assessment***

This is an opportunity to re-write an assessment that is offered to students in order to get a 50% mark. It is offered to students that would have obtained final mark within the range of 45% - 49% on a summative assessment

5.5.2.1.5 ***Assessment Book***

This is a special answer book that is branded with a CUT logo and assessment instructions, which is used specifically for writing main evaluations by students.

5.5.2.1.6 ***Assessment Paper***

This is an examination or main evaluation paper that is used for main evaluations at the end of a semester or year. An assessor or examiner designs the assessment paper, which is moderated by officially appointed personnel.

5.5.2.1.7 ***Test book***

This special answer book branded with a CUT logo and assessment instructions offered to students to write formative assessments during the year.

5.5.2.1.8 ***Test paper***

A test paper is a formative assessment paper used for main evaluations during the semester. An assessor or examiner designs the paper, which is also moderated by an internal academic staff member.

5.5.2.1.9 ***Mark sheets***

An official paper document for recording student marks after marking by an assessor.

5.5.2.1.10 ***Deferred assessment or deferred summative assessment***

This refers to a summative assessment opportunity given to students who could not write the same assessment for reasons of sickness or others recognised by the institution as valid.

5.5.2.1.11 ***Syllabus***

This is *"A description of the competency and autonomous learning outcomes of a course/module, as well as the learning topics to be covered in order to achieve these outcomes"* (CUT, 2017: Assessment policy; CUT, 2017: Assessment procedure).

5.5.2.1.12 ***Leakage***

This is a situation whereby students may have access and knowledge of the assessment paper before the actual day and time.

5.5.2.1.13 ***Collusion***

This *"May involve one or more candidates agreeing to collaborate with unscrupulous assessment agencies or school authorities, between candidates and invigilators, between supervisors,*

invigilators and school authorities or between parents of candidates and invigilator etc., all with intention to cheat" (CUT, 2017: Assessment policy; CUT, 2017: Assessment procedure).

5.5.2.2 Principles that inform assessments

The University adheres to the principles of validity, reliability, manageability and directness in governing the conducting of assessments. The discussion below focuses on these principles and their significance to CUT.

5.5.2.2.1 Validity

- Face Validity: The assessment should be designed and conducted in a manner seeking to achieve a perceived fairness. Moreover, assessment should not put a student at an advantageous or disadvantageous position.
- Content validity: Assessment should be consistent with previously designed and expected course outcomes and cover the scope of knowledge that the student is expected to master.
- Constructed validity: The degree to which the assessment evaluates that which it is set to test.

5.5.2.2.2 Reliability

The policy states that the same results should be achieved when *"particular students are assessed across time for the same knowledge, skills, attitudes and values using a variety of methods; and different markers assess the same piece of work"; and that*

Value judgements (such as pass or fail marks) should be as objective as possible. There should be academic and administrative quality control; before, during and after assessment. If a student's marks differ significantly depending on the marker of the assessment, the assessment is not reliable. Guidance for marking should also be transparent and defensible" (CUT, 2017: Assessment policy).

5.5.2.2.3 Manageability

An assessment at CUT is considered manageable if it is not too *'difficult or expensive to implement'*. It must fall within the boundaries of time and cost efficiency. Moreover, the amount and type of work related to assessment should allow for reliable and reachable results within a reasonable period.

5.5.2.2.4 Directness

The policy states, *"Assessment should be as direct as possible; it must be directly related to real life through the use of knowledge and skills outside educational settings. Authentic assessment also includes assessment of processes, practices, skills and reflection that occur in the learning situation"* (CUT, 2017: Assessment policy).

5.5.2.3 Formative and Summative Assessment responsibilities and procedure

The following discussion focuses on procedures formally followed during assessment. It also explains how responsibilities around assessments are assigned and carried out.

5.5.2.3.1 Nature of formative assessments

Formative assessments consist of two main tests, which are written within the first and second terms of each semester. Most of these tests are taken manually through a printed question paper and CUT answer sheet. Rubrics or memoranda form part of assessment tools for grading formative assessments and determining the student's course mark. Every student is entitled to some feedback during face-to-face contact sessions based on assessment taken to determine progress made. In general, the formative assessment is composed of:

- Printed test papers with the official logo and other official information on the cover page;
- Printed memorandum with the official logo and other official information on the cover page;
- Both the test paper and memorandum are set by the lecturer as the examiner and moderated by the selected moderator;
- The marks for the first and second tests are entered on the ITS system before or on designated dates;
- The predicate is calculated at the end of that semester and before the main evaluation to determine if a student qualifies to seat for the summative assessment; and
- Each student's predicate is published on a central notice board for all students to see.

A student qualifies to write the main evaluation or summative assessment on condition that they obtain 40% or more on formative assessments.

5.5.2.3.2 Formative assessment: Lecturers/assessors and students

A lecturer has the responsibility to conduct formative assessments for all the subjects that they facilitate. This underlines that a lecturer in charge of a subject is also an examiner or assessor. The University requires that all learners must receive study guides, before the face-to-face contact sessions can begin between lecturers and students, to communicate tasks due for completion during teaching and learning and the expected time frames. In addition, the study guide contains the following crucial information about assessment:

- *"Schedul[e] of assessment opportunities over the duration of the course/module and the duration of each assessment opportunity;*
- *The format and expectations of each form/type of assessment opportunity and its relationship to the course/module learning outcomes;*
- *The knowledge, competencies and autonomous learning skills to be demonstrated and assessed in each assessment opportunity, as well as the relative weighting of assessment outcomes*

towards the continuous assessment marks and/or final assessment mark for the course/module, and any other standard against which the student learning accomplishments will be assessed;

- *The minimum knowledge, competencies and autonomous learning skills requirements for successful completion of the course/module, e.g. a certain minimum level of competence in some or all of the theoretical and practical parts of a course or module;*
- *The additional conditions into the conditions already mentioned under which supplementary assessment will be granted;*
- *The rules governing assessment and academic misconduct as complemented in the CUT calendar;*
- *The syllabus of the course/module; and*
- *An abstract from the assessment policy and the denotation/coding of the final assessment results"* (CUT, 2017: Assessment policy; CUT, 2017: Assessment procedure).

It is the responsibility of a student to make sure that they are aware of the assessment rules and regulations as stipulated within the study guides. Furthermore, students must adhere to the dates and timeframes stipulated for tests, assignments and academic projects of every subject.

5.5.2.3.3 Summative assessment: Examiners, Assessors and Moderators

An examiner or assessor is responsible for designing or setting assessment papers. A paper is first submitted, by the examiner, to the moderator who checks prescribed standards, format and mark allocation before submission for examination. The paper and memorandum may be printed or electronic copies. However, they are mostly in electronic form to allow for the easy effecting of changes if there is need. The completion of moderation work is followed by the examiner's printing of the exam paper and its memorandum, and physical submission by the examiner to the exam department. The assessor marks the students' paper or exam book after the assessment and completes the following procedures and forms:

1. The recording of marks into the printed EXAM MARK SHEET.
2. The capturing of marks into a SPREADSHEET that is printable.
3. The capturing of marks on a printed ASSESSMENT MARK CONTROL FORM (LS 107.3).
4. The capturing of a printed RE-ASSESSMENT CANDIDATES (LS 103) list.
5. Submission of all of the above documents to the moderator.
6. Submission of all the above documents and answer sheets to the HOD for verification and approval.
7. Submission of all of the above documents to the ARC. The turnaround time for marking and moderating scripts is as indicated in the table below.

Number of students participating in or sitting for the assessment	Calendar days allowed for completion of tasks by examiner/assessor after assessment date	Calendar days allowed for completion of tasks by moderator after receipt of assessment scripts	Total number of days
Fewer than 60	2	1	3
Between 60 and 120	3	1	4
More than 120	4	2	6
Deferred assessment	2	1	4
Reassessment	2	1	3

Table: 5.6 Task completion timelines for examiners/assessors and moderators. Source: CUT, 2017 Assessment procedure

5.5.2.3.4 HODs and the Assessment Review Committee (ARC)

Once the moderator has completed the prescribed tasks, the marked scripts, completed mark sheets and all prescribed forms are delivered to the HOD for review and approval. The marked scripts and accompanying documents are taken further to the ARC, which is responsible for quality assurance of the work performed by the examiner. Both the chief reviewer and the reviewers within the ARC perform the following tasks:

Chief reviewer:

- *Convening and supervising the work of the committee and*
- *Compiling a report to the registrar: assessment and Graduation* (Assessment procedure, 2017).

Reviewers:

- *"Verifying that the marks reflected on the cover pages of the answer scripts have been calculated correctly*
- *Verifying that the marks are accurately reflected on the mark-sheet;*
- *Verifying that the marks are reflected in percentage (%) form on the mark-sheet;*
- *Verifying that the mark-sheet reflects a mark for each script;*
- *Verifying that an assessment script is available for each mark reflected on the mark-sheet;*
- *Verifying that the examiner, moderator and Head of Department (HOD) have all signed in approval on the mark-sheet;*
- *Verifying that no correction fluid, e,g Tippex has been used; and*
- *Verifying that all marks on the mark-sheet are written in ink"* (CUT, 2017: Assessment procedure).

The following steps are taken after the ARC has performed its duties:

8. The PRELIMENARY MARKS CALCULATION SHEET is printed for the lecturer's approval.
9. The presentation of the printed FINAL MARKS CALCULATION SHEET
    a. For the lecturer's approval and signature
    b. For the moderator's approval and signature
    c. For the HOD's approval and signature
10. Or the presentation of the printed FINAL MARKS CALCULATION SHEET (yellow sheet)
    a. For the lecturer's approval and signature
    b. For the moderator's approval and signature
    c. For the HOD's approval and signature

5.5.2.3.5 The Assessment and Graduation Unit (AGU)

The AGU is responsible for:

- *"Producing and publishing an assessment schedule;*
- *Numbering the seats in each assessment venue and assigning a seat to each participating candidate (Assessment procedure, 2017);*
- *Supplying the chief invigilator with all necessary material and documentation one hour before the start of an assigned assessment session (a copy of the Chief invigilator's report sheet/card, mark-sheet and seating assignment sheet;*
- *Accepting from the chief invigilator all unused assessment material and documentation after each assessment session;*
- *Balancing/reconciling the number of used and unused assessment materials and documents against the number supplied for the session;*
- *Contacting examiners/assessors who fail to collect the relevant scripts and mark-sheet from the assessment venue and reminding them to collect the same from the Assessment and Graduation Unit;*
- *Immediately on conclusion of the scheduled assessment session, reporting to the relevant Dean of the scheduled summative assessment activity, facilitating the remuneration claims of external examiners, moderators and invigilators; and*
- *Forwarding, within three (3) working days, all chief invigilators' reports of the incidents of suspected misconducts or irregularities to the registrar's office for investigation and/or processing in accordance with approved policies and procedures"* (CUT, 2017: Assessment procedure).

5.5.2.3.6 Invigilators

The University employs invigilators to oversee the process of assessments, make necessary records and maintain a highly ethical assessment environment. The following contains the criteria that is followed while determining the number of invigilators needed. Full-time members of staff are supposed to act as chief invigilators while 'independent contractors' act as invigilators. However, independent contractors may act as chief invigilators on condition that full-time staff members are not available.

Additional invigilators	Student participation level per session
1	*For the first 30 students, or parts thereof*
1	*For every additional 45 students after having discounted the first 30*

Table 5.7: Determination of the number of invigilators. Source: CUT Assessment Policy, 2017

The Chief invigilator has the responsibility to check that the venue designated for examination is well prepared and fit for the purpose so that students can be allowed into the venue twenty (20) minutes before the start of the exam. They are also responsible for collecting assessment material form the AGU one (1) hour before the allocated starting time of the exam. The documentation that he/she collects consists of:

- *"The necessary question papers;*
- *The necessary stationery;*
- *The chief invigilator's report and mark-sheets; and*
- *The attendance slips (to be completed by students participating in the assessment)"* (CUT, 2017: Assessment Procedure).

Furthermore, the chief invigilator is responsible for:

- *"Ensuring that the correct assessment material and documentation for the specific assessment session is handed over by the AGU or by the Protection Serviced Unit at the assigned venue;*
- *Ensuring compliance with all codes, rules, regulations, policies and procedures governing assessments;*
- *Ensuring that the question papers are distributed to the candidates sufficiently ahead of time so that the assessment session may commence promptly;*
- *Ensuring that the area around each candidate is cleared of all articled and material not required for assessment purposes, and that an area of the venue has been designated for the depositing of briefcases, bags and other items prior to commencement of assessment session;*
- *Ensuring that students participating in the assessment session openly display their student identity card on the corner of their assigned desk;*
- *Ensuring that all announcements are made before the assessment session commences;*

- *Announcing the start and end times of the assessment session, as well as the course's/module's or parts thereof to be assessed during the session.*
- *Deciding whether any of the invigilators may be released or not from duty during the assessment session;*
- *Reporting, in accordance with procedures, all cases of suspected misconduct, deviation, mistakes, errata or differences to the AGU on the prescribed form (LS 121.2) within twenty-four hours of the session;*
- *Arranging attendance slips in the same order as the mark-sheet and the Chief invigilator's report;*
- *Checking the number of attendances slips against the number of students present, and checking the attendance slips against the mark-sheet and chief invigilator's report with the Chief invigilator expected under no circumstances to add candidates' names to the report or mark-sheet, and to refer any enquiry in this regard to the AGU;*
- *Indicating on the Chief Invigilator's report and mark-sheet whether a candidate is present or absent, and also performing the following duties*
  - *Deleting the absentees' student numbers from the Chief invigilator's report and mark-sheet, and indicating the attending candidate's names with √;*
  - *Indicating the student numbers of absentees in the relevant column on the Chief invigilators report and Mark-sheet; and*
  - *Carefully completing and signing the chief invigilator's report;*
- *Arranging the students' assessment scripts in the same order as the names on the Chief invigilator's report and mark-sheet, before handing the scripts over to the examiner"* (CUT, 2017: Assessment procedure).

5.5.3 Policy and Procedure on the handling of test papers and examination books

Policy 507.2 of the Institutional Regulatory Code of the CUT regulates the handling of test papers and examination books within the institution. This policy, which was instituted on 4 November 2002, seeks to ensure that all examination and test material are handled with confidentiality. It states that, *"Test papers, test books and assessment books are classified as confidential documents with a high risk, and should be treated as such. All test papers, test books and assessment books are only valid if the CUT logo appears on them. The copying services officers make a number of copies on requisition form. Extra copies are added for the library and Information Services (LIC), and are kept in a storeroom until after assessments"* (CUT, 2002: Policy and procedure on the handling of test papers and examination books). In addition, the following administration is mandated by the policy:

One: The receipt of *'test papers'*, *'test books'* and *'examination books'* from a supplier is followed by the Assistant Assessment Officer's verification that the correct quantity has been delivered. The assessment material is then stored in a highly secured room until the date of examination.

Two: The storeroom where all material is kept is supposed to be consistently secured. There is an identified person within the unit who is responsible for handling the key to the storeroom.

Three: Every formative test taken at faculty level is preceded by a requisition for test papers made on a specific LS225 form. The examination officer is supposed to register the quantity of material requested and the personnel who requested it. According to the policy, "*it is obligatory to sign for acknowledgement of receipt of the books. The faculties (responsible person: faculty officer) are responsible for the further safe-keeping and issuing of test books and test paper, as well as the record keeping thereof"* (CUT, 2002: Policy and procedure on the handling of test papers and examination books).

Four: The Examination section has the sole responsibility to issue examination books during the examination. The section delivers a specific number of examination books and question papers to the venue on a daily basis. Security personnel delivers these examination books and question papers in secured boxes.

Five: A checklist for stationery and examination books delivered to the venue is maintained. Reconciliations between the submitted and utilised material are made after the completion of the examination.

Six: The examiners responsibility is to make sure that material like completed or incomplete test papers, test books and/or examination books from the test or examination venue do not leave the venue in the hands of students.

Seven: "*Completed examination books are stored according to national archive prescriptions. Completed and marked test papers and test books are provided to registered students by the academic departments after the test. Completed examination books are stored by Stuttafords Archiving Services for five (5) years. The Examination Department is responsible for the arrangements for the archiving"* (CUT, 2002: Policy and procedure on the handling of test papers and examination books).

5.5.4 Policy and procedure on the administration of results

Policy 505.16, of the Institutional Regulatory Code of the CUT, regulates the administration of results. This policy, implemented on 12 August 1999, seeks to ensure the integrity and accreditation of the University's qualifications. The policy expectations regarding test, course and examination marks are outlined below.

5.5.4.1 Test Marks

- Academic departments should assess students during a semester and in line with the rules that govern all examinations.
- All test marks are captured into the ITS system after the evaluation of students.
- The responsibility to make sure that all marks are correct lies with the academic departments.
- The lecturer in charge of the subject gives feedback on set tests to students.
- All test marks and calculated course marks are supposed must be published on the central notice board every quarter of the year.

5.5.4.2 Course marks

- The examination officer verifies the course mark of every student per subject that would have been captured into the ITS system at the academic department level.
- The examination officer supplies academic departments with preliminary course marks.
- Academic departments confirm if all test marks were captured accurately and the correct weights were taken into consideration in calculating the final predicate.
- Furthermore, HODs of academic departments review student's course marks in order to make recommendations on *'borderline cases'* for approval by the Faculty Examination Board/Executive Committee of the Faculty Board.
- The examination department then publishes the preliminary course marks on the central notice boards and offers a chance for students to t verify that their marks are correct. If the marks are not correct, a student may make an appeal to their faculty within two days.
- A designated appeal committee, within each faculty, handles all appeals and its recommendations may be approved or rejected by the executive committee of the faculty.
- The examination officer effects the changes in the course marks as approved by the executive committee of the faculty board and republishes the corrected marks on central notice boards.

5.5.4.3 Examination marks

- The scripts are marked and moderated in line with the rules of examinations after an examination has been taken.
- The examiner's marking must follow the memorandum as accurately as possible. The examiner must write the total marks on the front page of the answer book and calculate the examination percentage. Then he/she transfers the examination mark to the Mark-sheet.
- The scripts and all supporting documents are submitted to the moderator. He or she moderates 20% of the scripts according to the examination rules and identifies 'borderline cases.'
- The examiner collects the marks, reviews the moderator's comments and makes the necessary adjustments to reconcile any disparities. The Examiner then submits the papers and all documents to the HOD for review and approval.

- "*An independent double-punch system with computer verification is applied. The Examination Administration Section produces a computer printout of the examination marks entered per subject.*
- *The Examination Administration Section checks whether the examination marks were entered correctly into the computer from the source marks sheet.*
- *The Examination Administration Section controls the processing of the final mark and result.*
- *The examination officer verifies receipt of all scripts and that all marks have been entered into the computer.*
- *The Examination Administration Section provides the academic departments with a moderated marks sheet per subject, a computer marks sheet per subject, and a list of results per student.*
- *Academic departments study the individual results profiles of all students. Borderline cases (within a 2% margin) that could qualify for a possible amendment to the result are discussed individually at the discretion of the faculty.*
- *The Executive Committee of the Faculty Board grants approval for the release of the results and gives written instruction with regard to the amendment of marks (if any).*
- *The Examination Administration Section implements the relevant decisions and publishes the final results by means of individual results sheets, the Internet and the MTN telephone service.*
- *No results are issued by academic staff members"* (CUT, 1999: Policy and procedure on the administration of results at the CUT).

5.6 The Academic Workload Allocation model at CUT

The said model, with reference number 0/4, was implemented on the 25 May 2015 to determine and regulate academic staff duties and time spent while performing those duties. The purpose of discussing this model is to highlight the link between the University's continued growth in student population and issues concerning the lecturers' workload resources that serve the students.

5.6.1 Terminology

As a basis to its objective, the model starts by defining the following basic terminology that are intrinsic to normal university functions:

Instruction/research (or academic) staff member: *"… someone who spends at least fifty percent (50%) of his/her official time on duty, instructing students and/or conducting research.*

Instruction: *defined as activities directly involved in teaching students, including preparation; marking; setting examinations; curriculum development; lectures; seminars; practical training; and supervision of research projects, theses and dissertations.*

Research: *refers to activities that are designed to further human knowledge, either by the creation of new knowledge or the application of existing knowledge*" (CUT, 2015: Academic workload model)

5.6.2 Proposed principles and regulations

- *"A 40-hour work week for academic staff, with flexitime allowed specifically in cases involving after-hour classes;*
- *The management of academics' working hours should be the responsibility of the relevant HOD, who should utilise, for instance, the operational plans of the unit to determine how staff should be deployed;*
- *Staff should be expected to be in their offices when not engaged with classes, research or engagement (including consultancy) elsewhere;*
- *During the examination period, an academic staff member may perform marking duties outside of the office with the approval of the HOD;*
- *Principles of transparency require that information regarding teaching and office hours be freely available; posted on departmental notice boards and on the office doors of the individual staff member; and*
- *The HOD (as the supervisor) should at all times be aware of the whereabouts of a staff member, who in turn should be contactable during office hours"* (CUT, 2015: Academic workload model)

5.6.3 Practical implementation of the instrument

- The model was devised using variables drawn from the inputs observed or scheduled in the time-table. The number of periods is one such variable that is easily observable on a time-table. At the same time, the model submits that the number of students per subject has a huge influence on time that an academic staff member may spend evaluating test scripts and assessment. As a result, the number of students should form part of the model although it may not be easily observable from a time-table. The model considers that there are 12 weeks of lecturing time per semester and 50 lecturing periods per week but it ignores all duties related to examination because normal lecturing is discontinued during main evaluations period (CUT, 2015: Academic workload model).

5.6.4 Methodology of the model

In determining Total Teaching Deployment (TTD) value, the model adds together the number of periods spent per subject on:

"The actual contact time (number of theory, practical and/or tutorial periods) spent with students. The preparation time for lecturing is included in this factor;

The time required for setting test and examination papers, including accompanying memoranda, which is independent from the number of students; and

The evaluation of test scripts and assignments including practical or laboratory reports that is directly related to the number of students enrolled for a particular subject" (CUT, 2015: Academic workload model).

The major deduction from the framework is that an academic staff member's workload is directly related to the number of students. The number of students directly influences the amount of time and resources, both financial and human, which are needed to serve them. Therefore, the expectation is that since the number of subjects offered by CUT has increased, the amount of financial, time and human resources has increased. The same conclusions should be made considering that, the number of students has been increasing significantly over the years, hence, an increased resources t are needed to address the students.

5.7 Sustainability Framework for CUT

The sustainability framework of the CUT has been underway in line with sustainability objectives of the University's Vision 2020, and as a response to the changing higher learning landscape as well as demands by external bodies such as the DHET. A team of experts within the corridors of the University has been brought together to develop a framework that will lead the Institution towards achieving its goals in ways that guarantee a balanced and continued success. The framework states that, in reference to Vision 2020 as it appears within the Strategic Plan of CUT, "*Encouraging sustainability is one of the values stated within our strategy. We are conscious of our corporate social responsibilities and of the long-term role we play in both immediate and wider societies. We exercise this responsibility through our academic activities and through managing the University in a sustainable manner"* (CUT, 2018: Sustainability Framework). It is thus clear to the University that the absence of sustainability essentials within its core business will jeopardise its long-term success.

The framework makes it clear that the institution's academic project should be engaged in a financially viable way. The framework declares that *"CUT should also take appropriate steps to increase its operational and financial efficiency, reduce costs, and provide a better environment, within which the day-to-day experiences of students, staff and visitors reflect our commitment to sustainable development"* (CUT, 2018: Sustainability Framework). Engagements between staff and students should be carried in ways that ensure financial thoughtfulness. As a result, regular reports to the CUT Council should satisfy the Council that the financial health and continuity is guaranteed: *"The council should be satisfied that the fiduciary responsibilities of staff and students are executed*

in such a manner that the future financial wellbeing of the university is assured" (CUT, 2018: Sustainability Framework).

The framework acquiesces that teaching and learning should be a cost-effective process, which does not compromise quality. The framework states that the university strategies should be embedded with sustainability values as this *"helps us to increase our operational and financial efficiency, reduce our costs, and provide a better environment, within which the day-to-day experiences of students, staff and visitors reflect our commitment to sustainable development"* (CUT, 2018: Sustainability Framework). Finally, the framework also holds that both research and teaching should have policies that explain sustainability goals that are clearly measureable and monitored throughout.

5.8 Chapter summary

The chapter outlined the context and background of the CUT to which the impact of educational technologies is to be assessed. It focussed on the core business of teaching and learning, from facilitation to the assessment of students, marked mainly by the use of manual and paper-based procedures. The chapter also noted that the number of students enrolled and subjects offered by the University have been increasing since 2002 to 2017 and made a supposition that this has implications on the resources which administer the core business. A further implication noted in the chapter is that the financial muscle of the university is being stretched to sustain this progression. These suppositions are made considering the fact that:

- The SCA forces the University to progress or change based on student dynamics;
- The University's teaching and learning process is through face-to-face contact sessions;
- The formative and summative assessment processes permitted by institutional policies and procedures are paper based;
- The administration of formative and assessment material, and marks permitted by institutional policies has long processes that highly paper based and manual.

These realities imply that the entrance of more students into IHLs makes it obligatory to increase:

- The volume of material needed for class notes, assessments and general administration tasks;
- The number of venues and resources needed to administer classrooms, tests and examinations;
- The number of invigilators for both main tests and examinations; and
- The workload and turnaround time for classrooms and marking of tests and examination.

All of these processes have financial implications to the University and they raise questions on whether financial sustainability is achievable or not. The pertinent question to this study, which falls within a context where manual processes are rampant, pertains to the role of available educational technologies.

CHAPTER 6: METHODOLOGY, INSTRUMENT DESIGN AND DATA COLLECTION

6.1 Introduction

The previous chapter explained the unique University procedures and operations as a context that compels an investigation of the nature of use of available web technologies. The chapter went further to show the role that various policies have in shaping the manner in which the core business of the University is run. The purpose of this chapter is to articulate the research methodology that was used to evaluate the implementation and benefits of web technologies within a selected University. Therefore, the chapter explains the research approach, philosophical framework, research design and methods employed in conducting the study. It also outlines the practical field activities followed by the researcher in collecting and analyzing data. Since the study sought to evaluate the implementation of web technologies over an extended period of time, a case study was found to be a relevant research design and methodology. As a result, the chapter also explains how a single case and various data collection techniques, such as documentary review and focus groups were done. Finally, the chapter discusses the techniques of analysis relevant to the study and finally, the ethical considerations to this study are explained.

6.2 Philosophical Framework

Researchers conducting a scientific enquiry should understand and delineate the general stance that they adopt as a foundation to their study. This stance is a set of beliefs referred to as philosophical assumptions or research paradigms (Creswell & Clark, 2011:39). A philosophical framework refers to *"the worldview within which the research is situated"* (Quinlan, 2011:481). There are four types of philosophical stances in research as outlined below (Creswell & Clark, 2011:38-47). These are, firstly, **positivism,** which holds that there is a single reality governing a phenomenon under investigation. It is relevant in generating quantitative data to determine course cause and effect. It also uses variables that are generally accepted within a particular field. Therefore, the testing of well-established theories or assumptions is the objective of positivism. Secondly, a **participatory** worldview is a standpoint that is informed by political and societal issues. The motivation under participatory paradigm is to make the world around a better place. Qualitative data is habitually generated under this paradigm. Thirdly, **pragmatism** is a mixture of positivist and constructivist assumptions, where a single reality (Positivism) and multiple perspectives (Constructivism) may be used to explain the same phenomenon. It is normally associated with the mixed methods methodology because it uses techniques that generate quantitative and qualitative data. Pragmatism does not necessarily adopt a rigid view of research. It is a flexible philosophy that considers what is more practical and useful at a particular stage of research rather than relevant methods. In addition, pragmatism places more value to addressing research questions rather than research methods (Creswell & Clark, 2011:38-47; Edmonds & Kennedy, 2017:218). Fourthly,

constructivism professes that there are multiple perspectives that should be considered in investigating a phenomenon. It places value on qualitative data generation techniques to cater for different views that may highlight various perspectives from which to generate knowledge (Creswell & Clark, 2011:38-47). Hence, constructivism is the framework that underpins this study because it makes an allowance for multiple perspectives to form part of the findings of the study through a documentary review that is supplemented by focus group discussions.

6.3 Research Approach

A research approach refers to the manner in which a researcher "*conducts his thinking about researchable phenomena or situations"* (Bitzer, 2017:5). It exposes the logic followed by researchers in order to arrive at their conclusions on a researchable phenomenon. One may follow the three main research approaches, the deductive, inductive and abductive in conducting a scientific enquiry. An approach is **deductive** if the study's empirical conclusions are based on testing of previously established assumptions or theories, while another is **inductive** if the empirical conclusions are based on field generated observations of an empirical reality (Welman, Kruger, & Mitchell, 2012:28, 34). A deductive approach is therefore *'a top down approach'* that moves from the general to the narrow, while an inductive approach is a bottom-up approach that is aimed at making theoretical generalisations (Creswell & Clark, 2011:38). In addition, an **Abductive approach** consists of a "*backward-looking reasoning process that aims at developing a hypothesis to explain a current observation or event…it involves the generation of a hypothesis that is applied to an observation to explain its cause"* (Bitzer, 2017:5). This research followed an inductive approach because the investigation purported to make conclusions on the financial impact of web technologies based on field generated-findings. This is because there is a widespread use of web technologies in the educational field and yet their financial effects have not been researched. Therefore, a novel study that can unravel this reality by allowing field generated outlooks was found to be essential.

6.4 Research Design

A research design is a strategy that a researcher follows in addressing the research questions using relevant data collection, analysis and interpretation techniques (Yin, 2009:26). This study employed a design that employs qualitative techniques (Creswell and Garret, 2008; Leedy and Ormrod, 2014:97). It incorporates qualitative methods to cater for explanations and multiple perspectives that satisfy the requirements of research (Creswell and Clark, 2011:2). Qualitative studies hold no single or ultimate discoverable truth. Nonetheless, such studies are extremely useful when a subject is too complex to be answered by a simple yes or no hypothesis. Qualitative studies are also relevant for subjects that possess multiple perspectives with equal validity or where truth might exist.

Therefore, a qualitative study tries to reveal the nature of the multiple perspectives (Shuttleworth, 2008:1).

Qualitative researchers conduct their fieldwork in ways that allow them to think about and read through the lines. They follow methods that enable them to combine their interpretations with the views of participants and thus make their findings more comprehensive (Pietkiewicz & Smith, 2014:7). Previous research indicates that web technologies are utilised in IHLs and the private sector in a fragmented way that makes it difficult to carry out a structured investigation of these technologies' impact (Armstrong & Franklin, 2008:5; El-Sayed & Westrup, 2011:5-6). These research observations led current researcher to adopt a qualitative design that will focus on one exemplary institution. The qualitative nature of the current study starts with a review of literature and culminates with a documentary review and focus group discussions. The application of an inductive approach to the study is influenced by the sense that field generated findings or perspectives elicit the requirements of the study.

6.5 Literature Review

Creswell and Clark (2011:256) recommend that a literature survey should be viewed as a critical part of research methods. Researchers are advised, in their literature surveys, to critically review qualitative, quantitative and mixed designs. The result of such literature reviews should be a clear assertion by the researcher on the ways in which their study will contribute to existing literature. Similarly, Quinlan (2011:165) complements that critical engagement with literature is aimed at developing the theoretical framework of the study. Such literature has value only to the extent that it speaks to the study being conducted. A researcher's prior-fieldwork activities should involve an exploration of previously published literature that relates to their intended research (Olivier, 2014:35-36). Therefore, an intensive literature review, focusing on books, peer reviewed journal articles and published conferences accessed *via* well-known search engines such as Ebsco Host, Google scholar and university web sites, was conducted prior to the development of the theoretical framework of the study. The literature review explored the different web tools used by universities world-wide, in SA and within the private sector establishments. Furthermore, some of the reviewed literature explored different financial benefits of these technologies and the techniques that some studies have attempted in measuring such benefits.

6.6 Case Study Research

Research methods are techniques used to collect evidence and analyse it using a particular logic (Yin, 2009:6). In particular, a case study research is a process of scientific enquiry into a particular concept, people, group or organisation over a certain period of time and within a specific or fixed context (Quinlan, 2011:182). It is "*...an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between*

phenomenon and context are not clearly evident" (Yin, 2009:18). This method is also applied in cases where comprehensive information about one or few cases is needed unlike in survey designs which are applicable when little information is needed about a large number of respondents (Olivier, 2014:100). Although case studies can also be used to generate quantitative data, they are more valuable for generating qualitative data, (Quinlan, 2011:182; Leedy & Ormrod, 2014:108, Olivier, 2014:98 ;). The fact that the current study requires an in-depth exploration of the financial impact of web concepts over an extended period makes a case study a relevant method. In addition, case studies have been rated as proficient techniques for adequately conducting management accounting enquiries within an ever-shifting area such as IT (Nixon, Burns & Jazayeri 2011:2).

However, case study research has been criticised for its intrinsic inability to afford statistical generalisation to the population of study. This criticism is refuted by the fact that a case study does not represent a sample within a population. Thus, they should be used in order to generalise to theoretical propositions and not to populations. Instead of statistical frequencies, a case study researcher should rather aim to generalise to or extent the theory (Ryan, Scappens & Theobald, 2002:149; Yin, 2009:15). A case study affords researchers with the ability to concentrate on one context and this limits the chances of missing important insights within that specific context. Tying together numerous data collection techniques in one study also allows evidence validation (Yin, 2009:18). Hence, Leedy and Ormorod (2014:137) submit in concurrence that *"in a case study the researcher collects extensive data on the individual(s), program(s) or event(s) on which the investigation is focused. These data often include observations, interviews, documents, past records and audiovisuals materials. In many instances, the researcher may spend an extended period of time on site and interact regularly with the person or people being studied".*

There are four main types of case study design that may be followed depending on the purpose of the study. These are outlined below.

6.6.1 A single-case design

A researcher may focus a study on one unit of analysis for various reasons. The first one is that one unit can be used if an organisation concerned represents a ***critical case*** for testing, challenging or extending a certain theory (Yin, 2009:46-65). A critical case can apply to an organisation or specific setting that enables a direct addressing of given research objectives (Ryan, Scappens & Theobald, 2002:151). This study uses one university as a critical case. The researcher chose a single-case study with a view that only one instance or case was needed to demonstrate whether web tools improve the financial wellbeing of universities or not. According to Whitmer, *et al.,* (2016), good practices on the use of web technologies within universities are very hard to find. In such cases, a single case may serve as representative case. Therefore, a context that will serve as a prototypical context for subsequent measurement and view of web implements usages and financial benefits at higher

learning should be exemplary. Additionally, Olivier (2014:99) notes that only a single-case is needed to evaluate the features of a program. Therefore, a single university was considered enough to enable a critical unpacking of the characteristics of web tools and their potential financial benefits.

The second rationale is when a case under investigation represents an ***extreme or unique case***. This is normally true when a certain phenomenon is uncommon to the extent that one instance or occurrence may be seen as satisfactory enough to document and report on (Yin, 2009:46-65). It is useful for extending an existing theory in order to address various issues. In such a situation, the clear limitations of the theory must be noted and the study must single out specific additions to be made to theory (Ryan *et al.,* 2002:151). The context of the study should also satisfy the extreme case, with the context of this study being that academic research has not focused yet on the financial benefits of the web phenomena. There exist no attempts at evaluating web tools from a financial point of view within educational institutions (Badenhorst, 2014:14-15; Bagarukayo & Khalema, 2015:168). Some frameworks, such as one by Manguic (2009), and the unit of analysis postulated by Gilfoil and Jobs (2012), focus on the private sector establishment and lack clear explanations on how cost and income drivers can be impacted in order to derive a financial benefit. Therefore, one case may present a valuable report on the use of web tools for the financial benefit of universities.

Thirdly, a case study can be considered if it is a ***representative case***. It may also be seen as typical of numerous organisations to the extent that an investigation conducted in that setting would be indicative of the general status in that field. The fourth rational is when a particular enquiry had previously been impossible to conduct. Therefore, any preliminary studies that may first share the light on the phenomenon previously unfamiliar would be considered meaningful. This type of case study is called a **revelatory case**. Various studies underscore that it is impossible to measure the related financial benefits of web tools because of lack of accounting frameworks that have successfully done so. So, one case that would offer a point of departure for such measurements is needed. The fifth reason for a single-case is when it is a ***longitudinal case***. It is a case study conducted more than once under the conviction that some facts are so dynamic as to warrant another study of the same case in the future (Yin, 2009:46-65; Olivier, 2014:99).

6.6.2 Multiple-case designs

This type of case study considers different situations, which hold similar characteristics and enable the making of comparisons that would lead to certain conclusions (Yin, 2009:46-65; Olivier, 2014:99). According to Ryan *et. al.,* (2002:151-152), a multiple case study is relevant for the performance of replication and theory development. Replication allows the selection of numerous but similar cases in order to reproduce existing theoretical stand points. Various cases may be used

in order to customize the theory or extend it to a set of circumstances. The goal of research in a multiple case must be a theoretical framework that can explain various situational realities. The current study, however, does not focus at multiple cases.

6.6.3 A holistic design

This is all-inclusive and focusses on the entire case. A holistic design is comprehensive in scope because it does not concentrate on the details of the case. The current study may not be viewed as holistic because it is intended at finding a detailed information of a phenomena within a specific context.

6.6.4 An embedded design

This type of design divides the main case into its subcategories or sub-cases. As a result, information that relates to the subcases must always be representative of the main case (Yin, 2009:46-65; Olivier, 2014:99). A university is normally divided into faculties and departments, with these sub-division viewed as sub-cases from which to make comparisons of financial benefits and costs depending on their level of utilisation of web tools. No data that could compare different faculties within the University was found during field study. Therefore, the study does not follow an embedded design.

The discussion below focuses on four different types of accounting case studies described by Ryan *et al* (2002) that were considered for the study:

6.6.5 Descriptive case studies

A case study is descriptive if its objective is to describe in detail the characteristics of a system or set of procedures within a specific context. A descriptive case study may be used, especially in accounting, to define and compare the financial systems, techniques and procedures of multiple organisations in order to reveal the best practice. Hence, descriptive case studies are valued by accounting firms as the best techniques for evaluating best accounting practices.

6.6.6 Illustrative case studies

This case study demonstrates the qualities or abilities of innovations. The main objective is to promote a new system or procedure of doing things. Tagged along with illustrative case studies is an implicit assumption that the procedures of the organisation in question are superior to others, but a case study is not an accurate approach to validate such claims.

6.6.7 Experimental case studies

Experimental case studies provide direction into how accounting procedures should be performed in practice. They are useful in exploring the contextual problems to implementing new accounting solutions. Experimental case studies highlight the opportunities that can be harnessed from the introduction of new solutions.

6.6.8 Exploratory case studies

An exploratory case study is used in accounting to discover the rationale for using certain accounting practices. Researchers use exploratory case studies to generate hypothesis on the motives behind certain practices. Therefore, an exploratory case study provides a theoretical foundation against which, more rigorous studies can be conducted to test the theory. In addition, the objective of an exploratory case study in accounting field is to make generalisations.

6.6.9 Explanatory case studies

An explanatory case study aims to explain the rational for using a specific accounting practice. The objective of explanatory case study is to use a theory to explain a specific case and not for generalisations. Researchers who conduct explanatory case studies may also modify the theory provided it does not explain the observed practice accurately (Ryan *et al.,* 2002:143-144).

6.6.10 Arguments concerning case studies

Ryan *et al* (2002) argue that there is a lack of clear lines of demarcation between different types of case studies. Various questions arise and these include: what constitutes innovations so much that a case study may be viewed as illustrative? And what constitutes existing procedures so much that it can be a basis for a descriptive case study? Furthermore, the differences between exploratory and explanatory case studies are not very clear. Therefore, the scholars suggest that the objectives of the researcher should rather be used as guiding principles to determine which type of case study to use. Correspondingly, Yin (2009:8) highlights that the strengths of exploration, description and explanation can be combined within one study consistent with the researcher's objectives. It was therefore, deemed appropriate to use both a descriptive and exploratory case study because they suit the envisioned outcome of the study. The current study explored, through literature, the intrinsic characteristics of web concepts that make it financially worthwhile, thus making it explorative.

6.7 Explorative nature of research questions

The main objective of the study was: *To develop a framework for enhancing the financial benefits of implementing web technologies for teaching and learning at CUT*. This led to the construction of the main research question: *"How can the financial benefits of implementing web technologies for teaching and learning be enhanced at CUT?"* From this question arises the explorative, 'how' nature of the research questions and focus in the set of objectives.

Co-Objectives:

1. *To carry out an investigation of the nature of accessible web technologies for teaching and learning at CUT.* Addressed by the research question: *"What web technologies are accessible for teaching and learning at CUT?"* Literature has explored the types of web tools and their

usages. The blackboard LMS is a platform that houses almost all institutional web tools and thus, the present enquiry explores how the web tools have been used since their inception.

2. To assess in detail the potential financial contributions of web technologies to CUT since their implementation. Addressed by the research question: What are the potential financial contributions of web technologies to CUT? It explores and describes the financial.

3. *To examine the effectiveness of current practices for assessing the financial impact of web technologies at CUT.* Addressed by the research question: *How effective are the practices that CUT utilises to assess the financial impact of web technologies?*

4. *To develop a framework for enhancing the financial benefits of implementing web technologies for teaching and learning at CUT*. Addressed by the research question: *What is a possible framework for enhancing financial benefits of implementing web technologies for teaching and learning at CUT?*

6.8 Population and Sampling

Welman, Kruger and Mitchel (2012:52) state that, *"The population is the study object and consists of individuals, groups, organizations, human products and events, or the conditions to which they are exposed"*. A research study must define a population to which the results of the study can be ascribed. However, it is not essential to define the population in case study research where programs are a focus in as much as it is to outline the case itself (Olivier, 2014:98). It has already been explained that the intention of this study was not to make generalizations to the population. The focus of the study is on web programs and their intrinsic nature, which allows them to make a certain impact. Documents were the main source of data collection and supplemented by focus group discussions with the center for e-learning. All four staff members from the e-learning unit participated in the focus group discussion. The group consisted of the director for e-learning and educational technology, instructional designer (multimedia) e-learning and educational technology, learning designer, and e-learning support officer. The significance of this group is that they are overseers of web technology implementation at CUT. It is their sole responsibility to report on the level of implementation of web tools at an individual, program, department and faculty levels.

There was no need for sampling in this study because the purpose was not to make generalisations to the population but to theory (Ryan, Scappens & Theobald, 2002:149; Yin, 2009:15). The study focuses the measurement of web technology benefits to a defined unit of analysis as an alternative to population and sampling (Welman *et al.,* 2012:53). Another reason for not soliciting data from human respondents is that the study period covers such a long time that it was not possible to find

a satisfactory number of respondents who have been working with the institution for that long (see scope of the study below).

6.8.1 The unit of analysis

A unit of analysis is defined as *"the level or distinction of an entity that will be the focus of the study. Most commonly, in social science research, the unit of analysis is at the individual or group level, but it can also be at the programmatic level (e.g., institution or state level)"* (Edmonds & Kennedy, 2017:18-19). This research focusses on web technologies (including Blackboard Learn) and their financial effects on teaching and learning as the major component of the core business of the University. The CUT's two main campuses at Bloemfontein and Welkom administer Teaching and learning. Both campuses have four faculties with different departments as shown in Figure 6.1 below. Therefore, the unit of analysis of the study consists of are all web technologies deployed by the University to support teaching and learning in all four faculties. In addition, the analysis focused only on programs and official documentation, which made the determination of a sample irrelevant.

Figure 6.1: The unit of analysis composition (CUT, 2017)

6.9 Data collection and scope of the study

This section outlines the instruments that were used to collect data and their practical application in the field. The field of IT uses document reviews and interviews as qualitative methods to carryout investigations and ascertain certain facts about programs (Shelly & Rosenblatt, 2012:164). For the purpose of this investigation, individual web technologies and those that make up institutional LMS qualify as programs with this research collecting data relating to the technologies' effects on learning operations. The first e-learning policy at CUT was instituted in the year 2002. It was

interrupted by changes and improvements in educational technology. The most significant interruption was in 2009 when the previous e-learning strategy was revised and online availability of courses became noticeable. As a result, this investigation covers the period from 2002 to 2008 (before significant utilisation of web technologies at faculty level), and compares it with the 2009 to 2017 period (after significant utilisation of web technologies at faculty level).

6.9.1 Research instruments

The researcher sought official and written permission from the relevant offices of the University and made appointments, where necessary, before carrying out the research. The first permission sought was from the CUT Institutional Planning and Quality Enhancement. The receipt of this permission facilitated other permissions from the Registrar of the University and The Centre for e-Learning allowing this researcher access into the University's archives and other official records.

6.9.1.1 Document reviews

A document review entails the collection of data from existing documents (Quinlan, 2011:227). The International Institute of Business Analysis (IIBA), (2015) states that it involves *"Studying or reviewing the existing documents within the organization, or relevant documents within the area of study for a better understanding about the area in which a business analysis is conducted"*). Nonetheless, there are two major ways of eliciting the requirements of a study. The first involves a review of the internal documents of an organisation and/or external documents related to the matter under review, while the second focuses on meeting the stakeholders of the study organisation. Researchers tend to depend mainly on meeting the stakeholders of the organisation under review. The practice of meeting the stakeholders is important in research, but it has led to researchers negating the importance of reviewing documents existing within an organisation about which a project is being undertaken. There are times when documents of an organisation can reveal an adequate amount of information to address the requirements of the study (IIBA, 2015). Hence, a document review was deemed relevant in this study.

Documents may be classified into two categories and, these are found documents or researcher-generated documents. Oates (2006:233) states that found documents are documents that existed within and about an organisation prior to conducting a study. Research-generated documents are those that the researcher generates during the research process and these include photographs, notes and diagrams, which would not exist if the research was not undertaken. This study used already existing documents as the main source for data collection. Many organisations generate and keep documents that may be very significant sources of data. The nature of existing documents is significant here since the field of information systems and computing consists of design and digital multimedia. As a result, Oates (2006:233) avers that the use of documents should not only include written text in the form of official documents. The documents can be (1) Pictorial sources of data

like pictures, photographs, diagrams, animations, comic strips, signposts and models; (2) Aural sources like sounds and music and (3) electronic sources such as screen shorts, websites, computer games and the archives of online communities. Hence, the current study used both written documents and screen shorts to reveal specific features of web technologies.

The review of relevant documents yields numerous benefits. Document analysis reduces the cost and time of performing any business enquiry. It is of paramount importance to engage in a thorough analysis of existing documents before engaging with the stakeholders of an organisation. This eliminates the chances of wasting the time of stakeholders while asking them for data that one can gather without interviewing them. Therefore, document analysis helps reduce the need for too many human respondents to a study by allowing the researcher to collect information prior to meeting the stakeholders. In many cases, document analysis can provide a better understanding of the subject matter without or prior to meeting with human respondents (IIBA, 2015). Finally, a document review is also considered a relevant technique for case study research as it can be supplemented by other techniques such as interviews when necessary (Oates, 2006:233).

6.9.1.2 Archival Research

A study that focuses on documents found in institutional archives within websites and other existing databases is termed an archival research. An archival research is a review of any organisational or entity's historical records on a subject matter. In addition, an archive consists of stored official documents, irrespective of the size or number of records, and once a researcher gets access to these official stored accounts, they may study closely their contents (Oates, 2006:233; Quinlan, 2011:187). Nonetheless, the researcher sought permission to access the archival repository of documents, reports, and policies within the premises of the university's relevant offices. The researcher also asked the responsible management to advice on available documents relevant to the study objectives.

Consequently, this research involved a search, from the University official web site, for official documents, policies and procedures, annual reports, memos and website recording the history and objectives of educational and web technologies within the CUT. The researcher also used documents that were retrieved by the University Institutional Archives officer. The reviewed official documents were copies of originals, empty forms and samples of those that had been filled, as suggested by Shelly and Rosenblatt (2012:164). The archival research also involved a gathering of private documents, explained by Payne and Payne, (and cited in Meyers, 2013:153) as internal organisational records. Finally, documents were downloaded and further screened by scanning through in search for specific key words that imply web technology existence and effect.

6.9.1.3 Criteria for relevant documents

Three stages of documentary review, as suggested by IIBA (2015,) were followed in this study. The first stage was ***Preparation (1)***. This involves an evaluation of documents to consider whether they are relevant for evaluation. Three conditions need to be satisfied in the determination of the relevance of the document for evaluation. First, relevant documents should directly or indirectly reveal the implementation of e-learning and availability of web technologies at CUT. Secondly, the documents should be based on institutional policies and plans that relate to the core business of the institution and the potential or actual effects of web technologies. Thirdly, relevant documents must represent the financial implications of technology within the institution. A document was considered to have financial implications if the implementation thereof holds the potential to change some of the main operations of the university through the use web technologies. The assumption is that an organisation's transactions are the resulting effect of the way institutional operations are carried out. Therefore, the altering of operations using technology leads to a reduction or complete elimination of some transactions (Gelinas, Dull, & Wheeler, 2014). Consequently, a screening process of all received documents meant some documents were found to be irrelevant according to the criteria mentioned.

Documentary review (2): The second step suggested by the IIBA (2015) is the actual review of documents. This process entails the act of getting information out of the documents or 'eliciting the requirements' of the study. As a result, the researcher captured the objectives of a document and its implications to the use of web technologies within the core business of the University. This reviewing drew on literature findings that web tools and concepts contribute to the operational cost cutting and profitability of organisations by eliminating manual processes (Grosseck, 2009:480; MacKeogh & Fox 2009:149; Mangiuc, 2009:77; Barnes *et al.,* 2010:4; Hinchcliffe, 2010:26-31; Mohapatra, 2013:164; Schniederjans, Cao & Schniederjans, 2013:914; Mungofa & Peter, 2015:62). The documentary review enabled the researcher to identify gaps and questions that needed further verification with the relevant authorities and officers, especially those that have been within the employ of the University for the most part of the Period under consideration in the study.

Wrap-up (3): The IIBA (2015) warns that no documentary evidence should be considered reliable without the verification of its authenticity and validity of the data it contains. Therfore, focus group interviews were conducted to evaluate the legitimacy of evidence in the documents as suggested by Scott (cited in Meyers, 2013:158). Hence, the researcher focused on **Authenticity (1),** where it was ascertained that data does not emanate from dubious sources and that it is original to the context that it represents. The researcher also considered **Credibility (2)**, which involves verifying that the received data had not been tampered with and that it was as independent as possible from influence. The third focus was on the **Representativeness (3)** of the documents. As a result, the objectives of the documents and the information contained were identified to make sure that the document

reflected what it is expected to represent, otherwise the Scott notes that any deviations must be clearly understood. Finally, the researcher focused on the **Meaning (4)** of the documents by ensuring that their data provides visible evidence that is easy to understand.

6.9.1.4 Focus groups discussions

A focus group is data collection technique facilitated by creating a discussion between participants on a particular aspect of research. It is a valuable technique for collecting expert opinion in cost and time efficient ways. The researcher in a focus group facilitates the discussion and to makes sure that it is focused and fulfills the research objectives. Face to face discussions around the table in a boardroom as suggested by Quinlan (2011:300, 480) were conducted. In order to prepare participants and set them at ease (Cassell, 2015:38), figure 6.2 demonstrates the criterion suggested by Quinlan (301:2011) that was followed by the researcher.

The purpose of the discussions was explained to the participants. The researcher explained who he is and what the participation of the interviewee would will involve regarding time and space. The researcher also explained that the interviewee's comments were going to be recorded and requested their permission to do so. Lastly, the researcher informed the interviewees about the planned dates and times for the interviews in order to get proper permission.

6.9.1.5 Focus group discussion verification

The focus group discussions data was recorded and later transcribed by the researcher. The transcription was submitted to all participants for verification through interactive Google documents. All the respondents, including the director confirmed that the transcribed data resembled their responses accurately.

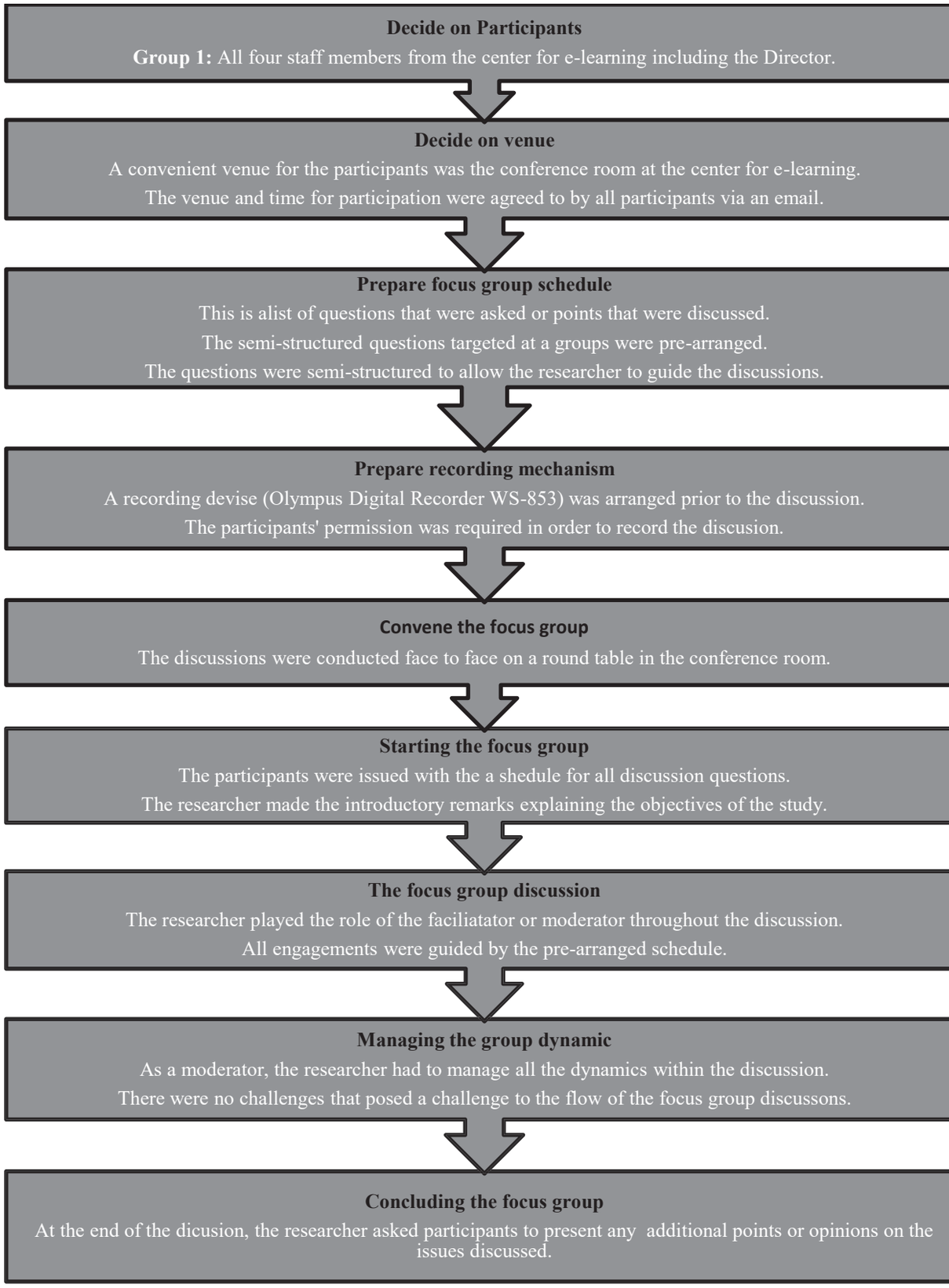


Figure 6.2: Conducting face to face focus group: Source: Quinlan (2011:301)

6.9.1.6 Data Collection procedure

The procedure for collecting data using case study techniques as explained by Olivier (2014:98-104) was adopted:

Step 1: All relevant records of a program or system in use at an institution that indicate the concept being investigated must be studied. This statement has two implications for the present study. Firstly, it means that the institution under investigation must be using web-based technologies to support education at faculty level. Secondly, it means that the concepts under investigation, namely the financial effects of web tools should be investigated. Therefore, the records under study must be from periods prior to the adoption of web tools and after. Hence, Step 1, as suggested by Olivier (2014), is addressed by research questions 1, 2 and 3 of the study where Literature review and documentary reviews are used.

Step 2: Interview specific officials who worked in the institution before and after the adoption of the system to get their opinion on how the concept under investigation has changed and what they attribute the change to. Even though the official documents were able to address the research objectives to a satisfactory level, follow-up focus group discussions were conducted to validate data gathered from research question 2 and 3 through documents. Out of all the participants of a focus group, only the director has been working with the Institution for such a lng time.

6.9.1.6.1 Research question 1

Literature has shown that the main attributes of a web concept is the web as a platform. The literature review identified the web tools existing within the SA university environment. An internal document review on policies, reports and website on accessible web technologies was conducted within CUT to unpack the nature of web technologies available and how they are used at the institution.

Follow up focus group discussions: Follow-up discussions sought to verify and confirm if there are other web tools which might have not been captured by documents and through observations.

6.9.1.6.2 Research question 2

Web technologies are associated with reductions in operational costs (Grosseck, 2009:480; MacKeogh & Fox 2009:149; Hinchcliffe, 2010:26-31; Mohapatra, 2013:164; Schniederjans, Cao & Schniederjans, 2013:914). Literature notes reductions of the costs of communication, stationery, transportation, research, logistics and customer care (Mangiuc, 2009:77; Barnes *et al.,* 2010:4; Hinchcliffe, 2010:31; Mohapatra, 2013:164; Mungofa & Peter, 2015:62). Other cost reductions arise from the reduced time of performing operations (Mangiuc, 2009:77; Barnes *et al.,* 2010:4; Hinchcliffe, 2010:31; Mungofa & Peter, 2015:62). The study investigated the effects of the core functions of Online Publicity, Content Charing, Assessments and Collaboration on costs for printing and stationery, communication, accommodation and travelling operations.

Follow up focus group discussions: The general observation is that institutions that use web tools should enjoy the benefit of cost cutting. Additional questions sought opinions on the nature of the effects of web technologies on selected operational costs and profitability.

6.9.1.6.3 Research Question 3

The following documents were used to investigate the presence of any financial practices as part of the evaluation of the financial impact of web technologies:

- Policies, reports and strategies on financial practices for measuring the benefits of web-based tools were sort.
- Policies, reports and strategies on financial practices for measuring cost reduction benefits of web technologies were solicited.

Follow up focus group discussions: These were held with the e-learning management. The discussions involved questions such as: What is the strategy that you use to measure the cost reduction effects of web technologies within your institution? What is the strategy that you use to measure the profitability of web tools within your institution?

6.9.1.6.4 Research question 4

Finally, additional data that could reveal the extent at which the core features of web technologies have altered specific teaching and learning transaction was sought. Based on the analysis of literature, the findings of the study, a framework was developed in order to fill the gaps that were identified.

6.10 Pilot study

A perfect understanding of instruments is almost impossible despite the researchers' attempts to eliminate possible misunderstandings of their instruments. The researcher is not always fully aware of the adequacy, suitability and accuracy of their questions before they enter the field. As a result, a pilot study is used to assess the fitness level of an instrument (Olivier, 2014:84). A pilot study is, thus, a small-scale trial carried out before the main investigation that is intended to assess the adequacy of a research design and of the instrument to be used for data collection (Sapsford & Jupp, 2008:104). The results of a pilot study are mainly used to improve an instrument, which also means that a respondent for this purpose may be selected conveniently. Furthermore, pilot study respondents may give their opinions on issues that they think were more sensitive, difficult to understand or repetitive (Cassell, 2015:36).

6.10.1 Piloting the focus group schedule

It is crucial to rehearse the interview questions with at least one of the potential respondents or at least someone with similar characteristics as the respondents. Researchers employ this strategy if the respondents are not easily accessible people (Cassell, 2015:35-35). Similarly, focus group questions need to undergo a test (Quinlan, 2011:305). One interviewee was conveniently selected since the questions were planned for the centre for e-learning which has a small pool of employees.

The planned pilot was first scheduled at the convenience of the interviewee. The outcomes of the pilot interview were also recorded for later adjustments of the instrument.

6.10.2 Results of the pilot study

The following amendments on focus group questions which address all research questions of the study were done based on the responses from the e-learning designer.

6.10.2.1 Research question 1

The researcher could determine through pilot interview that the current blackboard version at CUT might not be the first one that had been implemented by the University. According to the interviewee, the current version was an upgrade from the previous one. As a result, the researcher added new questions that investigated the first year of Blackboard implementation at CUT, the version that was first implemented and the motivation for upgrading to the newest version. Therefore, to address research question 1 the following additional questions were inserted into the instrument:

a) Which year and month did CUT start using Blackboard?
b) What version was the first Blackboard at CUT?
c) Which year and month did CUT start using the current version of Blackboard?

6.10.2.2 Research question 2

The respondent answered this question with ease, thus showing that its requirements were easy and clear to understand. However, the respondent showed that it can be clearly answered by the director for e-Learning since he is the one who does the business plan. It was not known to the respondent if there are any practices that the director uses to assess the financial benefits of web technologies apart from benchmarking with other universities. No changes were made on this question.

6.10.2.3 Research question 3

All the questions that address this research question were also clear to the respondent.

6.10.2.4 Research question 4

The respondent suggested that a question that would address the reality of online surveys and the replacement of traditional ways of getting feedback would help make an instrument more complete. This is because lecturers traditionally used a paper questionnaire to get feedback from students on the effectiveness of their lecturing. However, a web-based tools, such as Question Pro, are now available for that and for conducting online research surveys. Another suggestion was that a question that would ask about the utilisation of Office 365 that is available now to all staff members at CUT be added. The office package that allows multiple users to work on an online document at the same time. In addition, documents like Microsoft Excel, Word, and PowerPoint are available on Office 365 to allow collaborative work and editing.

6.11 Data analysis

This section explains the strategy that the researcher followed in analysing the collected data. Documentary evidence may be analysed qualitatively or quantitatively. Content analysis may be used as part of a quantitative approach and it involves a researcher's calculation of the number of times a certain phrase or words are used within a document. Alternatively, a thematic analysis may be used, as part of a qualitative analysis whereby the researcher evaluates various issues and perspectives communicated within a document or by various participants. Since the study collects and analyses qualitative data, thematic analysis was employed.

6.11.1 Data preparation

The analysis of qualitative data requires that all data sources be in a similar format. Subsequently, the researcher should establish the general idea being put forth by the text. The next step would be to identify significant themes communicated within the data sources (Oates, 2006:267). This initial review of the data should be done on all textual data, such as transcribed focus groups and documents, to get an overall idea being communicated by the entire body of data (Bloomberg & Volpe, 2016:195). Similarly, Pietkiewicz and Smith (2014:12) submit that the analysis of qualitative data starts with a repetitive reading of transcribed material to assist researchers to comprehend the data and its meaning and remember the context under which engagement with participants was conducted. New revelations are expected every time the material is reviewed. Pietkiewicz and Smith (2014) also mention that, during analysis, researchers ponder on a number of things such as content (the subject matter being discussed), *language* (allegories, symbols, mannerisms and conducts), *context and initial interpretative comments*. Furthermore, some individual traits, which include gender, age, social status, and emotions, should be used to establish additional understanding.

Content: According to Pietkiewicz and Smith (2014:8), qualitative researchers *"try to formulate critical questions referring to the material, such as: What is the person trying to achieve here? Is anything meaningful being said here, which was not intended? Do I have a sense of something going on here that the person himself or herself is perhaps less aware of?"* Thus, the researcher evaluated the subject matter discussed within collected documents and transcribed focus group discussions so that the data can be in a similar textual format. The researcher read between the lines to detect implications to the existence and purpose of web technologies, their nature, potential and actual financial effect on operational changes of the University, possible existence and effectiveness of measurement practices or at least the potential to measure them.

Language: The researcher also evaluated the language within the documents for its authority, precision and resoluteness to influence take-up of web technologies and effect the required changes.

Context and initial interpretative comments: The context under which the documents were developed and the accompanying objectives were also evaluated.

Other traits and emotions: The reality that the study covers a long period compelled the researcher to pay attention to other issues such as years of experience. Some data from participants who have been within the employ of the University provided additional and valuable information than others. Other respondents provided data that related to their status or level within the organisation. Similarly, documents were not expected to hold the same level of authority in initiating web technology take-up and objectives. So, in line with technology diffusion theory that managerial influence plays an important role in the technology take-up, some policies from teaching and learning were evaluated to understand if they carry any authority to influence web technology diffusion within the University. The researcher also paid attention to some emotional responses that indicate elements such as understanding, confidence, and the need to probe further during focus group discussions.

6.11.2 Identification and categorisation of themes

Oates (2006:268) suggests the following three preliminary themes to the process of thematic analysis:

- Segments that bear no relation to your overall research purpose so are not needed (at least for the current study;
- Segments that provide general descriptive information that you will need in order to describe the research context for readers (for example, history of a company, number of employees, location, time your respondents have spent in their current job role); and
- Segments that appear to be relevant to your research question(s).

The recorded focus group data for this study was first transcribed to be in textual format that is similar to the documentary data. The researcher read through the data to identify various themes that stand out and ignored those not needed. And some segments that serve the purpose of the research context formed part of chapter 5 of the study on the core business, background and policies and procedures of the University. While the next set of segments addressed the research objectives of the study as suggested by Bloomberg and Volpe (2016:195). A hermeneutic principle of '*interpreting a part in relation to the whole and the whole in relation to the part'* (Pietkiewicz and Smith, 2014:12) was applied to each segment. The main themes were extracted from the documentary evidence consisting of the university's official documents after summarising them. The summarising of documents is an appropriate tool that helps researchers to comprehend and consolidate information from documents (Bloomberg & Volpe, 2016:196). Themes may come from existing literature or those that the researcher has developed (Oates, 2006:268). In the case of this

study, the researcher developed themes based on both approaches because they are not mutually exclusive. That is, where relevant, some themes were developed according to literature findings, but others were self-developed.

6.11.3 Refining categories and coding

Having identified various segments of themes, researchers should concentrate only on those that relate to the study's research questions. To that effect, they should read through the data over and over again while refining the themes and categories (Oates, 2006:268). It is at this stage that some sub-categories may be identified, and where possible removal of some of the themes which are not in sync with the emerging categories may exist (Pietkiewicz & Smith, 2014:12). On the other hand, coding is used to identify and differentiate categories. Bloomberg and Volpe (2016:196) note that *"Coding is essentially a system of classification – the process of noting what is of interest or significance, identifying different segments of the data, and labeling them to organize the information contained in the data"*. The same authors highlight that coding should be a flexible technique in which different researchers use what works for them. This is because coding is basically a way in which meaning is assigned to various portions of data – be it words, sentences or paragraphs.

The coding of the study's data resulted in the identification of the main themes and these were given a name that relates to or addresses the research question in view. The main themes were subdivided into various categories that emerged while reviewing the data. All documents were classified according to the year in which they were developed. Each year was given a classification name that represents the nature of the development of the web technology phenomenon. The purpose of this approach was to ensure the capturing of the phenomenon and its impact in a progressive manner over the successive years. Other themes extracted from focus group discussions and added to those extracted from documents within the years identified as the scope of the study. The idea of developing themes from engagement with textual and focus group data satisfies the inductive logic approach where the researcher has an open mind to field generated perspectives. It is recommended by Bloomberg and Volpe (2016:2001) that the responses during fieldwork should be assigned to respective respondents. Therefore, the participants of the focus group were differentiated by letter ***"R1 to R4"*** while documents were by nature differentiated through their institutional names.

6.11.4 Identifying interconnections

This stage *"involves looking for connections between emerging themes, grouping them together according to conceptual similarities, and providing each cluster with a descriptive label"* (Pietkiewicz & Smith, 2014:12). The researchers' continued analysis of the data enables them to continue to identify other levels of sub-division of themes and interconnections between segments

of themes (Oates, 2006:268). These interconnections were identified and explained through data analysis work.

6.11.5 Explaining the patterns

This stage focuses on the researcher's attempts to explaining the identified themes and patterns. The researcher builds up a theory based on what data reveals to him and links it to a developed conceptual and theoretical framework. The researcher also compares and contrasts the findings with literature findings (Oates, 2006:268). Therefore, the researcher's explanation of the patterns drew on the findings evidenced in the reviewed previous literature. The researcher also focused on the findings which confirm literature and those that invalidate it in order to draw inferences.

6.12 Validity and reliability of measuring instruments

6.12.1 Validity

Validity is one of the two fundamental features of the applicability of a research instrument (Salkind, 2012:123). Quality research depends on a commitment to testing and increasing the validity of research results. Validity determines whether research measures what it is intended to measure and approximates the truthfulness of the results (Tariq, 2009:218).

6.12.1.1Construct validity

The most important type of validity, and yet very tricky, is the one that checks the extent to which the outcomes from an instrument are associated with other concealed group of variables (Salkind, 2012:125). The implication of this to the current study is that an instrument that determines the financial effect of web technologies is automatically suggesting that web technologies have a certain effect on the financial constructs within an organisation. Therefore, the researcher had to obtain and present sufficient evidence that web technologies affect financial performance and the instrument used determines those effects. Yin (2009:41) notes that, in order for a researcher to ascertain construct validity, they must: *use multiple sources of evidence, establish chain of evidence, have key informants draft case study report".* The researcher ascertained this type of validity by looking for correlations between the instruments of this study and those of previous and related studies.

6.12.1.2 External validity

It is a test of whether the current evidence of the study can be generalized beyond the case study in question. It concerns itself with whether the findings of a study within the present unit of analysis also holds true within another (Yin, 2009:43). The same author points out that case study research is unfairly viewed as unable to offer this type of validity as it is confused with a survey. Contrarily, surveys should be statistically generalised to populations because they use samples.

Furthermore, Oates (2006:145) argues about case studies that there is possibility of overall conclusions whose relevance can be extended beyond the case itself. He asserts that cases cannot

be viewed as dissimilar as some cases may have similar and dissimilar characteristics. In addition, to the extent that a case being studied may have common characteristics with other cases, the findings may be generalised to other cases. Cases may be similar based on "*their location, history, social mix, technical basis or organizational type*." Technical basis and organisational type are the relevant basis upon which Universities in SA may be similar. However, the majority of universities have similar fragmented life-styles of web technology implementation. They adopt web technologies, such as Blackboard, and supplement it with other web technologies. Most of the universities are still utilizing Blackboard for information publicity and a lower level content sharing and yet, their core business is teaching and learning, research and community engagement. Therefore, one exemplary case may be useful to achieve generalisability. At the same time, it may be difficult to generalise the findings of a UOT to those of a traditional university whose practices are widely theoretical as opposed to the practical.

6.12.1.3 Contextual validity

Contextual validity refers to the authenticity of the evidence provided by case study research and the related conclusions reached from such evidence. There are three ways to achieve this type of validity. These are, firstly, ***Data triangulation***, where the authenticity of one type of evidence can be confirmed by comparing it with other types of evidence generated through other instruments. Secondly, ***Method triangulation***, is used to assess, with various research methods, the validity of the sources of evidence, data collection and can be conducted on the sources of data. Thirdly, there is a ***Researcher triangulation***, which refers to the validity of the interpretation of research findings. Researchers can achieve this by submitting their interpretations to the respondents of the study especially if confidentiality issues are not violated. The fourth way to achieve reliability involves ***Methodological triangulation***. This type of triangulation is achieved by comparing one research theory and methodology with the findings of other studies that employed different methodologies and theories. However, although one researcher might succeed in drawing from different theories, it is almost impossible to adopt an alternative methodology. The alternative should be for different researchers to deliberate on their findings (Ryan *et al.,* 2002:155-156). Hence, focus group discussions were conducted as part of the data triangulation and in order to verify the data generated by institutional documents. A combination of structured and unstructured questions was used to achieve method triangulation, while a research triangulation was achieved by submitting the findings and interpretations of the study to the respondents for their confirmation and comments. A similar approach was adopted to achieve methodology triangulation.

6.12.2 Reliability

Another requirement of good research measurement is that it must be reliable (Salkind, 2012:123). According to Leedy and Ormrod (2014:93), reliability of a measuring instrument focuses on the extent to which it yields consistent results when the characteristics being measured have not

changed. Something that is reliable will perform in the future as it has in the past. A reliable test or measure of behavior can measure the same thing more than once and will result in the same outcome.

6.12.2.1 Procedural reliability

It means that the procedures followed in the case study must be clearly documented to allow an investigator the ability to do the same case all over again (Yin, 2009:45). Customarily, empirical studies, especially quantitative ones, put much emphasis on reliability, which stresses the need for a researcher to maintain an independent and neutral position. However, a case study requires that researchers adopt the relevant procedures, which mostly require them to be involved while monitoring the progress. Consequently, for a case study to be reliable, it should demonstrate a good design that is relevant to the stipulated research questions and a comprehensive research plan. All the data collected should be captured and fully documented. All this should be done in a way that it allows another researcher the ability to inspect what would have been done (Ryan, Scappens & Theobald, 2002:155).

6.13 Ethical considerations and informed consent

The manner in which a research is conducted and the outcomes published should not compromise the dignity, integrity and freedom of participants (Salkind, 2012:85). Therefore, all research should adhere to some rules of ethical behaviors (Leedy & Ormrod, 2014:101). The researcher followed the following rules of ethical behavior:

(i) Protection from harm: during the course of this study, the researcher undertook not to expose the participants to any unnecessary physical discomfort, or psychological discomfort such as stress, embarrassment or loss of esteem.

(ii) Informed consent: the nature of the study was described in full to the participants and they were given a chance to choose to participate or not participate.

(iii) Right to privacy and confidentiality: the nature and quality of participants' performance is supposed to be strictly confidential. For this study, all respondents were coded with R1-R4 in order not to explicitly expose who said what during the transcription of the results.

(iv) Honesty with professional colleagues: The researcher undertook to report the findings in a complete and honest fashion without misrepresenting or intentionally misleading others about the nature of the findings.

6.14 Chapter summary

This chapter has articulated research approach, philosophy and methodology, that was followed while undertaking the invitigation and analysis of the study. Research instruments and rationale for using the case study and qualitative data collection techniques are also explained. Also noted in the

chapter is the view that qualitative evidence provides openings to multiple perspectives given the level to which the financial effects of web technologies have not been researched. Further, observations in the chapter were that the nature of the investigation does not depend much on human population for data collection and hence the decisions regarding population and sampling in the study. The reliability and validity of research instruments were explained and noted as not aimed for generalisations to populations but generalizations on a theoretical stance.

CHAPTER 7: DOCUMENTARY ANALYSIS OF ACCESSIBLE WEB TECHNOLOGIES AT THE CENTRAL UNIVERSITY OF TECHNOLOGY, FREE STATE

7.1 Introduction

The previous chapter explained the methodology, research approach and philosophy which were employed to address the research objectives of the study. Practical data collection and analysis techniques were also explained in that chapter. This chapter addresses the collection and analysis of relevant data relating to the first research question on accessibility of web technologies at CUT. All the collected and analysed data relates to the adoption of web technologies for teaching and learning from 2002 to 2017. This period is divided into two intervals with the first being the years 2002 to 2008, which is considered as an interval during which, web technologies at CUT were not functional enough to cause significant operational changes. The second interval related to the period 2009 to 2017, which holds much relevance to the growing use of web technologies at CUT and has an archive of the official documents that were instrumental to the growing usage of web technologies. The main document that describes the implementation and growth of e-learning at CUT is the CUT e-learning strategy known as the ***Central University of Technology E-Learning Strategy 2015 to 2020 and beyond*** (CUT, 2015-2020, e-learning strategy). The CUT e-learning strategy chronicles the growth of web technologies from 2009 to 2015 and details the envisioned practices and benchmarks between and further than the years 2015 to 2020. The same document reflects on various policies that governed the execution of e-learning since the year 2002. Therefore, an evaluation of web technology implementation for this study focuses primarily on the details of this e-learning strategy.

Chapter 3 established that using web technologies enables organisations to reduce operational costs and improve profitability by replacing traditional and costly practices. Therefore, this study considers that, the chances of realising financial benefits have always and continue to exist whenever there has been an implementation of technology that has the potential to change the way things are done. Those benefits arise form a replacement of older manual procedures with the utilisation of web-based technologies. As a result, this chapter singles out specific points in time, in terms of a year and month (where possible), where certain technologies were implemented, or periods when recognisable change or growth regarding web technology must have occurred. The study relies mainly on the analysis of official documents (from 2002 to 2017) that include policies, reports and institutional plans, as explained in the methodology chapter. Focus group interviews and personal observations were used to explain data collected through documents.

7.2 Documentary analysis and focus group discussions on accessible web tools at CUT

The first research question that was asked in order to address the first research objective is: What web technologies do staff and students have access to at CUT? The findings, based on the analysis of the E-learning strategy, other official documents and focus group discussions, are as follows:

7.2.1 ACCESSIBLE WEB TECHNOLOGIES AT CUT

Various web technologies are available at CUT.

7.2.1.1 Blackboard learn is the main web-based platform at CUT

7.2.1.2 Blackboard is the latest development of WebCT

7.2.1.3 The CUT has renamed Blackboard Learn the institutional name, e-Thuto

7.2.1.4 Other freely available web technologies are accessible through Blackboard

7.2.1.5 There are other specialised web programs that are permitted at faculty level

7.2.1.6 e-Thuto as a web platform

7.2.2 PERIOD OF INSIGNIFICANT USE OF WEB TECHNOLOGIES (2002 – 2008)

Web technologies were not used significantly during this period

1. *2002 to 2004 - The first plan for e-leaning and educational technology (EET)*
2. *2004 to 2009 - The 'Strategic Plan for Educational Technology (SPET)*
3. *CUT Annual Report (2008)*

7.2.3 PERIOD OF SIGNIFICANT GROWTH IN SUBJECT INTERGRATION (2009 – 2017)

2009: Initial subject integration into e-Thuto

4. *Revision of SPET*

2010: Growth of subject integration within e-Thuto

5. *Vision 2020 and strategic plan (VSP) 2010-2015 and 2016-2020 (a)*
6. *The Improvement Plan (2010)*

2011- 2012: constant growth in subject integration

7. CUT annual report (2012)

2013: Increasing growth in subject integration

8. CUT annual report (2013)

2014: Decreasing growth in subject integration

9. Strategic operational plan of the academic division (SOPAD 2014)

10. CUT Teaching and learning plan (TLP) (2014 – 2020)

11. CUT annual report (2014)

2015: Implementation of the new e-learning strategy

12. The CUT e-learning strategy 2015-2020 and beyond

13. CUT annual report (2015)

2016: Continuous increase in subject integration

14. CUT annual report (2016)

15. CUT Innovation in Learning and Teaching (ILT) annual report (2016)

7.2.1 Accessible Web Technologies at CUT

7.2.1.1 Blackboard Learn as the main web-based platform

Blackboard Learn is the main web technology that is accessible throughout all faculties. Furthermore, various other types of web technologies are accessible within this formalised LMS. This formal LMS is used to ascertain confidentiality concerning student's information and to properly coordinate the use of web tools for the benefit of the institution. The practice of availing additional web tools within one formalised platform is acknowledged in literature as a means of control that affords lower support costs and convenience to educational institutions (Katsifli, 2010). This state of affairs is also true with CUT according to focus group discussions but the main reason is security and easy coordination of information. **R1:** "*There is a reason why we don't go for a method that allows anyone to use anything. On an LMS, all those things are coordinated; it's a place where students can get access to all the things that you want them to use. And then there are things like student information and marks and all that stuff that you must gather together within an LMS in a secure way. We use LMS to do that coordination".* Some studies have connected the complexity of realising the benefits of web technologies to the informal nature of the phenomenon

of web technologies (Armstrong & Franklin, 2008:5; El-Sayed & Westrup, 2011:5-6). This implies that to a university, such as the CUT where they have been formalised, the benefits should be harnessed and perceived easily as a result of an official institutional buy in.

7.2.1.2 Blackboard as the latest development of WebCT

Various strategic business mergers resulted in Blackboard becoming a general name for the present LMS. The mergers include the purchasing of its predecessor, WebCT, which developed into Blackboard (Bradford *et al.,* 2007:302; Brown 2010:3; Inside Higher Ed. 2010). The focus group discussions supported this fact when **R1** showed that Blackboard is the resulting technology after the purchasing of WebCT and additional advances. **R1** noted that: *It's the same thing, it's just the development. WebCT is also an LMS but an older version and it developed later in to Blackboard. Blackboard purchased WebCT hence the change of name. But it's the same principle".* Moreover, the two are still recognised within the 2017 university calendar synonymously as *'WebCT/Blackboard'* (CUT, 2017: Official calendar). Therefore, accessible web tools include WebCT within a university that has had that technology as a platform. However, the use of Blackboard as a latest web technology introduced improved functionalities, which were not available in its predecessor.

7.2.1.3 Blackboard Learn as e-Thuto at CUT

It is a common practice among the SAUs to give LMSs institutional names as a means of personalisation and assimilation into the institutional culture. Blackboard Learn is known by the name, MyTutor, at TUT (Bagarukayo & Khalema, 2015:173). In addition, Sakai LMS was renamed Vula at the University of Western Cape, (Ssekakubo, Suleman & Marsden, 2012:255). Blackboard Learn is the current LMS at CUT, which has been given the institutional name **e-Thuto**. Personal observations and experience confirm that it is a web-based technology because of its unlimited internet accessibility beyond institutional boundaries and normal operating hours (Bradford *et al.,* 2007). **E-Thuto** has a unique quality in comparison to other web technologies in that it allows unlimited access to other web tools for educational purposes (Katsifli, 2010:10, 11, 51). When a question was asked whether web technologies within the e-learning strategy refer mainly to the use of e-Thuto, a response by **R1** was "*If you put the word **mainly** there, the answer is YES".* This statement by R1 indicates that although there are other web technologies that are accessible, the prevalent one is e-Thuto. Furthermore, all respondents answered with a decisive *"yes"* to the statement that *"e-Thuto contains most of the web technologies used for teaching and learning at CUT".*

7.2.1.4 Other web technologies accessible through e-Thuto

It has been discovered that other SA universities such as UP (Penzhorn, 2013:57—73), TUT (Bagarukayo & Khalema, 2015:173), UCT (Bosch, 2009:193) and UWC (Armstrong & Franklin,

2008:86, 87) use additional web technologies to supplement their formal LMS. As Bennett *et al.,* (2011:524) note, the numerous web technologies that have emerged offer unlimited ways of online interactions and sharing information. The inclusive approach enabled by using these web tools offers institutions a chance to maximise the utilisation of these tools and their benefits. The respondents of this study pointed out that other web technologies are permitted at CUT in order to allow flexible facilitation of learning with technology. As **R1** indicated, web technologies are available *"...through the LMS as well as through the web, not necessarily only through the LMS, we are not blocking all other things, there are a lot of other web technologies that are available".*

Three realities exist within e-Thuto. Firstly, e-Thuto is in itself a web-based technology that possesses various intrinsic features. Secondly, e-Thuto has other web tools that are plugged in it. This factor was highlighted by **R4** in the statement that: **"***Some of the technologies like SafeAssign are available in blackboard but it's not necessarily part of Blackboard. It's like a plugin tool. So, there is a lot of other tools that are plugged into Blackboard".* Thirdly, other tools that are not part of e-Thuto nor plugged into it are accessible through Blackboard and can be used within or outside an LMS. A statement by R1 is indicative of this: **R1:** *"All stuff that is freely available on the web; there are a lot of things available on the web that we can access. In that sense there is a lot of other things that we can't list".* This complexity of all web tools indicates that it is more comprehensible to conceive web technologies by their core functions than attempting to enlist them.

The practice of allowing flexibility in the use of web technologies appears to promote unlimited access to the use of web tools and the maximisation of the benefits. Nonetheless, permitting the use of other unmonitored web technologies outside the formal LMS leads to uneven utilisation (Armstrong & Franklin, 2008:5; El-Sayed & Westrup, 2011:5-6) which makes it difficult for organisations to recognise the benefit of use that is uniform to the institution. Moreover, it may appear as if the University has formalised the utilisation of web technologies through the present LMS and yet, a closer scrutiny reveals the contrary. The incorporation of too many technologies has resulted in the formal platform becoming too large and complex and thus, permitting more free style practices that are difficult to conceive and direct. A platform that could potentially formalise the use of web technologies is becoming too complex to allow a formal institutional take-up that is measurable. Therefore, one can infer that, web technologies are incorporated at CUT for fear of being left behind or in an attempt to be the first mover into newest web implements instead of a formal institutional take-up that has clearly known objectives that are contributed by all intended users (Armstrong & Franklin, 2008:3; Ross 2009:4-5). A further confirmation of this is shown in the reality that a policy that directs the utilisation of educational technologies, mainly web technologies, was only developed in 2015 and yet the implementation of web technologies at CUT

started as far back as 2002. This confirmation also suggests that the University has been using web technologies in an ad hoc way.

7.2.1.5 Other specialised web programs permitted at faculty level

Another discussion among the respondents led to the conclusion that apart from e-Thuto, some faculties or departments have their own web based specialised software. However, these softwares, which can be integrated into the e-Thuto platform, function independently. This is evident in the discussion where ***R3*** noted the query: *"I am thinking of that web technology that the Engineering department uses for their mathematics program. What is that program?"* And **R1**: replied *"Ya there is one or two faculty specialised programs that are used also but that all plugs into Blackboard. There is one for Mathematics that the Cengage is publishing out. There is one in Management Science that the Accounting department also uses. You can call it web based, and they do trainings on it, it's not an LMS but its content based and they do their testing and some assessment. It is imported or plugged into Blackboard. And at IT there is the CISCO program that they use for very specific specialised training but it's not necessarily part of Blackboard.* **R4** also added that: *"There is also SAM program from Microsoft that is used by the IT Department of the Engineering Faculty. You can call it software but it's also web based. They do trainings and tests after training on specific areas of work like excel and PowerPoint".* This context where free style practices are permitted within and outside an LMS and far too many web technology options permitted may be making it more complex for the University to coordinate the use of web technologies.

7.2.1.6 E-Thuto as a web platform: Reflections and personal observations

E-Thuto is the main web platform at CUT that enables the University to take a blended learning approach defined within the E-learning strategy as a *"Combination of online and in-person learning activities".* This approach is similar to complementary patterns of Blackboard use (Whitmer *et al.,* 2016), which means that e-Thuto as a web platform is an additional part in offering pedagogy but does not replace the traditional methods of teaching and learning. The cost cutting benefits of web technologies can be fully realised if the web platform used to perform the core business (Getting, 2008; Grosseck, 2009:480; Barnes *et al.,*2010:7; Hinchcliffe, 2010:26-31; Zheng *et al.,* 2010:13; Mohapatra, 2013:164). However, the fact that complementary patterns dominate the use of Blackboard means that there is a low level of online assessment (evaluative patterns) and that there is an insignificant amount of time spent online by both students and facilitators (Holistic patterns) (Whitmer *et al.,* 2016). This suggests that there is low level of online interaction between the intended users.

The discussion with the respondents confirms this limited and sometimes incoherent use of web tools. Respondent **R3** indicates a considerable level of sceptical transition to the web as a platform in the caution that: *"I just want to say also that it is very important to note that Blackboard is not*

here to replace teaching but to help teaching. As we used data projectors in the past, Blackboard is here to help teaching and it will not replace teaching. That's very important". The goal of web technology implementation is not to replace everything about teaching and learning. However, it is imperative to implement the technologies with a clear intention to replace specific things within teaching and learning in order to get recognisable benefits. Furthermore, the main intention with the implementation of the e-leaning strategy is to advance the current usages of e-Thuto, hence, a description of the standard features of e-Thuto and the web tools that it houses is outlined below.

7.2.1.6.1 Customised Blackboard interface – e-Thuto

The figure below depicts the current interface of e-Thuto, which is accessible through the university website after one's entering of their login details in the spaces provided. The login details for students are available after an official registration as a student. The CeLET is responsible for supplying staff and students with access passwords and usernames. Blackboard is available through Blackboard mobile (Bon De Schryver, Hossana Twinomurinzi & Jordaan, 2011:7; Penzhorn, 2013:71), while e-Thuto is available through mediums such as handsets that include modern smartphones to enable unlimited accessibility of educational content and continuous learning. Both students and lecturers can download blackboard mobile application to their phones and the fact that it is a web-based platform, means that all students and lecturers can use the platform from anywhere as long as there is an internet connection.

Figure 7.1: The interface of customised Blackboard at CUT- e-Thuto

7.2.1.6.2 My courses

The figure below shows the standard look and features of the first page of e-Thuto after a user has logged in. The icon to the right, "My Courses" enlists all subjects enrolled for by the student. The

same interface is displayed on the side of the lecturer upon logging in. On this window, the courses e-Thuto 101 and 102 are online courses designed by the centre for e-Learning to train all lecturers on the advanced usages of e-Thuto.

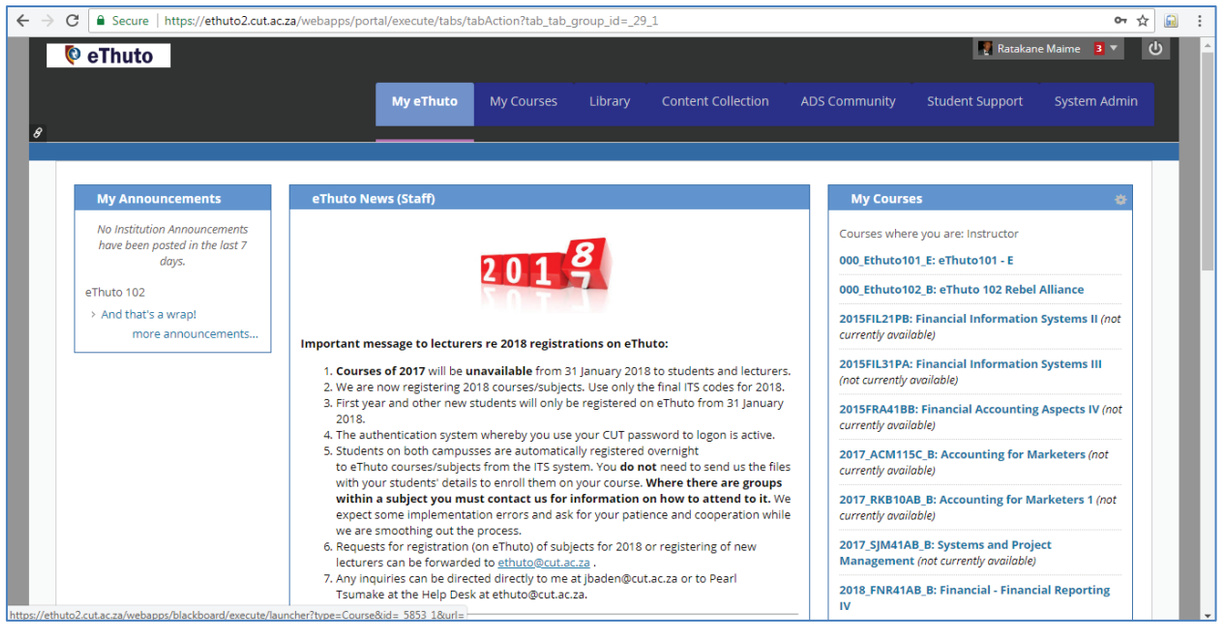


Figure 7.2: My Courses page of e-Thuto after logging in

7.2.1.6.3 Announcements

The conceptual framework of the study considers Announcements as the main tool that fulfils the core function of online information publicity. It is one of the most utilised tools in Blackboard (Unal & Unal, 2011:27). The utilisation of this function means that an institution can save time and expenses associated with traditional notice boards, which have relied mainly on printing and stationery. The fact that announcements have an email function integrated to them increases the chances of student users receiving an announcement. Additionally, this function is more reliable than traditional methods of publicising information on items such as test dates since information is available on the web for as long as the lecturer may choose. The figure below shows how a typical announcement created by the lecturer for student view may look.

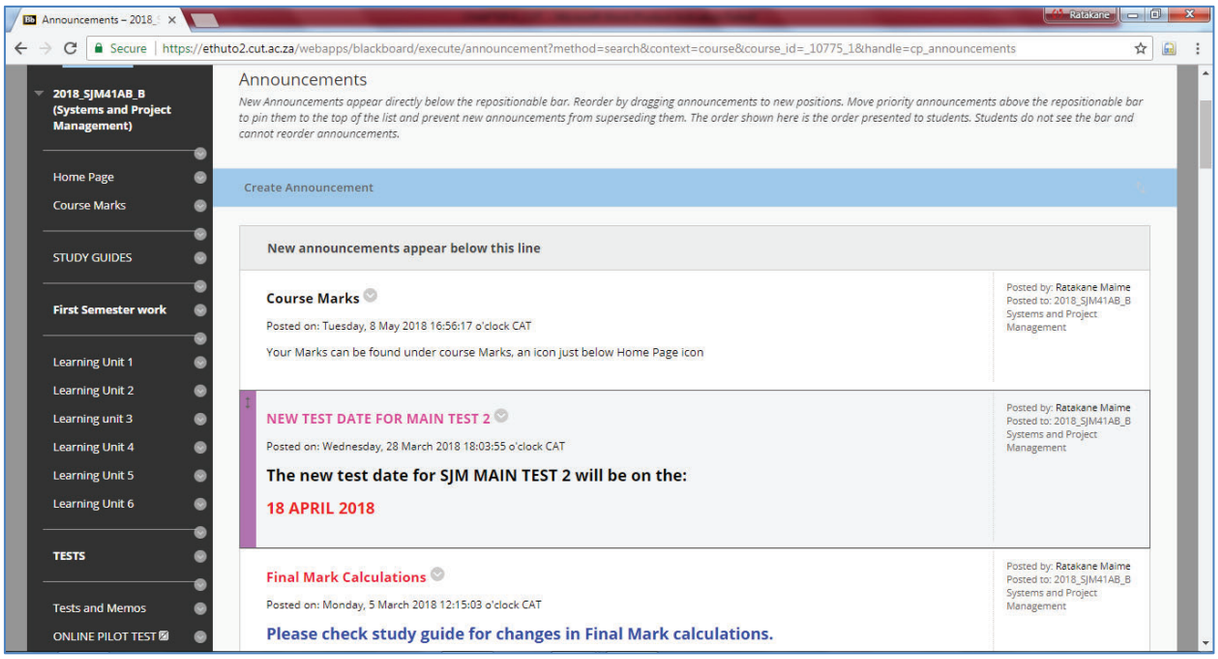


Figure 7.3. Example of how the Announcements function looks

A reflection by **R3** helps explain the importance of the function within e-Thuto and affirms the claims made above. Thus, **R3** notes: *"...I always explain it to lecturers that if you put an announcement on the notice board, the first student comes and reads it, the second one comes and takes a photo of it, and the third one takes the announcement from the board and the rest cannot see it. With blackboard you have the privilege that the announcement is always there and you have evidence of the date, time, minute and seconds that you put the announcement. So, I think announcement plays a very important role but there must also be a culture of announcements on blackboard. So that one lecturer does not say an announcement in class, another one on notice board while another one uses blackboard. We must have a culture that says everything must be on Blackboard."* The above reflection underscores the significance of the Announcements function in teaching and learning. It also reveals that there is no uniform online information publicity within the University because lecturers follow unequal and divergent ways of announcements. This demonstrates that some manual processes are still being followed in making announcements to students, hence R3 affirms the need for a uniform use of announcements throughout the University.

7.2.1.6.4 Course content

The content area is used for uploading subject related material in the form of notes, audios and videos. After a student has chosen one subject by clicking on it, the content area appears as in the figure below. The figure displays the number and kind of learning units available to students as organised by the lecturer in charge. The organisation of the content area is not uniform for all subjects. Thus, all lecturers have, to a certain extent, been afforded the opportunity to arrange a layout according to their choice.

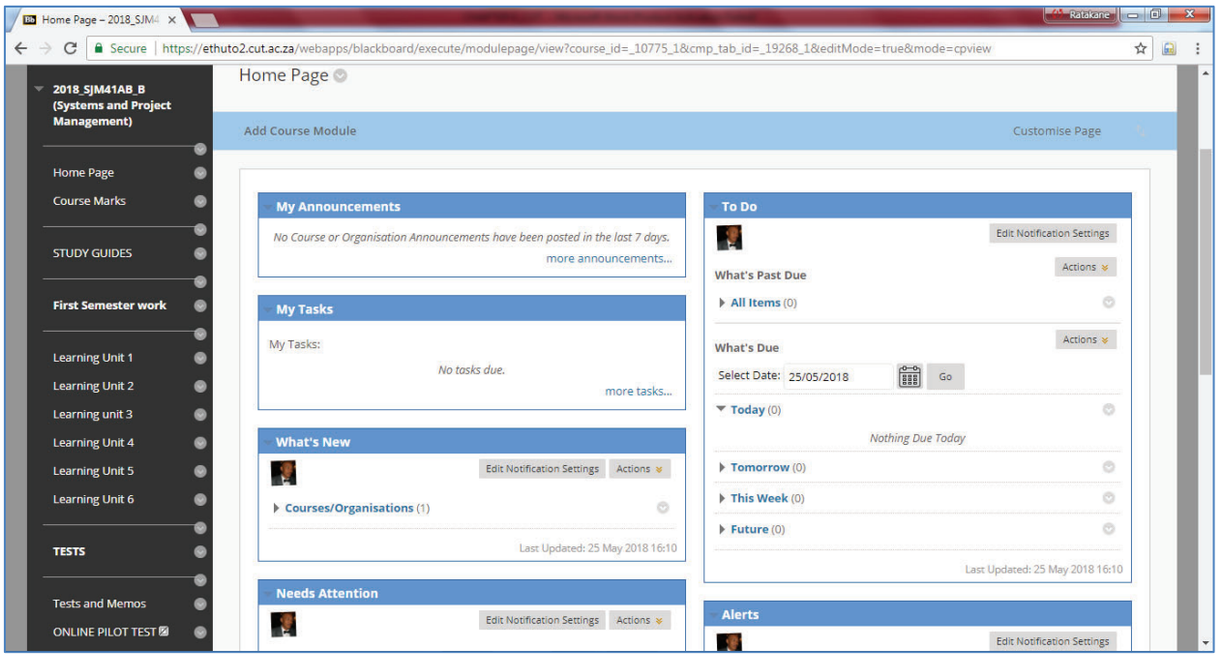


Figure 7.4: Typical Content area under one specific registered subject

The respondents of the study indicated that prior to utilising e-Thuto, lecturers shared printed notes with students, which was a costly exercise to the university. **R2** noted: "*Lecturers used to print study guides in colour and every student used to get one that they never looked at*". As **R1** stated, currently this is no longer the case. **R1** stated further that: *"…there is no lecturer that still hands out notes anymore and the text books…"* To this, R3 made the following additions. **R3;** *"We found that lecturers could give out more notes than before. Previously a lecturer would compile notes and send to Xerox for printing and they must fetch them. Now you can add more notes with just a click of a button"*. Figure 7.5 below shows how subject related content sharing of looks like in practice.

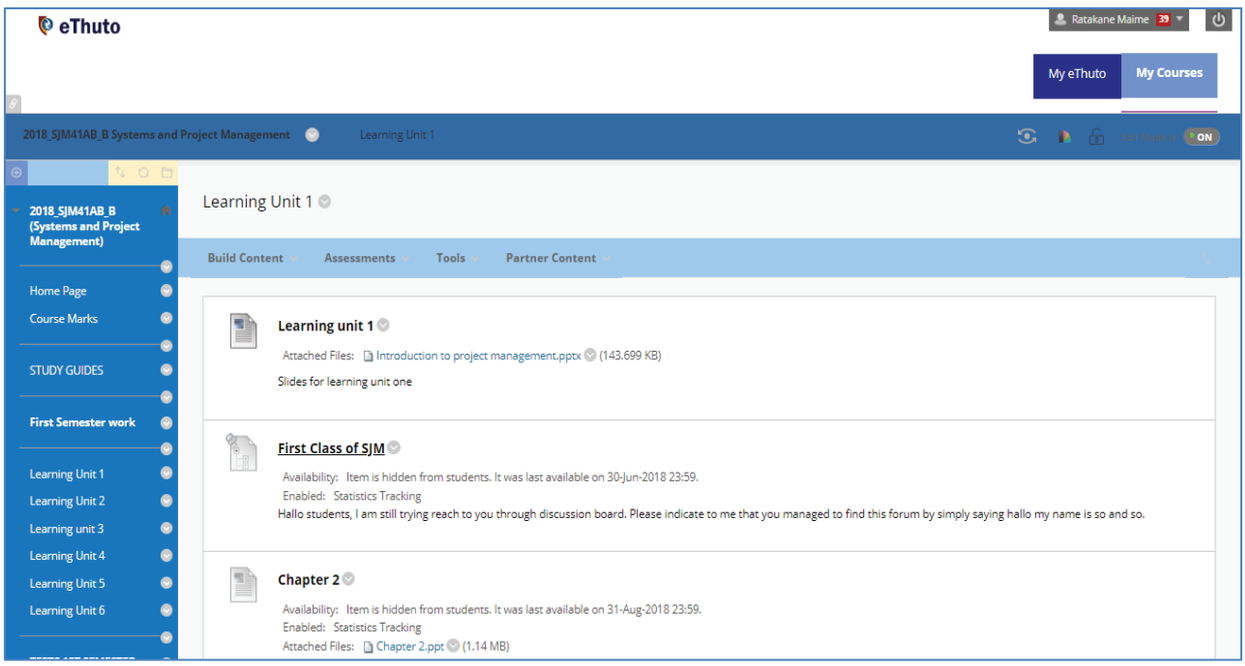


Figure 7.5: Typical learning unit within a subject

Figure 7.6 below shows other possible ways of sharing content with other web technologies. A list of other web functions is populated after the user clicks on the *'Build content'* icon. The *'files'* and *'items'* represent the sharing of content that would otherwise be printed material. Another type of content sharring may be in the form of audio, videos, images and links with other internet sides that may carry helpful subject related information for students. The figure also shows that *'mashup'* enabled applications are availble within content area. Thus, a lecturer may use e-Thuto to source information from various internet sides and recombine it into one content within course related documents (Rudman & Steenkamp, 2009:4; O'Reilly, 2010:29; El-Sayed & Westrup, 2011:2). Figure 7.7 below, shows that lecturers can contrubute to user content by issuing assessments and assignments. Students also contribute content by taking up and submitting assignments. A list of assessment related functions is populated by clicking on *'assessment'* icon. Additional collaborative technologies that are plugged into e-Thuto are displayed in figure 7.8. These are accessed through clicking on *'tools'* icon. Collaboration is therefore another way of contributing to web content within e-Thuto.

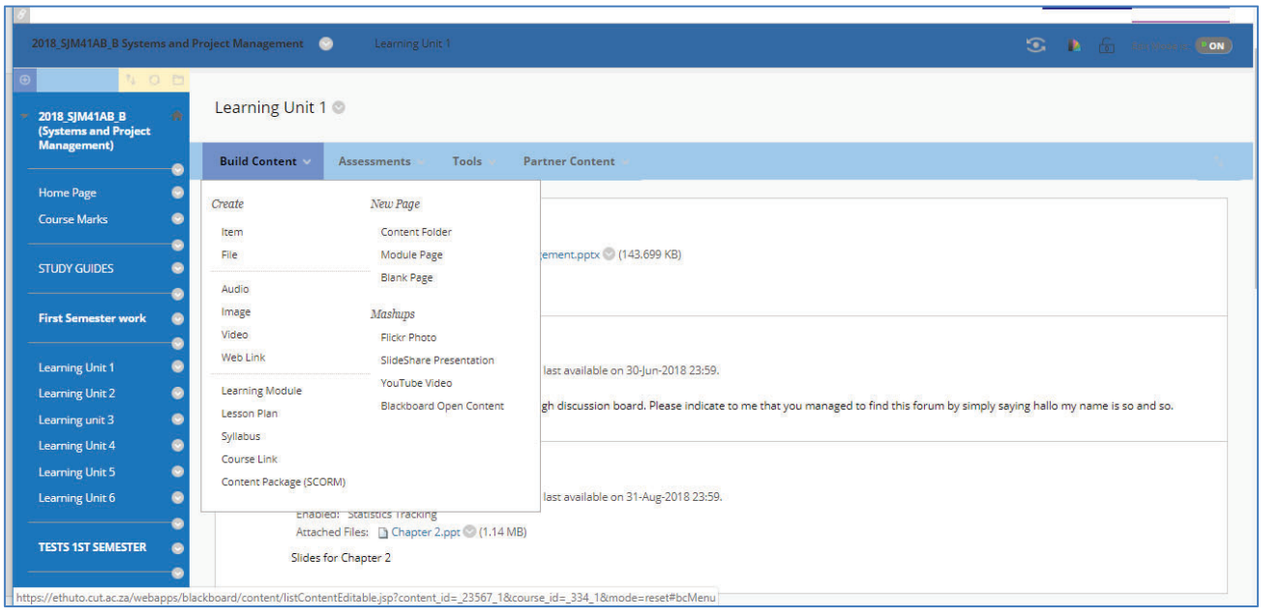


Figure 7.6: Web-based functions and technologies within content area

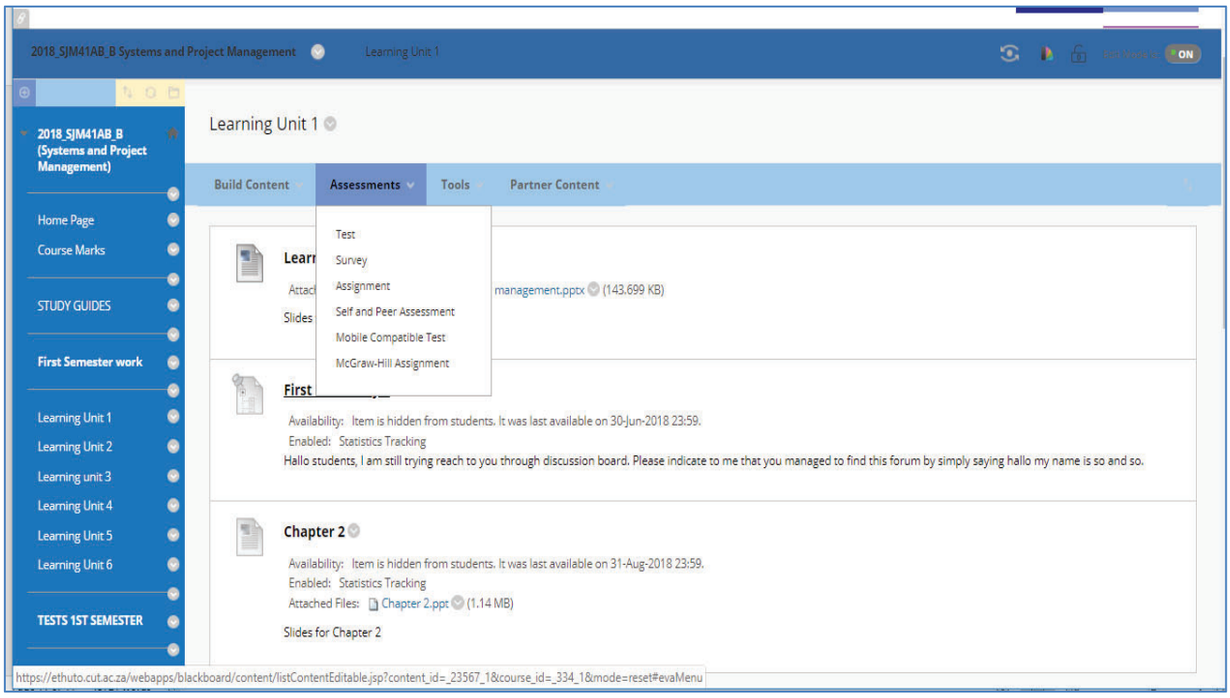


Figure 7.7: Assessment function and tools within content area of a learning unit

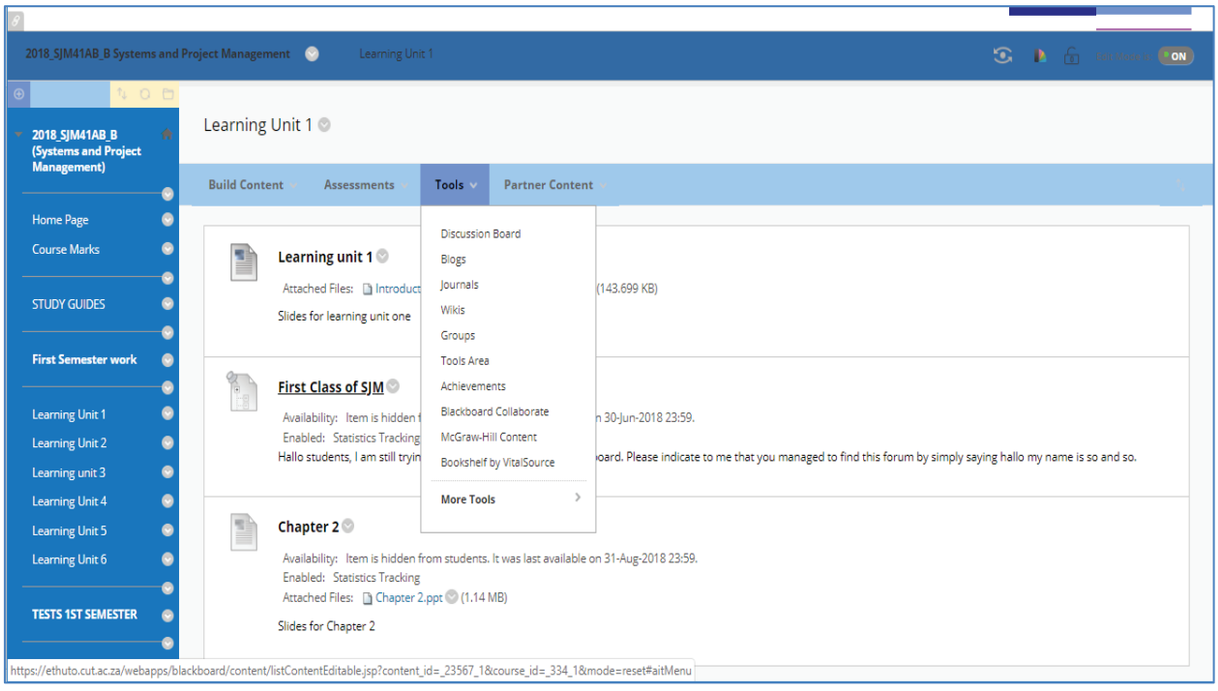


Figure 7.8: Additional web technologies accessible within content area

The use of Course Content content function is not used optimlly at CUT. Some lecturers use the Course Content function, which is embedded with several web technologies, to share material like notes and study guides. Such practices may be regarded as elementary usages of Blackboard discussed in literature as supplemental patterns (Whitmer *et al.,* 2016). However, the fact that manual processes are still backed by institutional policies, as chapter 5 reveals, suggests that the noted online content sharing cannot be completely true. As already noted, there is very little online interaction between lecturers and students because of the underutilisation of core functions, such as

assessments. The fact that announcements and access to notes and study guides dominate the use of Blackboard is a further indication that both students and lecturers spend very little time on a web platform. Thus, it is clear that the web-tool is an interactive tool that has various generations of web technologies and yet, students are still being served as mere consumers of information with little or no participation. (O'Reilly, 2007:17; Getting, 2008; Song & Lee, 2014:511).

An interactive use of a platform through functions such as online assessments and discussions reduces stationery and printing costs that relate to assessments. However, it would adhere to learner centeredness that advocates for a participative function of learners in their education. Furthermore, this would reduce reliance on physical space for teaching and learning and thus, reduce the costs related to the building of expensive infrastructures like computer labs (including associated rates) that are slowly becoming irrelevant to the modern techno savvy generation.

Finally, similar freestyle practices regarding information publicity exist with regards content management. The E-learning strategy reveals, in concurrence with some research findings (Armstrong and Franklin, 2008:5; Thinyane, 2009:406–414; Gachago *et al.,* 2013:94; UFS, 2014) that there is no uniform institutional approach to utilising web technologies at CUT. The use of course content is limited to theoretical material and very little learning is facilitated through videos. ***E-learning strategy:*** *"The use of Multimedia for course content delivery is also used by isolated cases and is increasing rapidly (about 20 academic videos are produced per month). This excludes videos recorded by lecturers themselves. There is however still a need to encourage academics to build this into their course offerings to supplement their traditional or known ways of teaching".*

7.2.1.6.6 Course management tools

Apart from accessing the 'Tools' function within content area, it may be accessed under course management. Either way, the ultimate result will still be a contribution to course related content. However, the use of the functions within course management depends on the competence of the lecturer. The advanced usages of Blackboard like the evaluative patterns (Whitmer *et al.,* 2016) are achieved through utilising the functions under this area. Icons under course management are also utilised for assignments, giving online tests and awarding manual or automated grades to students. In addition, the collaborative and interactive abilities of Blackboard are found in this area. *The staff members are being trained continually, through the e-Thuto 101 and 102 that has been mentioned earlier, to use available collaborative tools within this area.*

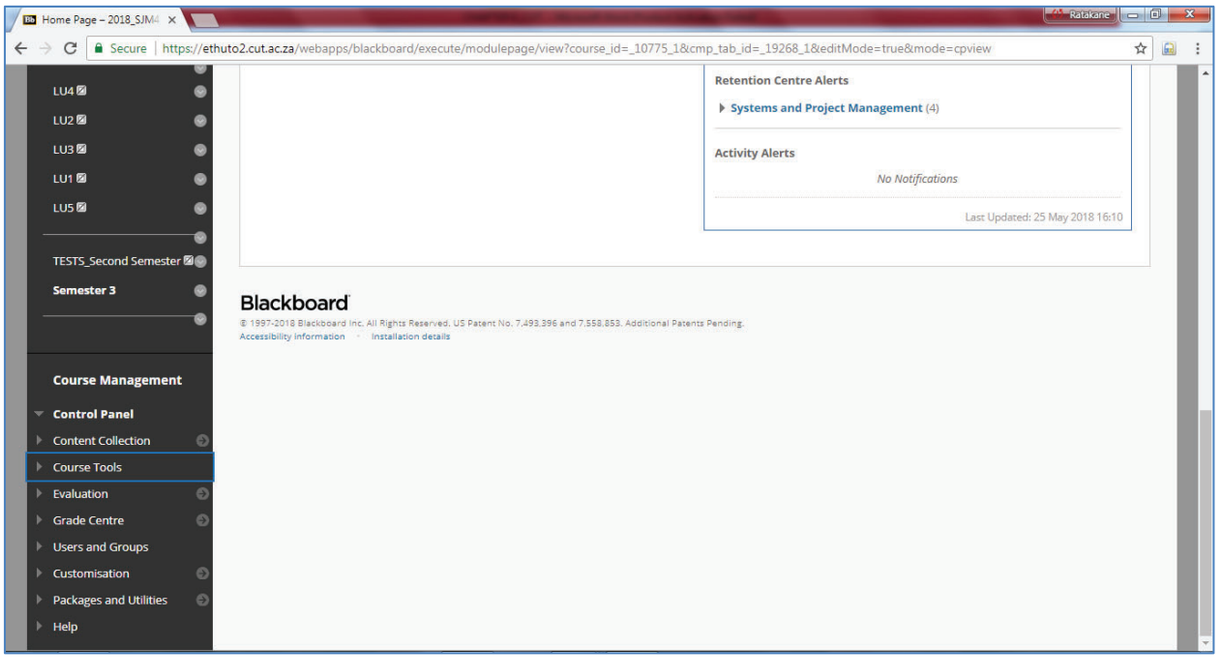


Figure 7.9: Course management area under one subject

A user's selection of Course tools under Course Management (refer to Figure 7.9 above) results in the population of a list of other web tools that are intrinsic to Blackboard and other add-ons as shown in Figure 7.10 below. The fact that e-Thuto has other plugged in tools and those that form the original make-up of the platform has been discussed just as the point that the most advanced utilisation of Blackboard is achieved through using the tools under Course Management. These tools are displayed on the left side as noted in the figure below. Hence, the focus group discussions indicated that e-Thuto is a very comprehensive web platform that houses other web tools that can be used to facilitate interactive learning.

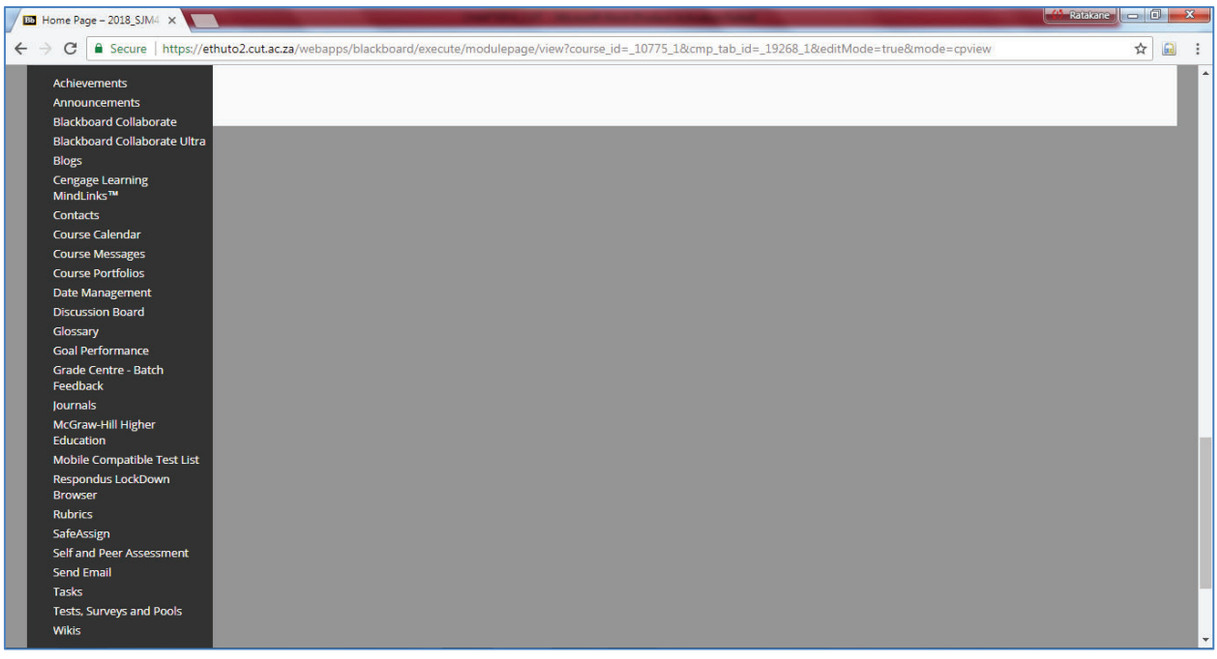


Figure 7.10: List of web technologies housed within e-Thuto web-based platform

7.2.1.6.7 Discussion boards

The Discussion Board is also found within the course management area. Its purpose is to allow flexible and unlimited subject related discussions beyond a classroom environment. The function extends course related interactions and learning beyond a classroom environment. The application shows users the total number of messages received and read, as well as the number of those that would not have been read (Unal and Unal, 2011:27). The user can also highlight massages that he has read and those that he/she still has to read. Should there be a need, the user may also edit information they posted on discussion boards at any later stage. An example of a discussion board within e-Thuto is depicted in Figure 7.11 below. The figure shows an example of how discussions may be clustered according to similarity of themes detected from various inputs by participants.

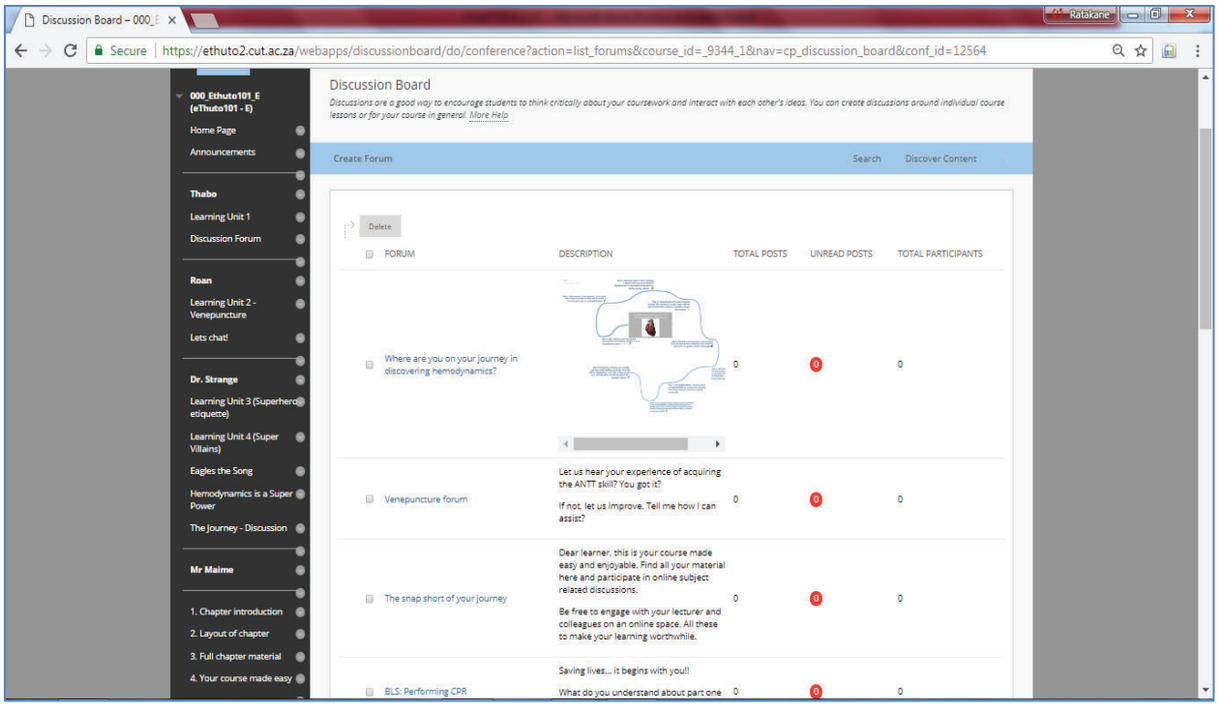


Figure 7.11: Discussion board within e-Thuto

The Discussion Board is purely participative tool that enables a lecturer to induce necessary topics while allowing all student participants to contribute. The use of this facility could eliminate or reduce the amount of time normally allocated to consultations between students and lecturers. It also permits continuous and flexible learning that is not limited to the classroom environment. However, the tis study's focus group discussions show that **discussion forums, wikis, blogs and other collaborative tools** are not being utilised optimally at CUT as indicated by **R1:** *"It is a case but it is not the way we would like it."*

7.2.1.6.7 Tests, surveys and pools

Assessment tools can also be accessed under Course Management tools. The evaluative patterns (Whitmer *et al.,* 2016) of Blackboard refer to the extent to which e-Thuto is used as an assessment tool. It is achieved when lecturers develop additional skills of using course management tools. As

the picture in Figure 7.12 below shows, the three, tests, surveys and pools, are the main features that are available for this function.

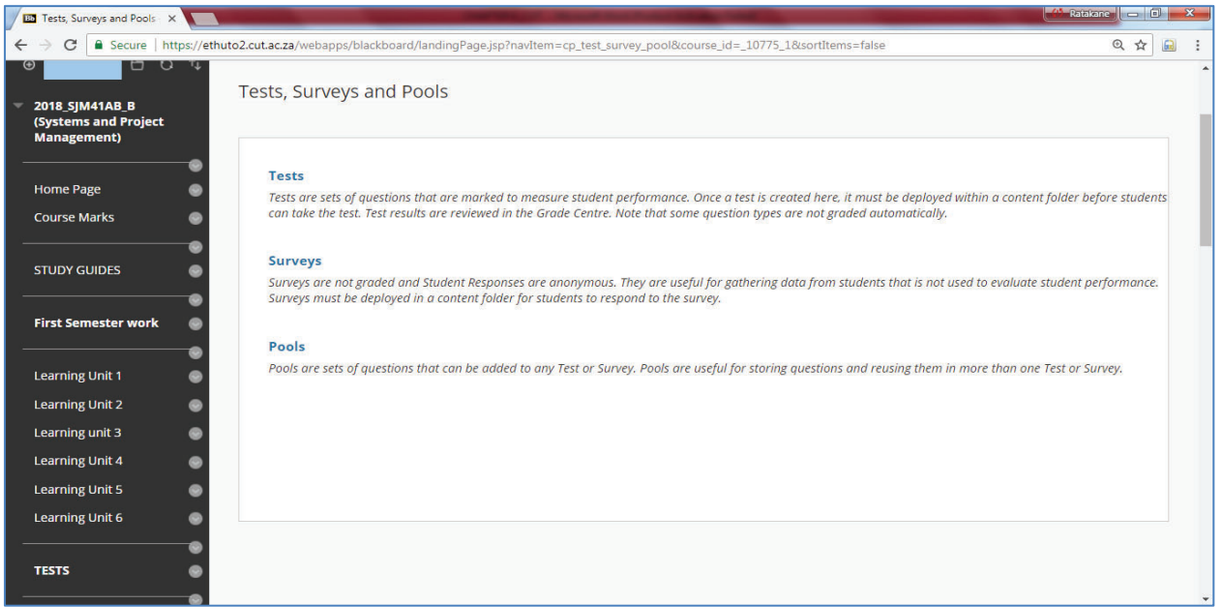


Figure 7.12: Tests and survey functions on e-Thuto

On a question that checked whether online tests have reduced reliance on manual tests, the respondents said the following:

R1: *I think change the word from manual tests to physical test paper. In that sense then yes, I think there is that.* The phrase *"I think there is that"* does not sound convincing enough that online assessments are used significantly at CUT which confirms the point already made that Blackboard based assessments are very low at CUT. At the same time, the following remarks indicate that some faculties seem to have made recognisable advances in this regard:

R3: *In some cases, however they still do the printing especially in engineering where they use diagrams and stuff its easier for a student to have a diagram next to him on a paper. Sometimes they do that. But then they answer it on Blackboard. So, they don't have to print answer sheets anymore and they don't have to mark it. The memo is also immediately available to students. What I also found the last time is that students who can't write, it's easier to let them re-write a test. So, it's not necessary now to say student A, B and C must come and write again on this date, you can hear from them what is available for them and you can immediately put them on for that test. And it's also easier for a lecturer that has a good question bank to recompile the test. It can take even ten minutes to set-up a new test if you have a good question bank.*

An additional question asking whether there are situations where students write exams online was made. The responses were:

R1: *Yes*

R3: *It's quite a lot*

R1: *And that came in after Fees-must-fall when they had to set new tests quickly. In that sense the Fees-must-fall campaign was very stimulating for us in the usage and it also effected this usage.*

R3: *In departments that have big classes like engineering, health and education. I think education was the first to write exams on e-Thuto*

It is therefore clear that the use of e-Thuto is gradually moving towards interactive methods of using web technologies. It is the conviction of the researcher that online assessments represent a more pronounced means of facilitation that saves on operational costs of universities. *In agreement with the respondents, online tests are much easier when the facilitators already have test banks within e-Thuto.* Hence, as already noted, 'assessments', which may be conducted through 'assessment, assignments and discussion forums (Whitmer *et al.,* 2016), offer additional ways through which users can contribute content.

7.2.1.6.8 SafeAssign application

SafeAssign is an application within e-Thuto used to detect the amount of plagiarism within a document. The observation made through focus group discussions is that SafeAssign is not necessarily part of e-Thuto in that it is an independent web tool. However, it has been plugged into e-Thuto to form part of the formally coordinated web tools and easy accessibility. ***R4*** noted that: *"Some of the technologies like SafeAssign are available in blackboard but it's not necessarily part of Blackboard. It's like a plugin tool. So, there is a lot of other tools that are plugged into Blackboard".* Upon clicking on the icon, the SafeAssign application and the related functions appear as in the figure below.

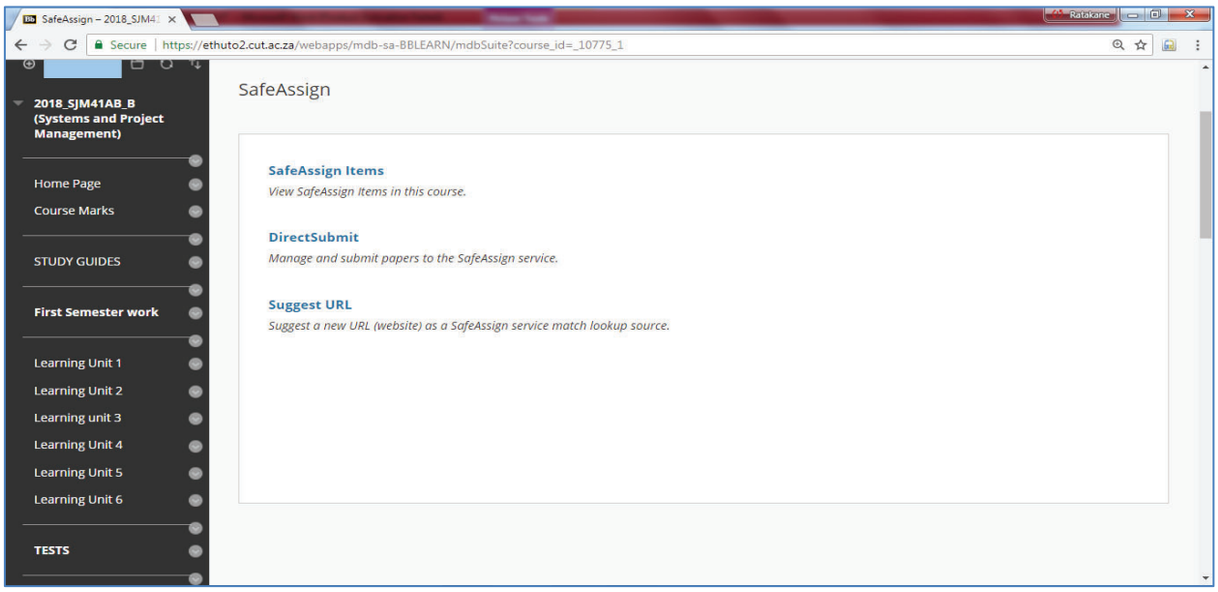


Figure 7.13: SafeAssign feature on e-Thuto

7.2.2 PERIOD OF INSIGNIFICANT USE OF WEB TECHNOLOGIES (2002 – 2008)

According to the E-learning strategy, CUT adopted a blended learning approach in 2002. The University recalls, within the E-learning strategy, some institutional plans since 2002 that relate to the use of technology for teaching and learning. Additional focus group discussions, which were supplemented by information available in the Annual Report of 2008, were carried out to improve clarity on each plan and the progression of educational technology within the institution. It was noted that two major policies governed the implementation of e-learning during this time.

7.2.2.1 During - The 2002 to 2004 first plan period for E-leaning and Educational Technology (EET)

The EET policy, which was developed in 2002, received a University Senate approval in 2004. As gathered from **R1, "***The purpose was to implement and coordinate the implementation of e-learning. That's very short, but that was the main focus of that policy".* However, the policy was not without limitations. According to **R1: "***The limitation of that policy was that it was outdated. We developed over it. Any policy becomes outdated and at some stage, you must upgrade. Your needs change, the technology changes, everything changes and you must reflect that in your new policies. That is the procedure".*

In addition, the respondents revealed the LMS under use during this period. The identification of the LMS used, which was WECT, is made in their answers to the question: "Which web-based technologies (e.g. e-Thuto, WebCT) were implemented at CUT for teaching and learning since 2002 to 2004?" Hence, the short response to the question made by **R1** was: "*WebCT was the LMS used".*

7.2.2.2 - The 2004 to 2009 period 'Strategic Plan for Educational Technology (SPET)

Observations suggest that there was no significant development nor implementation of the SPET, approved by senate in 2004, within the institution was guided by the implementation of the policy. The respondents were asked the questions: "What was the purpose of the policy?" And "What web technologies were implemented?" Their responses, as revealed by that of **R1** referred to above, was "*Alright I think you can just duplicate what we have said* (referring to responses regarding EET) *because they (referring to strategies) are just the same".* Therefore, it can be concluded then that WebCT was the main web technology in use during that period.

7.2.2.3 CUT Annual Report (2008)

The 2008 Annual Report documents the observations made by the Unit for Academic Development (UAD) that confirm e-learning implementations at the CUT. First, the UAD notes that it, *"aspires to support academic staff and students by means of the enhancement of a student-centred teaching and learning approach, the provision of need-directed academic staff development initiatives, leadership in student academic development practices, the initiation of innovative curriculum*

development processes, the implementation of educational technology strategies, and the provision of quality information literacy and information services". Secondly, the report outlines some the achievements it had observed. One of the reported achievements of the University noted by the UAD was the *"Training and supporting academic staff in the development and implementation of course material in electronic mode".*

The researcher reached following conclusions based on these findings:

- The beginning of 2002 should be regarded as the period of web technology implementation at CUT. This reality of web technologies has always been referred to as e-learning (Jordaan, 2015:47). The conclusion arises from the response to the question: What year and month was the implementation of web technologies at CUT? The response by **R1** was: *Approximately 2001, I cannot say which month exactly; if you want really a month you can say October.* The researcher's conclusion is also based on observations drawn from an evaluation of the E-learning strategy. According to the E-learning strategy, blended learning was implemented in 2002. The researcher arrived at the year 2002, as the tear of commencement, on the grounds that October 2001 is almost end of the year and the fact that it was an approximated date. The date is also not too far from January 2002 with the month of October marking the beginning of the end of the academic calendar where the educational tools are used minimally as the focus is almost on Examinations.
- Web technologies have been available since 2002. However, the observation that the training of staff for the development and implementation of electronic material at CUT is only reported at the end of 2008, leads to the conclusion that the use of technology for teaching and learning could not have reached any significance that could benefit the institution at large prior to the end of 2008. One can still expect a growing use of electronic delivery of educational material beyond that period as a result of staff being equipped, to some extent, on the development of electronic content.
- The years 2002 to e 2008 cover a period during which usage of web tools could not have resulted into a significant change of how the University carried out its core business. This conclusion considers that there is no recorded growth of web technologies during the period and that according to focus group findings the needs of the University grew beyond the then existing policies. Thus, there is no likelihood of a pronounced use of web tools nor of cost cutting benefits apprehended until the end of 2008.
- During this period, WebCT was the main platform used for teaching and learning. The metamorphosis into Blackboard had not yet been a reality. The conclusion is that WebCT represents a platform that had limitations to the developing needs of the University. This is conformed in the responses made to a question about the motivations for the choice of a web technology, which included: ***R1*** stating: *"…we choose the current version based on our needs*

(1) and on what we can afford (2) which is the budget that is allocated to us. I think those are the two main reasons. 'The other reason is that on any software if you don't upgrade you stay behind, and your old versions expire and you cannot continue with old technology. So, in that sense it is new technology that is built into these versions. 'We can't put in WebCT now and try to run it, it simply won't work because there are a lot of software developments that have taken place over the years so you must keep up to date otherwise it just won't work. 'Every year there is upgrades. For example, we upgraded December to a newer version, we are upgrading this July to a newer version, December we will upgrade again to a newer version. It is a continuous process". Therefore, the limited use of web tools during this period can be attributed the limitations inherent in the available technology that are solved by acquiring modern web technologies. Another impediment to growth of web technologies was that staff still needed significant training on how to use the available tools.

- The issue of financial costs to a university is important because it plays a big role in selecting the technology that should be implemented. That is why **R1** said *"...we choose the current version based on our needs (1) and on what we can afford (2) which is the budget that is allocated to us".* However, up to the year 2008 the reasons for implementing web technologies had nothing to do with achieving cost efficient operations or any other financial advantage to the University.

7.2.3 PERIOD OF SIGNIFICANT GROWTH OF WEB TECHNOLOGIES (2009 – 2017)

7.2.3.1 2009: Initial subject integration into e-Thuto

7.2.3.1.1 Revision of the SPET

The E-learning strategy reveals that the SPET *(referred to in 7.2.2.2.)* was revised in 2009 and that this resulted in a 19.63% availability of integrated subjects into e-Thuto. The year 2009 stands out as the time during which the institution begun to offer content material to students on a web platform. The revision of the SPET combined with some focus group discussions evidence the fact that:

- The year 2009 was the beginning of a new era on which web technologies grew. As **R1** states, the revision of the SPET was inspired by the fact that *"...the use of e-learning increased quite a lot".* This growth was big enough to be recorded. Before this period there is no recorded growth of usage of web tools at CUT. The availability of educational material through a web platform means that learning is no longer limited by space and time – a factor described in literature as increased availability, whose effective use results in reductions in printing and stationery costs (Bradford *et al.,* 2007).
- The discussions affirmed the literature findings that underscore the importance of the instrumentality of top-level management in making institutional policies and procedures that

allow for the web technology take-up within universities (Armstrong and Franklin, 2008). The response by **R1** is in accord with this literature. R1 describes the motivations for the revision of the SPET as follows: *"The overall University strategies, management strategies, they wanted that e-learning be implemented more. It was actually in response to the main strategies of the University that we also came in and said we need our own strategy at e-learning. So, it was a sub strategy of the main strategy".*

- Therefore, the growth of web technologies was driven by the implementation of new and relevant e-learning strategies. Previous policies (from 2002 to 2008) were not suitable enough to drive the new e-learning agenda in as much as they allowed for its implementation. Thus, growth may be expected over the following years as a result of top-level management financial and general institutional support. Consequently, the operational changes related to web tools will continue to grow more based on some kind of institutional buy-in.

7.2.3.2 Growth of subject integration within e-Thuto

7.2.3.2.1 Vision 2020 and strategic plan (VSP) 2010-2015 and 2016-2020 (a)

The vision and strategic plan reiterates both, the commitment of the University to *"moving towards a technology enriched educational environment", and* acknowledges slow progress owing to a diverse number of reasons as noted in the statement that: "*We have however made slow progress on three broad fronts: the extent to which the enriched environment is effectively, competently and innovatively used, the complex challenges around student internet access as well as the limited ability of infrastructure security, maintenance and reinvestment capacity".* This implies that:

- Growth of technology continued to be a University agenda, as evidenced by new policy implementations. This aimed at maintaining a relevant presence within the region. Available literature also describes the growth of web technology as an idea that is driven by institutional policies world-wide (Armstrong & Franklin, 2008:1, 2).
- A successful strategic plan will enable clear tactics that will lead to the growth and implementation of latest technologies. Thus, the implementation of the strategic plan must be followed by clear University strategies that promote a continuous use of the latest technologies and the actual implementation of the technologies.

The vision and strategic plans must also include a cluster of yardsticks, called the three strategic sets (SS), developed by the CUT Council in 2009. Learner-centred practices and facilities fall within the SS2. CUT's plan within the learner centred approach was to have at least 50% of its courses available on a web platform by 2010 and 80% by the year 2015. However, only a 31.74% availability was achieved in 2010. Compared with (2009), a difference of 12.11% noted after comparing the 2009 19.63% and the 2010's 31.74% leads to the conclusion that the year 2010

witnessed a continuous growth in the implementation of web technologies at CUT. This growth can be linked to the ***'improvement plan'*** on e-learning that was implemented in April of the year under review.

7.2.3.2.2 The Improvement Plan (2010)

The E-learning strategy notes that an improvement plan was implemented in 2010. Focus group discussions revealed that:

- There has been a continuous progress in the implementation of web tools that went hand in hand with the additional growth of subject integration hence, R1 noted: **"***It was just a request from management. That was what inspired it. That was just a way of bringing e-learning on track, monitoring and implementing it better and better. It was to improve the implementation of e-learning".*
- Management support continued to compel the growth of web technologies within the period recognised in this study as a period of significant growth in web technologies. This affirms literature notions that the implementation of web technologies is normally inspired by top management who are looking for certain outcomes (Armstrong and Franklin, 2008:1, 2).
- Specifically, financial benefits, are mentioned by El-Sayed and Westrup, (2011:5-6) as a motivation by top level management. However, to this end, the E-learning strategy and focus group discussions showed that the motivation was to enhance learning. As the E-learning strategy states, the main idea behind e-learning improvements through web technologies has been "*to take advantage of among other things, reduced time in face-to-face mode while presenting some parts of their courses electronically. The main aim has been to have an interactive learning environment where students could freely engage with each other, the learning material and their lecturers without confinements of space and time - on or off campus".*

7.2.3.3 The 2011- 2012 constant growth of web technologies

The growth of web technology implementation continued in during this period. The E-learning strategy notes that subject integration into e-Thuto stood at 44.70% in 2011 and rose to 57% in 2012. A more elaborative information can be deduced from the 2012 annual report as outlined below.

7.2.3.3.4 Central University of Technology Annual Report (2012)

This report outlines that various workshops and training opportunities were held in order to assist staff to participate in the usage of web technologies for teaching and learning at CUT. As a result, the university achieved a 57% integration of subjects on e-Thuto. In addition, the Centre for E-learning and Educational Technology implemented the clicker technology and an interactive classroom called SMART Class. The clicker technology is not a web-based tool. However, the

smart class technology allows lecturers and students to engage with each other through the use of newest pedagogical technologies available on the web based LMS. SMART Class is a new technology that recently made its way into few universities within the SA context. For instance, its enrolment within the Hotel School of the Faculty of Management Science at CUT in 2012 resulted in the raising of subject integration into Blackboard to 57% as 707 courses could be accessed online. These developments necessitated the upgrading of classrooms with audio-visual technologies such as data projectors. Currently, all classrooms at both the Welkom and Bloemfontein campuses are fitted with data projectors with 314 lecturers trained in 261 sessions for the use of Blackboard.

Therefore, this report indicates that:

- There are some strategies that the University is using, in line with the vision and strategic plans, to implement newest technologies as well as equipping staff with the necessary skills for their use. This is in line with the observation by Owusu-Ansah, *et al.,* (2015:34-35) that growth in the use of web tools and any other technology depends on the training received and user skills possessed by staff members. In addition, Armstrong and Franklin (2008:1, 2) note that the use of web tools appears to correlate with staff by in. Hence, available literature suggests that the implementation of new technology is often followed by the proper impartation of skills to users (Manqiuc, 2009:85, Parsons, 2006:1; Katsifli, 2010:45).
- The significance of the year 2012 in this study is that, the year witnessed another continuous increase in subject integration into the web.

7.2.3.4 2013: Increasing growth of web technologies

7.2.3.4.1 Central University of Technology Annual Report (2013)

The annual report of 2013 and the e-learning strategy reveal that there was a 76.46% subject integration into e-Thuto. This kind of growth links with the training engagements that the centre for e-learning conducted on staff members in the preceding years. A comparison of the 2010, 2011 and 2012 increases, in which percentage increases were 12.91%, 12.96% and 12.30% respectively, with the positive increase of 19.46% indicates that the use web technologies improved by a huge margin in 2013.

7.2.3.5 2014: Decreasing growth in subject integration

7.2.3.5.1 Strategic Operational Plan of the Academic Division (SOPAD 2014)

In March 2014, CUT came up with the SOPAD in line with the CUT vision 2020, Teaching and learning plan and other academic plans. The SOPAD has seven (7) Key Performance Areas (KPAs). The first KPA is '***Quality teaching, learning and student academic support***', which is subdivided into '***Learner-centred methodologies and facilities; state-of-the-art infrastructure and technologies'***. In particular, the revision of the e-learning strategy is envisioned as the key enabler

to achieving the first KPA. Accordingly, the plan sought to *"Revise the CUT e-learning strategy for 2015-2020 & beyond, in line with international and national trends; resource needs & possible partners and approved by Senate*". This agrees with literature indicating that international trends drive the introduction of web technologies in SA universities (Thinyane, 2009:406–414; Gachago, *et al.,* 2013:94;). At an international level, learner centred pedagogy is a force behind adoption of technology and automatically all web applications. Performance indicators such as *'increased and effective use of technology'* within the core business of teaching and learning should result in cost effectiveness at the faculty level of the University. The following table summarises the implications of SOPAD on technology as found within the first KPA.

KPA 1	**Performance indicator**	**Targets**
Quality T&L and student academic support *Timeframe: November 2014*	Revised T&L and assessment practices in line with new developments & changed behaviours towards a culture of excellence.	-Monitoring of the implementation of CUT T&L Plan by relevant stakeholders. -Faculties develop T&L plans aligned with CUT T&L Plan and implement T&L and assessment practices.
Timeframe: September 2014	Increased and effective use of technology in T&L.	Revise the CUT e-learning strategy for 2015-2020 & beyond, in line with international and national trends; resource needs & possible partners and approved by Senate.

Table 7.1: Key performance areas, performance indicators, targets and timelines

The key observations regarding the SOPAD are outlined below:

- Although the University had seen some measurable percentage increase of subject integration into e-Thuto in the previous years, the SOPAD still stressed the need for additional approaches that would enhance the use of educational technologies.
- This shows that the University has been unrelenting in its passion to use technologies in ways that generate recognisable value and at the same time realised some limitations in the ways that educational technologies had been used before.
- Therefore, SOPAD makes 2014 stand out as a year beyond which more rigorous strategies had to be implemented and growth in educational technology could be realized.

7.2.3.5.2 Central University of Technology Teaching and Learning Plan (TLP 2014 – 2020)

As mentioned in chapter 5, the CILT is a unit responsible for innovation and oversight around all the teaching and learning activities. The relevance of this document to this study is that it provides guidance and boundaries on the implementation of all innovation that affects teaching and learning. This means that all educational technology that the university implements is the responsibility of the CILT and its subsidiary units. The purpose of the TLP is to strengthen the University's commitment to teaching and learning, which is one of the three components of the institution's core business. The alignment of the TLP with vision 2020 and the strategic objectives of the University suggests that the plan is a vehicle towards achieving Institutional long-term plans. The TLP singles out the following goals as strategic goals of vision 2020 that it intends to support:

- *"Development of a new ethos, attitudes, behaviours and relations among and between staff and students. New organisational design, function and structure aligned with Vision 2020.*
- *Development of state-of-the art facilities.*
- *Development of high-level skills and competencies amongst academics, especially younger members and designated groups.*
- *Pre-university programmes for students in SET.*
- *Student-centred methodologies and facilities.*
- *Emancipating, empowering and supportive engagements and transactions between students and staff.*
- *Focusing on innovation for industrial and socio-economic development.*
- *Development of strong links with business and industry through public and private partnerships (PPP) and other mechanisms.*
- *Development of new curricula that is responsive to the needs of students, employers and society" (TLP 2014 – 2020:2-3).*

- Implications of the plan on technology use

The University's CILT pledges, under the heading *"create a technology-rich education environment"*, to support and encourage utilisation of electronic modes of delivery through its CeLET. The intention is to improve student access to learning by enriching the environment with useful technology. Thus, both students and lecturers must be empowered for this purpose with educational technologies being for the transformation of content. Moreover, technology should enable interactive learning. The expectation thereof, is that the successful implementation of electronic delivery by lectures will reduce the amount of face-to-face contact sessions and eliminate reliance on space and time bound learning.

The CUT is fully aware of the plan's implications on its status as a UOT that should be in the forefront of best uses of modern technology. The institution aims at supporting the implementation of the plan through easy access to internet connections throughout the campus so that students and lecturers can interact smoothly. Some additional strategies that support the idea of technology-rich education at CUT, as embodied within the TLP are:

- *"Setting up Smart Classrooms/interactive classrooms for all four faculties and the Welkom campus. One such classroom has been launched for the Hotel School. The technology installed in this classroom allows interactive teaching and learning within the class and between the students in the classroom and the kitchen, which cannot accommodate large numbers of students.*
- *The university is also embarking on a wireless project to ensure that students can use any space on campus and in the residences as a learning space"* (CUT, 2014-2020: teaching and learning plan).

The table below summarises goal number 5 of the Teaching and Learning Plan through which the University intends to establish a technology-rich environment. The table below depicts how the use of educational technologies evidently acts as an unrelenting force toward growth. Blackboard Learn and improvements around its utilisation are unavoidable means of growing educational technology use.

Goal	Objectives	Strategy	Responsibility	Timeframe
Goal 1: To implement e-learning by using Blackboard.	Ensure sufficient server hardware.	Install and maintain appropriate hardware.	ADS (CeLET)	Done
	Ensure effective server maintenance and administration.	Use a maintenance contract to provide maintenance.	ADS (CeLET)	Contract in place
	Implement a Blackboard Community System.	Pilot a Blackboard Community System.	ADS (CeLET)	Done
	Train and capacitate academic staff.	Conduct training workshops for lecturers. Ensure individual supportive training for lecturers.	ADS (CeLET) ADS (CeLET)	Continuous process Continuous process
Goal 2: To upgrade educational technology in classrooms.	Develop a technology-rich classroom environment.	Install basic technologies (data projectors and IP links, etc.) in all classrooms. Install network points in all classrooms. Ensure campus-wide wireless access.	ADS (CeLET) IComTech IComTech	Done Replaced by wireless access. Done

		Provide video- and audio-recording equipment for recording of learning material.	ADS (CeLET)	
Goal 3: To implement new technologies.	Ensure the usage of digital, audio, video recorders and other mobile technologies.	Record lectures in class for students to access from all learning spaces, including homes, workplaces and mobile phones. Encourage the use of clickers (interactive mobile learning) to promote technology integration and assessment in large classes. Introduce e-portfolios to support the graduate attributes project.	ADS (CeLET) ADS (CeLET) ADS (CeLET)	Continuous process Done Done
		Create a technology-rich active learning class environment. Establish active learning centres/Smart Classrooms for each faculty and for the Welkom campus.	ADS (CeLET) ADS (CeLET)	Continuous process First ALC done 2014/2015
Goal 4: To do research into new educational technologies.		Investigate and implement mobile learning, PC tablets (iPads, etc.) and other new technologies.	ADS (CeLET)	Report submitted Blackboard module 2014

Table 7.2: Technology-rich environment goal. Source: CUT Teaching and Learning plan (2014-2020)

It is therefore evident that:

- The university and its various centres' policies should primarily serve the higher interests of the Institution. As a result, the TLP is aligned with the University's vision and strategic objectives. However, there is no indication or suggestion, within the institutional objectives that the TLP targets, which seeks to achieve teaching and learning that is cost effective. The plan to enrich teaching and learning with technology is undoubtedly present within this policy. Nevertheless, the foremost inspiration is that all teaching and learning with technology should be learner centred.
- The TLP, being one of the foremost official documents that determines the nature of progression and innovations within teaching and learning as a core business, does not include financial sustainability goals embodied within the Vision 2020 and Strategic Objectives. Thus, the manner in which the core business is run is not likely to yield any significant goals.
- The prior-TLP-time main impact of Blackboard Learn, the main technology earmarked to enrich teaching and learning with relevant technology at CUT, was in the area of subject integration.

Evidently, there has been a desire to improve the use of Blackboard, which may be regarded as admission that the tool has not been used proficiently.

7.2.3.5.3 Central University of Technology Annual Report (2014)

The report states that, *"there has been a consistent growth and increase in the number of subjects/modules using e-learning/blended learning - from 19.63% in 2009 and 76.46% in 2013, to 87% in 2014".* Nevertheless, the difference (10.46%) between 2013 and 2014 reveals a decreasing growth in subject integration on a web platform compared with 19.46% growth difference between 2013 and 2012. In line with the 2014 annual report, the E-learning strategy mentions that in 2014 the University boasted 87% of subject integration. This denoted only online content sharing of documents and items such as study guides, and to a lesser extent study material on e-Thuto. The report also shows that in 2014, a small number of lectures facilitated learning through video attachments (about 20 videos uploaded monthly) and other records. However, there was an expectation of an increase in the following years to match up with the goals of web technology implementation. One of the goals was to blend traditional learning with web technology use. Some obvious results would be in the lectures ability to transfer teaching audio and video records into this web platform prior to normal classroom engagement so that in class, students and lecturers can interact more and discuss preloaded visuals.

7.2.3.6 2015 Implementation of the new e-learning strategy

This chapter has already introduced the strategy. However, a more specific discussion was reserved until this point because this chapter evaluates documents and the interconnected impact of web technologies within specific times. In addition, this strategy was implemented in 2015.

7.2.3.6.1 The Central University Of Technology E-Learning Strategy 2015-2020 AND beyond

As contemplated within SOPAD (in 2014), the E-learning strategy was developed by the CeLET in 2015 as an outline of institutional objectives, drivers and implications of implementing educational technologies. The University intended to use this strategy to grow the idea of web-based facilitation of teaching and learning. The realisation of the intended effects is within and beyond the five years of implementation. The plan projects the realisation of effects such as redirection and use of educational resources in ways that create value for the University. The use of web-based educational technologies, as purposed within the E-learning strategy, greatly refers to the utilisation of e-Thuto. It is a web-based technology, which also functions as a platform for the accessibility of other integrated web technologies and their intrinsic abilities to allow interactivity, interconnectivity and collaboration among users. Hence, the benefits of web tools relate mainly to the optimal usage of e-Thuto, an observation that is undermined by the reality that there has not been a higher use of the platform. Further discussions will expose why this state of affairs exists.

- *The international, local and university motivations*

The policy was induced by the international, national and unique University influences. The University mainly seeks to accommodate technological innovations that allow flexible modes of pedagogical delivery so as to become highly competitive and responsive to the current learner's needs. In this case, acceptance of web technologies is driven by similar motivations to those in other parts of the world where responding to the current learner's needs is accepted as a driving force to adoption of web technology (Armstrong and Franklin, 2008:12; Bosch, 2009:197-198). The local context is stimulated by the DHET and its take on international and local trends. The DHET has determined that the current trends in technology have the potential to transform teaching and learning and curriculum development as the core business of universities. It is of the view that tools enable universities to fulfil their core business in an efficient manner and combat the current resource scarce environment. These assertions concur with literature recommendations that web technologies within the intensifying scarcity of resources should be implemented as cost-effective modes of delivery for universities (Dlalisa and Van Niekerk, 2015:2, 3). Nevertheless, the purpose for web technology implementation at CUT does not address this financial orientated problem. Hence, it is evident that the policy's idea of "r*edirection of resources in ways that create value"* cannot be achieved without cost-effective operations. However, the idea of financial benefit is not explicit nor is it implied within this policy.

Although CUT started with the implementation of WebCT in 2002, growth in subject integration only begun in 2009 with the start of Blackboard Learn use. However, the cost containment implementation document made by the CFO seven years later in 2016 revealed a rise in operational costs on items such as stationery, printing, communication, travelling and accommodation. The fact that the CCI thought that these costs could be curbed through taking advantage of available web technologies is evidence that the University had not been using the tools efficiently. A more detailed discussion of the CCI is reserved for the next chapter. The E-learning strategy itself acknowledges that web technologies at CUT are underutilised: *"The focus of e-learning at CUT has been managing the learning process and delivering content by electronic means (blended learning programme delivery). Lecturers have been encouraged to use electronic delivery means in the mainstream curriculum and to support this with e-learning to take advantage of among other things, reduced time in face-to-face mode while presenting some parts of their courses electronically. The main aim has been to have an interactive learning environment where students could freely engage with each other, the learning material and their lecturers without confinements of space and time - on or off campus. All these endeavours can be applauded; however, e-learning is much more expansive than what we have for long kept ourselves busy with and while limitations cannot be ignored, many opportunities abound".* The acknowledgement concurs with Armstrong and

Franklin's (2008) observation that policies relating to web technologies have been the main contributors towards ad-hoc adoptions because they encourage utilisation rather than urge it.

The unique University context has the vision 2020, SOPAD and other institutional plans as its background. The CUT seeks to use the E-learning strategy to realise incremental improvement in the utilisation of the web space for interaction with students, which will see the decline of reliance in physical space for learning. These areas seek encompass h the inherent transformative effects of web technologies (Veletsianos, 2010:3). Therefore, the utilisation of the tools to their potential would allow students to learn without the limitations of space while saving time and cost associated with manual procedures. A further analysis of the E-learning strategy reveals that it contributes directly towards the University Graduate Attributes such as innovation and problem solving, communication, team work and technological literacy. This gives an impression that the use of web tools at CUT is indispensable seeing that it is driven by various mutually inclusive factors. For instance, e such graduate attributes can only be achieved through teaching and learning. Therefore, the policy is supposed to be one of the main change agents of how the core business is carried out.

A proper implementation of the E-Learning policy should generate recognisable value. Recent research (Dlalisa and Van Niekerk, 2015:2, 3) notes the ongoing resource reductions *vis-a-vis* increasing demand for higher education and thus recommends this financial outlook. Web technologies can help universities face these increasing problems because as research reveals, they serve a large number of people with less efforts and few resources (Penzhorn, 2013). Although the university has been attracting large numbers of students as well as introducing additional courses (CUT, 2017: Archives) web technologies are not being used to address this increasing workload. Rather, as the archives reveal, the University has been responding by increasing academic staff members, which means more costs to the University. Thus, the reality is that CUT is not optimally implementing the policy in a way that will generate value for the institution. This is because it lacks the financial outlook as one of the unavoidable contributors to efficiency within the Vision 2020 and Strategic objectives.

- *Implications of educational technologies as embodied within the E-learning strategy*

According to the strategy, the use of educational technology has the following implications to faculties and staff members:

1. *"The use of a variety of appropriate educational technologies to model and deliver instruction.*
2. *Assisting faculties to make individual decisions on the effective use of technology in programmes, including modelling appropriate uses of presentation tools, resource gathering on the internet, simulations, multi-media and evaluation tools.*

3. *Assisting faculties to acquire the knowledge and critical dispositions to apply educational technology as learning facilitators.*

4. *Providing faculties with on-going professional development opportunities.*

5. *Assisting faculties to critically evaluate internet resources for teaching and learning.*

6. *Assisting faculties to determine the impact of educational technology on teaching and learning practices, curriculum and e-learning research"* (CUT, 2015-2020, e-learning strategy).

The actualisation of these implications will result in a radical transformation that has a potential positive financial impact on the organization. There must be an increase in availability of courses on web platforms in order to realise the financial benefit. Extending the availability and use of e-learning to beyond content availability will harness further benefits for the institution. However, interactive tools must be utilized in order for the web technologies to facilitate teaching and learning. The transfer of organisational operations to the web space is considered a contributing factor to the cutting of operational costs through a decline of manual and paper-based procedures.

The period up to 2014 witnessed a growth in the use of web technologies for subject integration and various activities. In the main, this growth relates to the implementation and revision of e-learning related policies, and to some extent, the training and support of academic staff. From 2015 onwards, the growth of web technologies relates mainly to the successful implementation of the E-learning strategy. The following tables display eight strategic objectives, also known as guiding principles of e-learning, contained within the E-learning strategy. Each strategic goal has specific targets, which should be achieved within a certain period. At the same time, some targets are meant to be achieved over a prolonged period. Hence, the years 2015 and beyond become an additional key indicator to the benchmark of 2009 to 2014, regarding the effects of web technology within the University.

Objective 1: Promotion of creativity and innovation in learning and teaching

Time-frame	Target	Operational Responsibility
Ongoing	Support and encourage academics to engage with e-learning by identifying potential uses of learning technologies including effective use of VLEs, use/creation of e-resources, appropriate learning design in a subject area, exemplars of best practice.	ADS, - e-Learning & Departments

Ongoing	Provide information, advice and the opportunity to explore new technologies e.g. podcasts, web-conferencing, or multi-media authoring software.	ADS (e-Learning)
Ongoing	Increase numbers and improve the quality of active courses using blended learning. Increase over 2014 results.	ADS (e-Learning)

Table 7.3: Objective 1 of web-based education at CUT

The goal creates the impression that the implementation of the E-learning will improve the manner in which web tools are used at CUT. However, the phrase to *"support and encourage academics"* suggests that the strategy itself does not play a leading role in the staff members' implementation of web technology. The strategy only inspires staff to use and support those who already use them. The same can be said regarding the intention to *"provide information, advice and the opportunity to explore new technologies"*, which do not indicate any certainty that web technologies will be used.

The information provided shows that staff members may or may not use the tools. The period beyond 2014 witnessed a growth in subject integration. This growth merely indicated a growth in the registration of subjects on e-Thuto without explaining the quality of use. The fact that the intention is to *"increase numbers and improve quality of active courses using blended learning"* shows that not all of the registered subjects are active. The policy lacks a clear plan that will ascertain a formal institutional take-up. Nonetheless, the possible after-implementation effects of this strategy could be more freestyle practices that are more complex to conceptualise. Hence, it is clear that the E-learning strategy is not attempting to solve the issue of uneven utilisation of web technology in the short or long run. It can be expected further that beyond the implementation of the E-learning strategy, staff will still use the tools if and as they want.

Objective 2: Development of capacity for provision of e-learning and related support

Time-frame	Target	Operational Responsibility
July 2015	Establish an e-learning committee to discuss operational and strategic issues on a termly basis.	ADS & Departments
January 2016	Recruit and induct 4 Faculty Learning Technologists (designers) that will assist with developing e-Thuto courses.	Departments
Ongoing	Interface with Information Services with regard to:	ADS; Icomm Tech

	• provision of core technologies (VLE administration and technical issues), • piloting and further implementation of peripheral technologies, including plagiarism technologies, classroom technologies and software.	
Ongoing	Provide staff development for core and peripheral technologies.	ADS

Table 7.4: Objective 2 of web-based education at CUT

The plan to use web-based tools also drew from additional support offered to academic staff by the e-learning unit. The perception is e-learning contributes to improved usage of web tools for teaching and learning. It is the researcher's conviction that increased support leads to increased usage, which leads to change in daily operations and increased financial benefit. However, the journey towards the recognisable benefits will be undermined if the take-up of web technologies is not institutionally formalised and staff members are allowed to implement the tools at personal will. The technologies are available, and many more are being implemented or incorporated regularly but what is lacking is an over-all custom of use. An absence of a carefully mandated exploitation of the tools will not yield any benefit to the CUT. Further weakness observed here is that training sessions are conducted in an individualistic way as if to encourage the freestyle use of web technologies. The centre for e-learning conducts training to staff members who have time and will to attend such a training. In that sense, one may suppose that some staff members who do not see this as a priority will not avail themselves for such training. At the same time, attending a training does not itself suggest that the technologies will be used, and for the benefit of the institution.

Objective 3: Supporting institutional strategies in teaching and learning and informing e-learning developments in departments

Time-frame	Target	Operational Responsibility
Not mentioned	Assist departments to incorporate e-learning implementation into departmental plans and annual monitoring reports.	
November 2015	Centrally provide a VLE module complete with basic administrative information.	Icomm Tech; e-Learning
November 2015	Develop the e-learning website to disseminate best practice, case studies and other relevant information (e.g. national initiatives, key documents, guidelines, etc.).	e-Learning Unit; Department of

		Communications & Marketing
Ongoing	Create networks for discussion, support and sharing best practice.	ADS, Departments
July 2015	Provision/expansion of bandwidth and wireless.	Icomm Tech
Ongoing	Ensure the development and maintenance of flexible physical and virtual teaching and learning spaces.	Icomm Tech

Table 7.5: Objective 3 of web-based education at CUT

The same comment, as above, is relevant to this objective. This objective appears focused towards supporting emerging practices within University departments than on the direction for the use web technologies. Impliedly, the responsibility of the e-learning centre is to make available potentially useful technologies and best practices. The University management on the other side has to supply the budget. However, the utilisation of the tools by the intended users is not ascertained chiefly because it is not compulsory. It appears as if the e-learning centre can only make meaningful contribution to technology take-up if university departments have a growing interest in web technologies.

Objective 4: Supporting flexible delivery

Time-frame	Target	Operational Responsibility
November 2015	Provide expertise in designing both blended and fully on-line courses, for use in a variety of learning environments, including student support, accessibility, quality considerations, increased student enrolments.	ADS
November 2015	Advise on the use of VLE and other technologies to support students on flexible or blended courses.	ADS (e-Learning)
November 2015	Develop online courses in identified niche/flagship programmes (1 per Faculty).	ADS (CCD; e-Learning); Departments

Table 7.6: Objective 4 of web-based education at CUT

E-Thuto is as a flexible mode of delivery because it is not limited to traditional places and ways of engagement. A statement by **R2** indicates this fact: *"...lecturers do not have to be all at the same place, because that is the principle of flexible learning".* The utilisation of online assignments and tests also enables flexible delivery because the lecturer as the designer and the students as respondents do not have to be in a formal environment to fulfil their tasks. Provision by the University to allow access to all other useful web tools may be seen as another form of flexibility. However, this may contribute to uneven utilisation that inhibit an organised and measurable growth of technologies.

Objective 5: Promotion use of technology in assessment

Time-frame	Target	Operational Responsibility
Ongoing	Support the use of technology in formative assessment and feedback e.g. VLE assessment tools and plagiarism tools.	ADS (CCD, Teaching & Learning, e-Learning
November 2015	Review current best practice of summative e-assessment and provide recommendations for use and development.	ADS
November 2015	Provide University guidelines for using e-assessment summatively.	ADS
Ongoing	Engage with the unit responsible for assessment to explore possibilities for e-assessment.	ADS

Table 7.6: Objective 5 of web-based education at CUT

Traditional ways of assessment contribute to high printing and stationery costs. The use of web technology in assessments forms a significant part of the University's way of doing things and is supposed to yield cost reductions. However, the impression given by the statement to *"support the use of technology in formative assessment and feedback"* shows that the e-leaning department has no initiating role if there is no intention by staff members to use the tools for assessments. Another goal to *"review current best practice of summative e-assessment and provide recommendations for use and development"* seems to suggest that no one is expected to use the tools because recommendations may be made without any serious expectations. To "*provide University guidelines for using e-assessment summatively"* while there is no institutional policy mandating the use of e-assessments sounds like mere good advice which may or may not be adhered to. According to the focus group discussions, some lecturers are now utilising online tests in their respective classes. However, it has already been shown that this function is not utilised well and that it remains an objective within the E-learning strategy is an additional evidence. Moreover, one would expect that

the policy to have at least an over-all target on the number of subjects per faculty that should be using summative and formative e-assessments within a certain time frame similar to the way subject integration has been established in percentage form.

Objective 6: Provision of student support

Time-frame	Target	Operational Responsibility
November 2015	Ensure students are made aware of the support available to them for using the VLE.	Departments; ADS (e- Learning)
November 2015	Ensure students are aware of how their courses use the VLE and the related expectations on them e.g. submission of assignments, frequency of logging on, input to discussion boards, etc.	Academic staff; Departments; ADS (e-Learning)
November 2015	Provide an institutional VLE training module for students to cover all tools including e-submission via plagiarism tools.	ADS (e-Learning)
July 2015	Provide information on study skills and developing e-learning techniques and strategies.	ADS
Ongoing	Support student engagement in the use of e-portfolios e.g. PebblePAD.	Departments; ADS
Ongoing	Increase student learning experience and satisfaction with learning technologies and e-learning provision.	Departments; APU; ADS

Table 7.8: Objective 6 of web-based education at CUT

The provision of support to students can also be likened to staff support. Support given to intended users increases institutional wide acceptance and utilisation of the tools. As students learn how to use the tools, it encourages further pronounced utilisation by staff members. Armstrong and Franklin (2008:1, 2) found out that the valuable utilisation of web tools depends also on the ability of the students to use them. This means that it is easy for staff members to utilise the functions of web tools that student users are already conversant with. Therefore, the achievement of objective number 6 will result in an increase in web technology usage. There will also be an improvement in the way that the tools are used. As much as the use of the tools by staff members might depend on student use, an argument by the researcher is that academic staff's habits on the use of web tools can contribute more to the use of web tools. Students are most of the time ready to work with what

the lecturer uses. In agreement with Ramdeyal (2014), the disinclined use of web tools by staff members is the major stimulus behind lack of growth and poor quality of use.

Objective 7: Engage in research: learning technologies and/ or their application in learning and teaching

Time-frame	Target	Operational Responsibility
Ongoing	Identify current areas of good practice, or develop a practice base which is sufficiently robust and innovative to support bids for externally funded projects.	Academic staff; Departments; ADS
Ongoing	Actively engage with external organisations such as DHET , CHE and SETAs, and identify potential opportunities for research projects.	Academic staff; Departments; ADS
November 2015	Develop a reward and recognition scheme to recognise and encourage e-learning best practice.	ADS
Ongoing	Develop e-learning as a research niche.	ADS, SoTL Unit, Departments

Table 7.9: Objective 7 of web-based education at CUT

Relevant research, which may not immediately result in financial benefit, informs good and effective practices. Effective practices will in turn result in significant benefits to the institution. Whitmer, *et al.,* (2016) have suggest the need to research some best practices that exist elsewhere so that they may be used as exemplary situations for other courses or institutions. One may conclude that the centre for e-learning is well equipped with such expertise, but they do not carry the mandate to lead the way at CUT.

Objective 8: Support monitoring, evaluation and quality assurance

Time-frame	Target	Operational Responsibility
November 2015	Monitor and evaluate the use and impact of e-learning in departments to inform the departmental plan, annual monitoring report and QEP.	Departments; ADS (e- Learning); APU

Ongoing	Collect and analyse student feedback on their e-learning experiences.	Departments, Academic Staff; APU
November 2015	Gather data on the use of e-learning at CUT to allow comparison with national benchmarks and inform future institutional strategic developments.	ADS (e-Learning); APU
November 2015	Ensure that all regulations relevant to e-learning are readily available via the e-learning website e.g. University regulations, information and guidance on e-copyright, IP, QEP, etc.	ADS (e-Learning Unit); LIC

Table 7.10: Objective 8 of web-based education at CUT

This is especially important for this study which depends on the reports and observable usage of web tools. Reports on the level of web tool usage are used to discern possible operational changes and therefore possible financial effects. As much as these objectives endeavour to *"Monitor and evaluate the use and impact of e-learning in departments to inform the departmental plan, annual monitoring report…"* there is no report that could be found through which the use of e-learning was evaluated at faculty and departmental level. The only report on the growth of subject integration is at institutional level. Hence, it would be much easier to measure these uses and inspire best practices if the technologies were used as an institutional mandate that considers faculty and departmental levels.

7.2.3.6.2 CUT annual report (2015)

One of the goals of the E-learning strategy was to improve the number of subjects on e-Thuto from the 87% recorded in 2014. The 2015 annual report notes that subject integration on e-Thuto increased to 91.46%, which indicates that the use of educational web tools is continuing to grow in impact. The intention of the institution, as communicated by the vision and strategic plans in 2010, was to increase subject integration to 80% by 2015. As a result, the 91.46% achieved in 2015 indicates a speedy growth of web technology that is above expectation.

A further observation is that a comparison of previous years, where subject integration was growing at an increasing rate, shows the 3% increase from 2014 to 2015 as a decreasing growth. This may be explained by the fact that e-Thuto was no longer being used as a repository of notes and slowly beginning to be used, through the redirection of E-learning strategy, as a platform of participation and interaction. Nonetheless, there is a sluggish growth of online assessments. As the report states "*PowerPoint slides, notes, exercises, additional reading material, videos, web links, discussions*

and memorandums are placed on Blackboard for students to utilise. Clickers were also used in a number of classes. In addition, video recordings of practical classes are placed on Blackboard for students to refer to again after class". As explained by the report, some progressions in web technology may also be the result of individual faculty initiatives. For example, the faculty of engineering and information technology dedicated the year 2015 to *"Digital Scholarship and the Implementation of Digital Strategy"* where academic staff was encouraged to improve the utilisation of web-based tools by availing all study material on e-Thuto. The faculty further implemented the Digital Signage Networks (DSN) through which students can access *"the digital notice board anywhere, anytime".* The two factors clearly highlight online information publicity and content sharing as the core functions of web technologies within a university.

7.2.3.7 2016: Continuous increase in subject integration

7.2.3.7.1 CUT annual report (2016)

This document reports that the utilisation of educational web tools has been increasing as noted the 2016 recording of a 95.74% presence of subjects on e-Thuto. The reasons for this small increase are the same as those for 2015. Subject integration is reaching its maturity and this is resulting in the realisation of other functions that are more useful. In other words, emerging now is the way in which the web tools are being used. [The University centre for e-Learning used the E-learning strategy as a means to respond to the limitations noted in the way e-Thuto had been used. The intention has since changed from one of stimulating its usage as a supplement to traditional teaching methods and replacement of other inflexible modes of delivery, to one seeking the realisation of benefits beyond subject integration or availability of material].

7.2.3.7.2 CUT innovation in learning and teaching (ILT) annual report (2016)

This document, which is the sole responsibility of the CILT of the University, presents an annual report that revealed that the university continues to make additional developments through its centre for e-learning. These developments enhanced technology use-up by staff as well as eliminate operations that do not generate value. A web-based survey software called "Question Pro" was implemented in 2016. The implementation was supplemented with various training sessions to equip users with the skills that would enable them to use survey software efficiently. Hence, the respondents' answer to the question: "what web technologies are available at CUT?" yielded answers that mentioned this tool. For example, **R1** noted the following in his answer: *"Blackboard Learn LMS, Office 365 including Skype for business,* ***QuestionPro online survey"****.* In addition, **R2** elaborated that: *"QuestionPro is only available for masters and doctoral students' engagements".* However, this annual report highlights further that the tool was only adopted in 2016.

Question Pro is usable on various kinds of tools like desktops, smartphones and tablets. Through it, users can:

1. *"create online surveys;*
2. *create polls that can be taken live during a class session;*
3. *share a link to a questionnaire on e-Thuto, resulting in the elimination of bulk e-mails; and*
4. *analyse the results with the software's automatic reporting features, which includes a summary, pivot tables, segmentation tools, trend analysis, and text analytics" (CUT, 2016: ILT annual report 2016).*

The same document reports further that the University has implemented a video studio that allows lecturers to create visuals for uploading on e-Thuto to allow unlimited accessibility by staff and student users. It reported that two cameras record the lecturer and his demonstration concurrently during a recording session. A practical benefit of this facility was appreciated during the Fees-must-fall student campaign when traditional classes could not continue in a physical space. Some lecturers simply uploaded their virtual presentation on e-Thuto for students to access, thus indicating another potential of web technologies to transform education, which is however not properly taken advantage of. Web technologies were utilised under some level of external and unforeseen pressure such as Fees-must-fall. Therefore, incompetency of staff in using the tools may be an insignificant factor. The importance of using the tools does not appear to be pressing enough to staff members. This shows that there is a need for the University to introduce some additional impetuses to web technology take-up through policy.

7.2.4 Four generations of web technologies

A previous discussion focused on the progression of web technologies that is conceptualized within four generations. This segment of the study integrates the four web technology generations (web 1.0, 2.0, 3.0 & 4.0) within the prevailing web veracity at CUT. The ability to use the web as a platform indicates whether that a technology is indeed a web technology or not (Getting, 2008; Zheng *et al.,* 2010:13). Hence, a description of features of e-Thuto shows that its make-up and inherent competencies meet the requirements of a web-based platform. E-Thuto has publicity functions attributed to the first generation of web technologies (Getting, 2008). However, the singular use of publicity is an underutilisation of web tools although it may affect printing and stationery to some extent. Therefore, an explanation of the financial benefits of web technologies, through publicity should not be ignored even though additional cost cutting benefits can be achieved through utilisation of interactive functions.

Web 2.0 concept is present within e-Thuto through that include blogs, discussion boards, assignments and group work. They allow for a platform of participation and collaboration among users. It is this advanced and yet underutilised usage of web tools that permit additional benefits that are not possible through web 1.0 modes of publicity and content sharing. Publicity is subsumed

into the web 2.0 setting. Four categories of web 2.0 functionality, ***publicity, syndication, collaboration and recombination***, (Rudman & Steenkamp, 2009:3) and the related tools are available on e-Thuto and can be accessed under course management area. Here, ***Publicity*** refers to the presence of functionalities such as announcements means that enable e-Thuto to fulfil the idea of ***publicity*** within a different generation of web tools. ***Syndication*** relates to the availability of tools that include RSS or newsfeeds, social tagging or bookmarking. These tools indicate that e-Thuto is an environment, which allows for sharing, consolidation and sourcing of information from various sources on the web. Thus, the function allows for a better sharing of content that takes advantage of web 2.0 phenomenon. ***Collaboration*** refers to the presence of a function such as Blackboard collaborate that enable user collaboration within e-Thuto. The function allows the formation of online communities so that they collaborate on academic projects and assignments. ***Recombination*** refers to the presence of tools such as podcasts and mash-ups that are associated with the recombination idea that is unique to web 2.0 concept. The use of web 2.0 disrupts the centrality of the standalone computer in the running of the core business. The recombination and syndication phenomena can be used within any of the core functions of web technologies such as publicity, content sharing, collaborations and assessments. As a result, universities can save tremendously on resources by utilising what students have rather than constantly spending to make resources available.

The availability of Web 3.0 within e-Thuto is embedded in its ability to allow human to computer interactions (Getting, 2008; Hendler, 2009). The presence of such a function extends the usability of e-Thuto beyond online human to human interactions and collaborations. For example, a tool like safeAssign offers a human user the plagiarism report by comparing the user's document with other sources over the internet within seconds. Consequently, the function allows humans to interact with the web or web tools.

The technologies that serve the web 4.0 functionalities are not yet clear in literature. However, the suggestion is that the presence of web 4.0 is determined by the independence of the web or web tools from human initiative for functionality. An environment of web interdependency and the ability of the tools to transact within themselves is suggestive of the fourth generation of web tools. This freedom of interaction within e-Thuto may be prohibited by the formalised nature of LMS within a university environment. Nevertheless, the platform of e-Thuto allows users to access unlimited web services in ways that are not always formal.

7.3 Understanding subject integration into web technologies at CUT

The growth in web technologies at CUT has been in subject integration or registration on e-Thuto. This study understands subject integration to mean the web as a platform of engagement. This suggests that there is need to explain further how the core functions of publicity, content sharing,

assessment, collaboration and management are being utilized within the web as a platform. At CUT, subject integration has been measured along the number of subjects that are active on e-Thuto as a fraction of the total number of subjects offered within a specific year. The analysed official documents and focus group discussions suggest that online publicity, through announcements, appears to be the most utilised core function of web technologies. The growth in subject integration meant an increase in the number of subjects where content sharing occurred on this institutional platform. In addition, content material in terms of documents, a few videos were shared with students as content material, thus adding another way of contributing content.

As Table 7.11 below shows, some phased out subjects are excluded even though some repeating students could be studying them. The table shows that the total number of active subjects on e-Thuto has been increasing in a constant manner with the number the number of subjects active on e-Thuto between 2009 and 2010 growing by 12.11% while total number of subjects remained the same. However, the total number of subjects decreased by 2011, which indicates that the 12.96% increase may be regarded as a small increase. Conversely, the consideration that the total number of subjects increased in 2012 makes the 12.64% of subject integration a significant development. Further reflections from the table show that 2013 witnessed a reduction in the number of subjects offered and a 19.12% increase of active subjects on e-Thuto. In 2014, there was an increase of total subjects offered, which explains the lower 10.91% increase in subject integration. The last three years (2015, 2016 and 2017) also witnessed lower increases in subject integration. Nonetheless, the University celebrated all these achievements in spite of the fact that they are just the threshold of what web technologies can offer Moreover, the fragmented way in which the technologies are used demeans their professed successes. An excellent achievement would be reflected in the way the institutional transitions into other core functions such as assessments and collaborative projects. At that point, an institute would begin to see a significant financial contribution.

Year	Total number of subjects offered	Total number of active subjects on e-Thuto	Percentage Increase	Percentage of active subjects on e-Thuto
2009	983	193	0%	19.63%
2010	983	312	12.11%	31.74%
2011	944	422	12.96%	44.70%
2012	1 233	707	12.64%	57.34%
2013	1 164	890	19.12%	76.46%
2014	1 188	1 038	10.91%	87.37%

2015	995	910	4.09%	91.46%
2016	921	962	4.28%	95.74%
2017	1280	1252	2.07%	97.81%

Table 7.11: Presence of courses on e-Thuto from 2009-2017. Source: CUT: 2015-2020, e-learning strategy

The table above is explained too by a line chart, as shown below, which shows that subject integration increased almost constantly for most of the years within the latter interval of the study – 2009 to 2017.

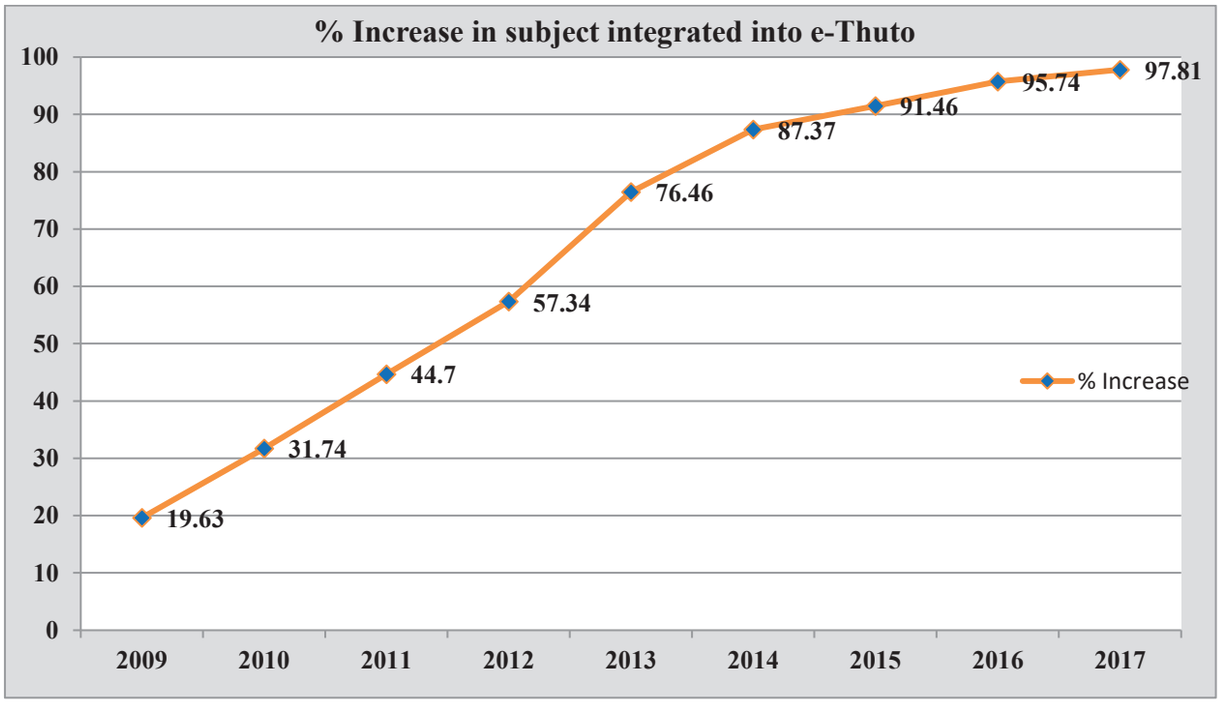


Figure 7.14: growth of subject integration into web technologies at CUT

7.4 Chapter summary

This chapter evaluated the specific web technologies that CUT has implemented and their impact on the institution's teaching and learning. It established e-Thuto as an LMS that houses most of the web technologies for teaching and learning at CUT. The chapter also noted that the growth in the utilisation of web tools at CUT is linked the process of increased subject integration mainly for the updating of subject material and announcements and in the use of assessments and collaborative projects. This kind of growth expanded the use of web tools to other newer generations of web technology. In that setting, web technologies would be used for both supplementary purposes and evaluative patterns. It was also noted that the newer patterns allowed for more rigorous transitions from manual procedures and permited the use of web technologies for what they are. Nonetheless, it was noted that the supplementary patterns had financial benefits, which were only limited to cost

savings on stationery and printing expenses. A further pattern noted here is that, the use of web technologies took the university to another level thereby expanding the set of benefits such as eliminating the reliance on physical space for teaching and learning as well as stationery costs related to assessments and assignments.

The chapter has outlined specific time periods that stand out as highlights of web technology development. It was observed that the E-learning strategy specifically stood out as the official document that explains the institutional take-up of web technologies. However, the document does not carry adequate authority to mandate the institutional adoption of web technologies. The Researcher noted that it has a tone that is too suggestive and unintentional to have initiated the essential change. Moreover, other institutional policies on assessment and handling the related material authorise these manual processes by academic staff. Finally, the major observation was that the implementation of WebCT in 2002, of Blackboard in 2009 and the current e-learning strategy in 2015 meant that, the only certain change was subject integration. This underlined the need to accept a more vigorous strategy of web technology.

This chapter also revealed that, while web technologies have the potential to transform the core business of the University in ways that contribute financial value, their underutilisation at CUT prohibited such benefits. The potential also fell short of the University's sustainability goals embodied within the Vision 2020 and Strategic Objectives. Another important discovery is that the University's e-learning strategy and teaching and learning did not have the financial objectives as a stimulus towards web technology implementation. Even though the current chapter identified weaknesses in the way web technologies are used at CUT, it also mentioned some successes in subject integration. At the same time, it was not clear which subjects are active on e-Thuto as opposed to those which are only registered.

The next chapter focuses on further data analysis seeking to detect the financial effects of web technologies based on their potential to reduce the operational costs by replacing some cost bearing factors within the core business of the University.

CHAPTER 8: DOCUMENTARY ANALYSIS OF THE WEB TECHNOLOGIES' FINANCIAL EFFECTS AND MEASUREMENT PRACTICES AT THE CENTRAL UNIVERSITY OF TECHNOLOGY

8.1 Introduction

Analysis of data relating to the first research question of the study was done in the previous chapter. This chapter, which focuses specifically on the study's research questions 2 to 4, assesses the potential effects of web technologies at CUT in relation to ideas established in available literature. It also investigates the existence of any financial practices used by the University in order to assess the financial impact of web technologies. The chapter also sets a platform for a framework of the study by revealing the actual operational effects of specific core features of web technologies on identified cost bearing financial statement items. It also evaluates the role and impact of the operational changes in triggering new patterns within the operations of the university as these new procedural patterns hold the potential to initiate new cost and profitability patterns.

8.2 Financial contributions of web technologies

The second research objective was addressed by asking the research question: What are the potential financial contributions of web technologies to CUT? An analysis of documents and focus group discussions revealed the following findings:

8.2.1 Web technologies replace costly operational structures

The use of web technologies affects operational costs of an organisation in the following manner.

8.2.1.1 Web technologies lead to financially efficient procedures

The 2010-2015 and 2016-2020 vision and strategic plans were reviewed to determine the implications of e-learning on financial efficiency of the University. Apart from the aspirations of becoming a highly competitive educational hub, the document reveals that CUT faces dynamic and challenging socio-economic factors that signify the need for the university to adapt to change. Therefore, the CUT's striving towards its *"priority socio-economic development outcomes",* shows its plans to direct its academic goals with a keen financial stability.

The document analysis also showed that the financial implications are inferred from goal 7 but explicit in goal 8 in the outlining of nine of the strategic goals of the vision and strategic plans. The CUT's goal number 7 is part of the institution's plan to achieve **'Operational Effectiveness, Efficiency and Quality'** explained as *'optimizing key processes that have an impact on institutional performance.'* The document states that achievement of this goal will be facilitated by an 'improvement *and enhancement of management and administration of the institution', 'continual review of the effective use of institutional resources' and 'improvement of quality of internal communication'*. However, as underscored in the previous chapter, efficiency cannot be achieved

without any effective financial control. The field of cost and management accounting holds the same view that value-creating activities cannot be attained without an effective management of cost, and that management of cost should focus on a specific business unit (Horngren *et al.,* 2008:32). The implication of both assertions is that teaching and learning, as the core business, should be the main target of cost-effective techniques. In addition, the techniques should be focused to faculties and departments of the university.

The document review also showed that goal number 8 of the strategic plan directly speaks of **'Financial Sustainability'**. The University plans *"to ensure financial sustainability"* by *'incurring expenses based on the value for money', 'exploring opportunities for commercialization', 'creating a focused vehicle for third-stream income activity', 'exercising sound financial control', 'increasing reserves and investments', 'optimizing tuition fees', 'maximizing the state grant', 'implementing transparent revenue-generating strategies', 'enhancing fund raising' and 'implementing a financial turnaround strategy'*. However, an examination of the document holistically yielded the following highlights:

- The vision and strategic plan is an official document that governs all institutional trajectories. It has goals that directly and indirectly speak to the financial health of the University and these goals can be achieved through a financially efficient core business. In addition, the tools that directly drive the core business of teaching and learning, the TLP and E-learning strategy, do not have these goals nor are they even implied. Hence, these documents fall short of research recommendations by Gilfoil and Jobs (2012:644) that the success of web technologies depends on the way in which the implementation is attached to the *'higher order'* objectives of an institution. Here, the higher-level institutional plans are to achieve cost efficiency and yet the implementation of web technologies through the E-learning strategy does not include that purpose.
- The vision and strategic plans stress a continuous dedication to improving the use of technology. The growth of e-leaning was first earmarked and mandated by the vision and strategic plans as well as the financial sustainability goals. This underscores that the TLP and E-learning strategy are supposed to be one of the practical ways to realise the vision and strategic goals. Nevertheless, it was observed that the financial goals that are embodied and earmarked within the vision and strategic plans are missing within the implementation of web technologies as purposed within the TLP and E-learning strategy, thus leading us to consider the latter as not addressing the institutionally recognised financial efficiency goals.
- An established financial fact is that wise expenditure has a direct influence on value creation (Cloete & Marimuthu, 2015:17, 82-85). Value can be achieved by cutting unnecessary costs of service supply in order to increase the profitability of an organisation (Niemand *et al.,* 2006:19).

Furthermore, Hinchcliffe, (2010:31) notes that web technologies can reduce operational costs by eliminating exorbitant daily procedures practiced by adopting organisations. They contribute to less costly internal processes (Barnes *et al.,* 2010:7). These benefits have already been identified within the higher education fraternity world-wide (Grosseck, 2009:480; MacKeogh & Fox 2009:149). Significant here, is the realisation that the proficient use of available web technologies is t central to the achievement of a financially efficient core business. Therefore, the use of web-based tools in education, and elimination of costly procedures will enable the University to '*incur[e] expenses based on the value for money'* that is envisaged.

8.2.1.2 Web technologies reduce reliance on physical space

8.2.1.2.1 CUT Cost Containment Implementation of 2016

The Chief Financial Officer (CFO) compiled CUT Cost Containment Implementation report of 2016 that analysed the behaviour of selected costs during the years 2014 to 2016. It was found out that the document was aimed at encouraging cost-saving procedures that would not compromise the core business of the University. Hence, the introduction of the document reads as follows: *"The issue of cost containment is critical to CUT as much as it is for all other institutions of higher learning in South Africa. As a follow-up to the cost containment workshop and associated resultant report, a formal implementation plan has been developed…. During the year 2016, informal cost cutting plans were put in place…"*

According to the plan *"optimum space utilization not only saves costs, but creates opportunities for income generation through space utilization"*. The above-reference to cost containment implementation suggests the key role of web technologies in achieving financial sustainability and establishing an efficient utilisation of cost bearing factors such as space. Impliedly, the University can reduce some spending patterns on infrastructure and other related expenses by transferring core business to a virtual space. This also has the potential to allow the University to utilise available resources for other income generating activities. The main characteristic of the web – ***the web as a platform*** (O'Reilly, 2010) is the key enabler to reducing reliance on physical space for organisational daily operations. Therefore, it was found out that web tools can enable the University to rethink its spending patterns and utilisation of physical resources. The resulting effects of the plan are shown in a table below and discussed further underneath to show the behaviour of costs in areas deemed critical by CUT.

COST DESCRIPTION	ANNUAL COST			VARIANCE	VARIANCE
	2014	2015	2016	2014/15	2015/16
	R'000	R'000	R'000	%	%
Printing	10 724	11 402	9 248	6,32%	-18,89%

Stationery	1 414	2 314	1 523	63,65%	-34,18%
Advertising	4 958	4 780	4 889	-3,59%	2,28%
Personnel (Salaries, etc.)	375 815	408 919	411 005	8,81%	0,51%
Conferences	4 002	5 884	4 931	47,03%	-16,20%
Travel Management	14 299	15 255	13 668	6,69%	-10,40%
Meetings	7 336	6 561	5 006	-10,56%	-23,70%
Entertainment	4 824	9 955	5 634	106,36%	-43,41%
Management Capacity Building & Support (Legal Fees)	3 351	2 951	6 668	-11,94%	125,96%

Table 8.1: Selected expenditure trend analysis

8.2.1.2.2 Final memorandum- Bulk printing on local printers, 2017

The Final memorandum –Bulk printing on local printers, was released by the ICT service delivery at CUT in 2017 as a follow-up to the cost containment implementation discussed above. The key issues mentioned in this document, which are critical to the analysis of documents in relation to technology implementation and cost cutting measure, are the need for cost containment at CUT and the observation that bulk printing had become a problematic issue within the university. The observation reiterates the point associated with the cost containment implementation to the effect that high printing costs were the main contributor to a high level of operational expenditure between 2014 and 2016. However, consultation with the print office (Konica Minolta) led to the ICT services finding out that paper consumption increased more with machines being repetitively replenished. It was also highlighted with concern that staff members still printed in bulk using the printing room and local printers. Finally, the ICT service appealed to Supervisors, Managers, Heads of Departments and Deans to monitor the utilisation of the printing processes on a link provided and to encourage their subordinates to implement paperless procedures. Based on the analysis of the two official documents, the following conclusions can be reached.

- The introduction of the cost containment implementation is demonstrative of the fact that the universities in SA, including CUT are beginning to feel the pressure arising from escalating operational costs. Literature (Dlalisa & Van Niekerk, 2015:2, 3) has shown that there is a serious deficiency of resources compared with the rising demand for SA higher education which has led to recommendations of web technology take-up as a possible solution to this escalating problem. Therefore, this study views the cost containment implementation as indicative of the CUT financial department's realisation that the use of web technologies leads to cost effective operations.

- Before the implementation of the cost containment implementation during the years 2014 to 2015, there was a rise in operational costs such as in printing (6.32%), stationery (63.65%), travel management (6.69%) and meetings (10.56). The rising of these costs could be attributed to an inadequate use of web technologies. It means that while web technologies were already available for 14 years counting from 2002, and for six years counting from 2009, the university departments still maintained manual procedures. Nonetheless, the university has been celebrating growth in subject integration during the same period when the operational costs were rising, thus suggesting that a considerable number of those subjects were only registered on e-Thuto but not necessarily active.
- The decline in printing costs experienced in 2015 and 2016 was followed by memorandum by the ICT services, which reveals that there were rising costs in 2017 owing to high levels of paper-based procedures. This shows that the University does not need temporary interventions to reducing costs. The fact that rising operational costs are continuing to be problematic at CUT and SAUs means that there is a need for a long-term plan that will combat this problem. A further conclusion is that available web technologies are not being used strategically to lessen manual processes.

8.2.1.3 Web technologies reduce printing and stationery costs

This finding is drawn from the discussion group. The respondents' comments on whether there is a relationship between the use of web technologies and stationery costs were largely in the affirmative. For instance, ***R1*** states that: **"***There is a relationship but not a direct one. I would rather replace the word relationship with an effect. Our e-learning implementation has an effect on* ***printing and stationery*** *and so on. It's not that much but we do have an effect. For example, we do not print* ***study guides*** *anymore. The other one is, the Engineering Faculty decided to go* ***paperless*** *also with academic staff. In that sense, we have changed that or have had an influence on printing and the other staff. Another one that I can think of is* ***text books****, availability of e-text books. One of the qualifications decided to provide textbooks on the tablet for students. There is now a very big movement towards* ***e-text books*** *and also* ***Open Education Resources (OER)*** *that we can use because it's for free.* ***That will have cost implication not only on CUT's budget*** *but also on student's budget. So, in that sense we also make it affordable for the students".* These comments indicate that the e-learning centre recognises the potential effects of web tools to cutting costs. A conviction held in this study is that these cost-cutting effects should be planned and not just eventual.

8.2.1.4 Web technologies reduce travelling and accommodation expenses

This finding is also related to the respondents' comments. The respondents were asked to give their view on the relationship between the use of web technologies and travelling expenditure. The responses below are instructove.

R2: *"Skype will have an effect on* ***travelling*** *between the two campuses".*

R1: *"Yes, in that sense Skype is not really part of e-learning but we are utilising it quite a lot on management side for* ***meetings****. We did make use of video conferencing previously but we have all replaced it now with skype. And that is used quite a lot at CUT at the moment. So that means that people from Welkom campus don't have to come to Bloemfontein for meetings. Even on council level, it happens quite a lot sometimes that a councillor doesn't have to come to Bloemfontein anymore so he can stay wherever he is and just participate from there".*

R2: *"Also I know a lot of supervisors who supervise postgraduate students at masters and doctoral degrees; they use it a lot because those students are not on campus. They use always skype or something similar like video conferencing so the students don't have to* ***fly up and down"****.*

R4: *"And we also have* ***interviews*** *quite often here with oversees people and also people in South Africa".*

The above responses endorse literature findings that online technologies create virtual presence that reduces the need to travel for meetings. Online technologies also allow for prompt sharing of resources in ways that reduce frequency of travelling (Barnes *et al.,* 2010:4; Sahd & Rudman, 2013:41; Mungofa & Peter, 2015:62). However, the tone of the respondents suggests that the resulting effects are not planned. The technologies are available but the prevailing culture is that people use the technologies on an ad hoc basis and when their use benefits them, thus confirming that the culture does not mandate at least a minimum utilisation, which is financially undesirable.

8.2.1.5 Web technologies reduce communication costs

The respondents made the following comments, which indicate the existence of a relationship between communication costs and the use of web technologies.

R3: *"An interesting thing that we also have here is communication with Germany because their engineers are here and their students who are here".*

R1: *"It's quite a lot, its more than that, we do use web technologies for interviews and interactions. It's part of the Internationalisation of our curricular also. I know that at Health, there is one department that also interacts with their counterparts in Canada. Previously, these procedures were manual and physical".*

An analysis of the above responses leads to the conclusion that:

- The above findings concur with observations recorded in available literature. Various studies (Mangiuc, 2009:77; Barnes *et al.,* 2010:4; Mungofa & Peter, 2015:62) indicate that the gaining of wide acceptance of online communication in organisations led to the replacement of traditional methods of communication and their associated costs. Online communication replaces traditional telephone expenses and also reduces the need to travel through a sense of closeness created by virtual meetings (Barnes *et al.,* 2010:4; Sahd & Rudman, 2013:41; Mungofa & Peter, 2015:62).
- Significant cost reductions were reported after the implementation of the 2016 Cost Containment Implementation. For example, there was an 18.89% reduction on printing costs, 34.18% on stationery, 10.40% on travel management and 23.70% on meetings, which are attributed to *"informal cost saving initiatives implemented by management"*. These operational costs are among the cost elements that literature identifies as impacted upon by an efficient use of web tools. Furthermore, an element of *"informal cost saving initiatives"* indicates the absence of a formal institutional approach enforced by policy. In that context, the extent of cost cutting that might result from the use of web technologies cannot be expected to last long because there is no institutional mandate leading to a formal take-up.

8.2.1.6 Web technologies reduce spending on advertising

The measured successes of 2016 compelled the University to plan additional cost cutting goals. The plan titled *"Cost containment guiding principles for 2017"* mentions that *"the opportunities to invest in technology to increase efficiencies, thus reduce cost will be explored and implemented"*. The use of web technology features as a key to reducing elements such as printing, advertising and meetings. For example, the plan was to reduce ***printing*** further by 24.3% through the use of relevant technology, which would also reduce costs associated with ***print media***. ***Advertising costs*** reductions were planned at 28% through the use of ***social media***, while also reducing the use of ***print media***. Costs related to ***meetings*** were also targeted for a 31% reduction through the use of ***web technologies like video conferencing*** while replacing ***physical meeting costs*** related to ***travelling, accommodation and associated meal costs***.

The following Table 8.2 is an excerpt of the eleven cost elements that the University identified as needing urgent attention, which this study has already highlighted in relation to the competencies of web technologies.

Cost description	Actions to be taken
Use of technology	That the opportunities to invest in technology to increase efficiencies, thus reduce cost will be explored and implemented.

Administrative costs	That the cost & complexity of administrative operations will be minimised.
Efficient use of resources	That care will be taken to get the best value from the limited resources at all times.

Table 8.2: Cost containment guiding principles for 2017

The above analysis together with focus group discussions and literature lead to the following conclusions:

- Web technologies help improve the University operations to be financially efficient by continually replacing costly procedures with less costly and efficient web space.
- Although a positive relationship between increased usage of web technologies and reduction of operational costs exists, the University is not benefiting, as it should.
- The following cost reductions can be achieved through optimal utilisation of web tools at CUT. These benefits have been achieved to some extent, as indicated by the cost containment implementation. However, as implied by the same document, the web-based procedures are underutilised.
    - Web technologies can reduce stationery and printing costs
    - Web technologies can reduce travelling and accommodation costs
    - Web technologies can reduce communication costs
    - They can reduce costs related to attending meetings beyond the University campus
    - They can reduce administration and advertising costs
    - They can also replace reliance on costly infrastructure and other non-current assets
- Reduced operational costs will improve profitability in the SCI of the University. An increase in an organisation's profitability means an improvement in the ROI.
- Reduced reliance on physical space and non-current assets will result in lower non-current assets costs within the SFP. This reduction leads to a higher return as non-current assets are the denominator component of the ROI computation.

8.2.2 Web technologies contribute to profitability by reducing operational cost

Web technologies do not have a direct relationship with the University's profitability. This is because the main income of the university is tuition fees. If the pricing of higher education through tuition fees was determined using all factors that contribute to the offering of teaching and learning, then it would be possible to determine the tuition fee component that relate to web technologies like e-Thuto and other web tools. Nevertheless, a research by Smit (2011: 223) notes that the pricing strategy of CUT and other SAUs is not professionally determined to include all cost related factors. The University still perceives its ability to produce a certain number and calibre of graduates as its payback. Hence, the following statement by **R1:** *"it is better to talk of throughput rather than*

profitability". The conclusion the, is that the only way that web technologies contribute to profitability is by reducing operational cost.

8.2.2.1 The use of web technologies has reached a significant level at CUT

The level of usage of web tools has been growing so rapidly such that the benefits of web tools acknowledged by respondents are believed to have reached a place of measurability. For example, the respondents' comments to the following question**:** *Has the use of web technologies at CUT reached the level at which these benefits can be realized? Why do you believe so?* were as follows:

R1: *Yes, I think so; others can also say their view.*

R2: *I mean if you take into account the fact that we pay for some of the technologies, I mean Blackboard also costs money, if you take into consideration that kind of offset, then the answer is definitely yes you can realise those benefits.*

The above responses indicate that there is a cost to e-Thuto and all other web technologies, which is a motivation enough to determine the financial benefits. In addition, the respondents were of the view that those significant benefits do exist.

R1: *I think you can look at it from a different view point. I think on e-learning side we have an implementation of very close to 100% of our subjects. We do have web presence and in that sense alone, that means that we are utilizing it actually very extensively. Close to all subjects we are reaping the benefits. In a certain sense we are very far ahead of a lot of other universities in the sense that we have implemented quite a lot.*

R4: *I think it's not just that lecturers are using it, they are now using different things in blackboard. So that is also something we have seen the last time. It keeps growing and growing and there is more interest from the lecturers' side to know more about what they can do especially in assessment and that type of things. There are a lot of questions about assessment from lecturers. They want to know how to use it.*

Further follow-up questions were asked: *Now that you are mentioning the subject implementation in percentages, do you have reports that show how these percentages were reached? Do you have a report on how specific tools within E-Thuto have been used over the years?* The respondents'' comments were as follows:

R1: *Unfortunately, we do not have that detailed type of reports. What we do have are yearly reports that we do to Senate about implementation part. That is, we can tell for example that last year we had 70% and we are now seating at 90%. We do have calculations on how we get those percentages and can make them available to you. Unfortunately, in the e-learning strategy I think there is also a place where we say we want to increase the usage and the quality of usage. That is our aim at the*

moment because previously our aim was to just to get them on. But because we are already at 98% our aim has shifted now from getting them on to improve the quality of usage. And unfortunately, we can get some of the reports but we do not a specific thing in place to do such calculation to see within a year what is the progress. We do have a way of evaluating a course to see how good it is implemented; the problem is that we do not have the capacity to go and do for each course just to do that. If you want to do the calculation you need at least 20 minutes per course to do that and we have more than about 1200 courses at the end on the year that are on the system. 1200 multiplied by 20 minutes, so we do not have the capacity or we don't have someone who can do that evaluation for us. We do have something in place but unfortunately, we can't do that because of lack of capacity.

The following conclusions can be made from the above responses:

- The only measurable success is in terms of subject integration. The ability of the University to assess the quality of implementation of web technologies is stifled by lack of financial, human and time resources. In that sense, any plan to improve the quality of use cannot be successful because it is not informed by a detailed assessment of problem areas and their nature.
- Core functions that include assessment have been underutilised but interest has since begun to rise. The only recognised benchmark, considered as a basis for measurement, is subject integration. However, to consider subject integration as a highlight for success might be misleading because the level of the subjects' activeness is not clear. Moreover, the E-learning strategy has lamented that staff members at CUT have been utilising the least beneficial and elementary functions of web technologies.
- There are cost-cutting benefits that can be harnessed from subject integration. More cost cutting benefits can realized as the quality of web technology usage improves. The fact that more benefits hang on the ability to use web tools interactively has already been established and is explained by the centre for e-learning as the quality of use. Hence, the e-learning centre is now motivating for web technology usage beyond subject integration to utilisation of other functions that have not been used before.

8.2.3 Web technologies do not save staff productivity hours

Web technologies have been found to be useful in saving employees' productive time by reducing time spent performing their responsibilities (Mangiuc, 2009:79). The same scholar devised a model that determines the financial benefits of web 2.0 tools based on the number of hours of productivity against the salary of an employee. Based on these claims, a question was asked: **"***Do web technologies help staff reduce time they spend performing their duties?"* The responses revealed that this is not a benefit that has been realized at CUT. This is confirmed by ***R1:*** **"***Hm, there is an impression that using a computer, you will spend less time. The point is that is not a true assumption.*

The point is if you want to teach, learning and teaching takes time. Computer or web technology will help you do it better, but it will not necessarily make the time you spend on it less. The only way to do that is when you do assessment and marking of scripts. You don't have to seat and mark 200 scripts, and in that sense it makes time less. For the other stuff it's just a tool to help you do things better, but still have to spend time on it, you still have to plan, to decide on what activity you are going to use, you still have to do the activities. All those things add into your time. From an administration point and organisational point of view there are benefits but if you look at teaching and learning, it's a different ball game you cannot compare the two".

R2 noted that: *I just want to say also on that it is very important to note that Blackboard is not here to replace teaching but to help teaching. As we used data projectors in the past, Blackboard is here to help teaching and it will not replace teaching. That's very important.*

It can be established from a comparison of the literature findings with the contrary responses that the determination of relevant variables for measuring the benefit of web technologies is a contextual matter. Botchkarev and Andru (2011: 245-69) note that it may be difficult to quantify certain benefits within a certain organisational setting and yet it may be easier within another. It is therefore necessary to isolate the organisational internal processes of one organisation from the other and then attempt measurement.

Therefore, the following conclusions were arrived at:

- While literature reveals that the use of web technologies can contribute to financial benefits, such as the measurement of ROI according the reduced time that staff spend in productive responsibilities, the above responses reveal that, in contrast to literature, teaching and learning web technologies do not reduce the time spent but make things better.
- The issue of reduction of time is therefore a contextual one. Time can be save in one organisation owing to the use of certain tools but that might not hold true in another based on what that organisation uses the tools for and the nature of its core business.
- The issue of time saved depends on the objectives of web technology implementation within an organisation. A University such as CUT, where blended learning is the prevailing approach, will some responsibilities that will remain more or less unchanged.
- However, some responsibilities within teaching and learning can be done with less time over time (for example, setting and marking of assessments). This cannot be said with the entire teaching and learning process and certainly not where there are indications of underutilisation.

8.3 Financial practices for assessing use of web technologies

The research question asked in order to address the third research objective is: How effective are the practices that CUT utilises to assess the financial impact of web technologies? There is a perception that the financial benefits of web technologies become measurable if there also exist quantifiable objectives established prior to implementation (KPMG, 2008:1, Mangiuc, 2009:79; Romero, 2011:147; Gilfoil& Jobs, 2012:644). Therefore, prior to addressing the research question, the researcher assessed whether the University sets any plans to benefit financially from adopting web tools. The following findings are based on the analysis of some focus group discussions:

8.3.1 The main objective of implementing web technologies is to enhance learning

There has been a consistent view in literature that web technologies are an unavoidable solution for both the private and public sector to mitigate against the scarcity of resources. The present institutional policies (vision and strategic plans) and plans (cost containment implementation) state that the serious resource shortages at SAUs and CUT should be addressed through a migration of some internal processes to technology. However, the realisation of financial benefits, such as cost cutting, does not form one of the main objectives of implementing web technologies for teaching and learning. An examination of the E-learning strategy in combination with the centre for e-learning's perspectives, shows that web technologies were not adopted for a financial benefit, but to enhance students' learning. The fact that there are no financial objectives within the e-learning strategy is, therefore, perceived as prohibiting such benefits to a recognisable range. This factor is evident in the following assertion by ***R1:*** *"...just remember that any university is not a financial company, so you cannot use a normal ROI formula just as it is. There are other things that also contribute. So in that sense, a subject that you offer for any qualification does not mean you will make profit out of it because we are not a profit company, we are an education company. Our profits, if we say profit, is to increase learning. A student must receive their qualification. The result is not so that we profit from it. That is the first thing I want to say on that.*

The second thing is that yes, on the e-learning side, we are looking at also implementing online programs which then can also benefit us to give additional income may be in the form of subsidies or whatever way we can get income. That if we get more students, that is may be a way in which we can say may be we can get more income. In that sense yes with e-learning we are going to implement online programs that will benefit the institution financially".

The University's main objective has little or no financial outlook related to the implementation of technology. The general perception is that the University exists to educate. However, the researcher argues that being student-centred does not mean that an institution cannot cushion itself or profit financially. Various studies decry the rise of operational costs in Universities and the fall of external funding which forms the major contribution of up to sixty percent (60%) (USAf, 2016). This should

be interpreted as both a threat to the smooth operation of higher education and an indicator that the internal processes should be financially efficient in a way similar to the expectations of the sustainability Framework of the University. The researcher's further probing on whether the University does not envision matters such as cost-cutting when implementing web technologies, revealed that such benefits are the unintended effects of using web technology. The respondents' views were as follows:

R4: *I am not sure about envisioning, but we will automatically safe costs on printing, stationery, and other things.*

R1: *If we have it online we also save on physical facilities, there is not air-con running, you don't need physical space. Cost cutting is not why it was implemented, it is a side effect. That type of benefit is not that much envisioned. If it becomes a why, then we must rethink all that we are doing at the University not only e-learning. Remember that our policy on teaching and learning is to implement Blended learning. Blended learning means that we want to make all these web technologies not only available to off-campus students but to on campus students. Our focus up to now is to improve learning. We do have to cut costs; in that sense we try to use the most efficient or the most effective one for what we can afford. We look at what we buy but the focus is the benefit for the students.*

R3: *It's quite an interesting thing because on the one side you save money, say for paper and class rooms, and on the other side you need money for more computers, more computer rooms and better internet system. So yah I would like to see the outcome* (referring to the study)*, but it's not easy to test it really.*

R2: *In our case, students don't have to print student guides for example; we put it on the web for them so that they can access it at any time. So they don't have to print it out. All that we do on the part of e-learning on website is that we promote the non-use of printing material and that type of thing but rather use it on the web.*

- The fact that the University does not plan to derive a financial benefit when implementing web technologies is a stifling factor to significant growth and measurability of such benefits. Previous studies (Gilfoil & Jobs, 2012:644; Mangiuc, 2009:79; Romero, 2011:147) note that financial benefits of web tools are harnessed significantly when they are part of the objectives during adoption. The same authors argue that organisations should set measurable financial objectives in order to determine the financial benefit derived The above responses can also be viewed as affirming the claim made by the researcher that there is a need for a strategy that considers the potential of web tools, the set objectives and their actual effects.

- The subject of financial benefits is not completely foreign to the University. The e-leaning centre contemplates it, although that is not within the normal core business of the University. For example, the online programs that the e-learning centre aims to implement for additional income are not within the normal teaching and learning at faculty level. Moreover, whatever income that will be made from that should be attributed to the online programs themselves and not web technologies.
- The financial value that the University could harness through technology use diminishes at the side of quality learning. However, there must be a way to achieve both quality education and financial efficiency. There is a need to shift from viewing the two constructs as conflicting ideas.

8.3.2 Modified ROI is a possible measure of the benefits of web technology

The researcher drew on Management accounting techniques that include PBP, NPV, IRR, PI and ARR as well as ROI Techniques such as Traditional or modified ROI, ROA, DuPont method of profitability analysis, RI and EVA in assessing the financial practices and financial impact of web technologies. The following question was posed to the respondents at the centre for e-learning: What financial practices are utilised by the University to assess these financial benefits of web technologies? The response by **R1** was as follows:

R1: **"***There is no specific way that we use but I see here that you have ROI and so on. I could share what I have with you. What I am doing is that I am looking at modified ROI, it is not ROI, its Return on value (ROV). The main difference is that the traditional ROI is where you put your profit over your costs, but that one the profit part is modified in the sense that it also looks at other benefits. And then you can have benefits and your physical profits if there was any. Benefits could also be divided into two parts: the one is measurable benefits and then there is unfortunately those that are not measurable. That is the difference in this way. So there is no calculation made on that. My argument on this is that it's not possible to do that because the variables that we put into the ROI formula are not measurable because we are dealing with teaching and learning that is not measurable in that way. They* **(universities)** *can for instance look at increases in throughput of a student which is one of the aims that we have. If a student is studying for three years instead of five years, then we can obtain the subsidy sooner than later because the way that a subsidy is allocated has changed from awarding it to enrolled students but to qualified students. But the point is, or the biggest problem on that one is that it's not really possible to make an easy calculation and to say we have spent so much money and we have made this profit and therefore our ROI is this. That's not possible because we are in the education field, in the learning environment".*

The above discussion group responses lead to the conclusion that:

- The University does not have an existing practice, technique or formula of determining the financial benefits of web technologies.
- In line with literature, it is considered impossible to measure financial benefits of web technologies using traditional calculation techniques (Botchkarev & Andru, 2011:250).
- The perceived qualitative nature of the variables involved in teaching and learning makes modified ROI the only way to measure the benefits of web technologies.
- It is presumed that such a calculation will consider both qualitative and quantitative benefits of using web technologies.

Furthermore, there is need to examine the actual behaviour of the elements of the SCI and SFP in order to determine the existence of a financial benefit that is directly related to web technologies. The factor would make sense to management and accountants and yet, it is largely lacking. As already noted, the possibility or difficulty of measuring the benefit depends on unique institutional processes. It is therefore necessary that the unique context of CUT be isolated from other contexts to determine the variables that could help solve the issue of measurement. The conclusion reached through literature, official documents and discussion groups is that web technologies contribute to the reduction of many operational costs discussed in this study. In addition, the financial impact of web technologies would be much detectable provided that there was a formalised institutional adoption of these implements. However, the fragmented practices that exist at CUT make such a detection difficult if not impossible.

Other questions were posed as a means to further conceive a possible framework of the study, which evaluated the way web tools affect some identified cost variables. These are examined below.

8.4 Presence of a framework for measuring financial benefits of web technologies

The fourth research objective of the study was addressed by asking the research question: What is a possible framework for enhancing financial benefits from implementing web technologies for teaching and learning at CUT?

8.4.1 There is no framework for assessing web technologies at CUT

It was found out that none of the techniques discussed above, be it capital investment appraisal or ROI methods, have ever been used to evaluate web technologies nor does the University have any other self-developed techniques. Gilfoil and Jobs (2012:642) developed a framework that considers the social media level of implementation and their objectives. Nevertheless, there is no framework of that nature at CUT. Specifically, ROI that is modified to accommodate the unique teaching and learning variables is perceived as the technique that holds the potential for such an evaluation. Other scholars, such as Manguic (2009), have come up with a ROI computation model that is similar to ROI virtualisation or ROV, which consist of additional modifications to the traditional formula and considers the unique organisational objectives and operational changes. A marketing related frame

work for social media ROI was formulated by Kaske *et al* (2012). Likewise, other non-financial variables have been added, which is why some critics of marketing orientated ROI dismiss any attempt from that point as ROI. Hence, the researcher asserts that an attempt to measure the financial benefits of web technologies must consider the objectives of implementation of web technologies together with the potential that the technologies have to changing or replacing certain operational procedures.

8.4.2 Operational changes affected by the core features of web technologies

The above-proposed approach is based on the conviction that time will compel the implemented technologies to make the planned and unplanned or unforeseen changes. A consideration of the objectives alone runs the risk of missing actual effects. For example, the objective may be to make learning accessible beyond university boundaries, and yet that results in the replacement of some manual and cost bearing procedure. There is need to investigate whether such potentials were not planned prior to implementation. Therefore, to complement research question 2, and as a basis for the framework of the study, the focus group discussions were conducted to probe for certain potential and actual operational changes that can be affected by specific core features of web technologies. The findings are as follows:

8.4.2.1 Online information publicity

- ***Online announcements and traditional methods***

Online announcements replace traditional ways of communication like notice boards. The weakness of notice boards is that published information is susceptible to things like natural damage, removal before all other intended users may see, and it falls short of transparency aptitudes of web-based tools. The Announcements feature plays an important role in reducing stationery and printing costs. The following responses indicate how this is achieved. **R1:** *There is less printing because they don't have to put all the stuff on the notice boards or on their doors. Or print announcements and hand it out to students".* Another discussion elaborated further on how time and costs related to distance are eliminated through online announcements. The response by **R2** stated that: *"Also students no longer have to drive to campus to just to look at the notice board".* It can be expanded further that even lectures will not have to travel to campus or leave other work-related engagements to make traditional notices to students, which saves their time. Nevertheless, absence of a uniform culture of use of online announcements reduces the chances of institutional benefits that are inherent in their use as **R3** pointed out: *So, I think announcement plays a very important role but there must also be a culture of announcements on blackboard. So that one lecturer does not say an announcement in class, another one on notice board while another one uses blackboard. We must have a culture that says everything must be on* Blackboard."

The above responses suggest that the use of the online Announcements tool is not consistent nor uniform at CUT. It can be concluded that, while policies on assessment require student marks and predicates to be published on notice boards, it appears as if the online announcement tool is available for anyone who wills to utilize, but it is not a requirement.

- ***Online announcements and traditional emailing facility***

The use of web technologies has the potential to replace traditional use of email and related overloads (Grosseck, 2009:479; El-Sayed & Westrup 2011:4-5). An instructor may still choose to send an announcement directly to a student's email to increases the chances of communication reaching them. Blackboard in particular facilitates personalised feedback (Unal and Unal, 2011:27). As a result, at lecturers will not use their own email to communicate to students. However, the discussion group responses suggest that the CUT's e-Thuto does not have such effects. The following responses are instructive:

R1: **"***Sometimes we do use emails with the announcements, sometimes not. So, I will not say that it will reduce the traditional emailing".*

R2: *"Also they are not really the same thing. Announcements are more generic to the whole group, whereas emails are used more to a person. Obviously, you can send an email to the whole group but it will just be the same as an announcement. Announcements are normally used more like digital notice boards but emails are more for a specific person".*

R3: *"And with email you can get feedback but announcement is only one way and email is two way".*

The above responses about web tool and email use at CUT do not concur with Manqiuc's (2009) assertion that the use of web technologies reduces costs related to traditional email facility. A further response by R1, indicates this contrary view reflected in the statement: **"***Email is not a cost. There is no cost to sending an email".* Therefore, there is no known effect of the Announcements feature of the cost of administrating emails. However, the main reason appears to be that the cost of emailing itself are unknown.

8.4.2.2 Online content sharing and printing and stationery costs

The online sharing of content reduces reliance on traditional ways of sharing educational content with students. The discussion group respondents confirm this observation as note in their statements that:

R2: *"Yes definitely, especially study guides because lecturers used to print study guides in color and every student used to get one that they never looked at".*

R3: *"Notes as well, there is no lecturer that still hands out notes anymore and the text books…".*

Ironically, the main reason for enabling this aspect was not financially motivated. Online sharing was employed to enhance learning by allowing lecturers to share information more efficiently, quicker and in a flexible manner as confirmed by the statements by**R1** that: *We found that lecturers could give out more notes than before. Previously a lecturer would compile notes and send to Xerox for printing and they must fetch them. Now you can add more notes with just a click of a button.* An additional observation is that, there is an acknowledged cost reduction effect noted in discussion finding where ***R2*** states that**:** *"And it's completely free"* while **R1** affirms, "*Cost reduction is only in printing costs and text books that we spoke about previously".* If this is true, then there must be a way in which the University can determine how much it has saved over the years through online content sharing. The reality is that this is not the case. Again, there is no guarantee that the culture of sharing content online will have continuity since it is not enforced by policy. Lack of clarity surrounding the nature of subject integration leads us to assume that it is not certain that all lecturers share all information online.

The reviewed literature establishes that web tools, including blackboard, reduce spending on the stationery items bought (Bradford *et al.,* 2007). Although web tools have an effect on things, such as printing, the same conviction is not as definite when it comes to stationery at CUT. The respondents' answers to the question on whether online content sharing reduces stationery cost were, the indefinite with **R1** stating **"***Yes a pen here or there"* and **R2,** *"Yes stationery in terms of papers and pens".* Therefore, it is likely that the University has not yet reduced spending on stationery although they have increased the utilisation of web tools in an effort to replace printing. In addition, all respondents agreed that any level of stationery replacement is for the sake of efficiency. At the same time, a combination of these responses with those on number 3 above may lead to the conclusion that if web tools reduce the number of printed items, then they should also reduce the patterns of stationery use.

8.4.2.3 Online Assessments and feedback, and manual tests and the related printing and stationery costs

A migration to web-based evaluations observed globally indicates a meaningful level of participation and user involvement, however, the reality is that the use of Blackboard for assessments is still limited within all universities (Whitmer *et al.,* 2016). This study also established that this slow progression is evident at CUT. In addition, the following response shows that the nature of a subject may account for such delays in this movement towards web-based assessments. **R2** stated that, *"In some cases, however, they still do the printing especially in Engineering where they use diagrams and stuff its easier for a student to have a diagram next to him on a paper.*

Sometimes they do that. But then they answer it on Blackboard. So, they don't have to print answer sheets anymore and they don't have to mark it*".*

However, online assessment use is based only on their efficiency and not financial reasons. According to **R1**, the reason for using online tests is *"only efficiency"*. **R2** also notes that there is a benefit of quick feedback: *"The memo is also immediately available to students".* The following additional responses also show that efficiency is a perceived benefit:

R3: *"What I also found the last time is that students who can't write, it's more easy to let them re-write a test. So, it's not necessary now to say student A, B and C must come and write again on this date, you can hear from them what is available for them and you can immediately put them on for that test".*

R4: *And it's also easier for a lecturer that has a good question bank to recompile the test. It can take even ten minutes to set-up a new test if you have a good question bank.*

The above responses indicate a redundant use of the word efficiency as a benefit of web tools as opposed to cost efficiency. This demonstrates that the perspective at the centre for e-learning on efficiency differs from that of the financial fraternity. The concept of efficiency is viewed as easier and quicker way of doing things unlike the financially orientated view that suggests financial proficiency in performing certain responsibilities or spending on certain resources (Horngren *et al.,* 2008:32). Hence, the implementation of web technology was spurred by the search for resource efficiency, and later on, the demand for free education and *Fees-must-fall* campaigns.

The presence of online formative and summative evaluations at CUT probed. An additional question was asked: *"do you really have situations where students write exams online?"* The following responses show that it is the case and that there were other external influence such as the *Fees-must-fall* campaign. Thus**, R1** affirms, **"***Yes"* and **R2** noted that, *"It's quite a lot"*. A further response by **R4** confirms the views reflected in current research that web tools can be used to address a big audience with less efforts (Penzhorn, 2013:57-73) and contribute to saving time, space and operational costs. A University, such as CUT, where the number of courses and student intake have been growing significantly (CUT, 2017: Archives) relies heavily on web technologies are indispensable. **R4** confirms this in the statement that, *"In departments that have big classes like Engineering, Health and Education. I think Education was the first to write exams on e-Thuto".* The most obvious contribution to cost-cutting is the elimination of paper work as indicated by **R1**: **"***Yes they do reduce costs because there is no paper being printed".*

E-assessment is mentioned within the E-learning strategy and yet the main stimulus behind e-assessments was an external factor, such as *Fees-must-fall*. This leads to conclusion that there are no solid strategies, E-learning strategy included, governing the adoption of e-assessments at CUT.

This in turn threatens the continuity and stability of any e-assessment practices. The said presence of online assessment cannot last if it is not stirred by an institutional practice. The fact that current policies, as explained in chapter 5, still allow for manual processes of assessments, suggests that any online assessment at CUT is based on the freewill of lectures.

There are other additional but informal uses of web tools that the respondents added to the discussion. These include the online submission of assignments and projects, which eliminate the manual handling of paper work for lecturers. The following responses reveal this fact.

R2: *"Assignments, not necessarily test but projects or assignments that students have to make, say for example that a student has to do a case study or something, they no longer have to print and bind it to submit to the lecturer, they do it online. There are a lot of subjects that do all assignments like that and even portfolios of evidence in IT department."*

R3: *"I can add on that one because I know that in IT, they also do their practicals at home. They just send some videos and photos on what they do. Students don't have to bring a big pack of a project to class, they send some photos and videos and after that thy send a report on what they would have done so there is a marking based on what the lecturer sees on a video or photo and also based on the report. It's quite interesting because one lecturer told me that sometimes when he sees the report he does not give a good mark, but when he sees what the student has done on a photo, he ultimately gives a good mark. It helps students to work anywhere and anytime."*

R1: *"Just another example, I found an example last night of a lecturer that is recording what he is doing today on a cell phone and in the evening, he takes that video recording and makes it available to students. We do make videos of certain aspects of a lecturer. We don't want to do it that much because the bandwidth that goes with video is too much. So, the cost will be too much. But we do make video clips and put them on Blackboard. There are quite a few lecturers that make use of that and there are actually those that do video recordings for students to do references later on."*

Therefore, Blackboard affords these kinds of opportunities to reduce manual handling assignments. However, the respondents' comments on these practices appear to be lop-sided to be normal or established practices.

8.4.2.4 Discussion forums (including wikis, blogs and others) and consultation time

The fact that online discussions can eliminate the need for physical contact (El-Sayed & Westrup, 2011:3-6; Mangiuc, 2009:78) means that they can save time and costs related to such manual operations. Educational technologies can be used to facilitate virtual classrooms (Grosseck, 2009:479). The use of discussion boards between lecturers and students facilitates the continuous learning, which can reduce the reliance on office bound consultations (Unal and Unal, 2011:27). Although the e-learning centre acknowledges this potential, the facility is not fully taken advantage

of. Ironically, the group discussion responses regarding the ability of discussion boards on saving time affirmed as noted in the statement by **R1** that, **"***Yes it does save time"* and **R2** that, *"It is the case but it is not the way we would like it".*

Furthermore, time is saved by addressing a large number of intended users at the same time. **R2** confirmed this in the statement that, *"More students can be addressed simultaneously".* Yet the respondents do not consider the use of discussion boards as cost efficient with **R1** stating that, **"***Well I do not see how it's would reduce costs because previously consultation time had no cost to it".* In addition, literature views time saving as a factor that can be measured in financial terms to devise a modified ROI of web technologies (Manguic, 2009). However, the possible financial contribution of web tools at CUT appears to be obscured by the absence of cost assignment to some of the internal processes. Thus, the existence of a financial view to the internal operations would assist in the assessment of the financial benefits arising from the use of specific technology.

8.4.2.5 Online collaborations and communication

- ***Video conferencing and travelling and physical meetings***

Web technologies reduce transportation and travelling costs by lowering the amount of travelling for meetings and other work-related engagements (Barnes *et al.,* 2010:4; Mungofa & Peter, 2015:62). Today's low-cost web conferencing tools have contributed to this shift to less costly travelling and meetings (Sahd & Rudman, 2013:41). The fact that video conferencing and skype contribute to reduced frequency of travelling is an indicator that they contribute to cost reductions at CUT. All respondents confirmed that web technologies reduce the need to travel. Their response was collectively, "*yes definitely".* The respondents also pointed out that Skype has replaced video conferencing at CUT, and that it is used by the University to support online meetings between Welkom and Bloemfontein campuses. These views are reflected in the focus group response that, "*Just like video conferencing, skype has reduced the need to travel between Bloemfontein and Welkom campuses for meetings. It is also used for management and council meetings to reduce the need for travelling and physical meetings".*

- **Online trainings and traditional training sessions**

The responses below indicate that the University is beginning to utilise interactive web technologies to hold training sessions for staff members. However, this is still at an infantile stage. The following responses where **R1**, stated **"***Yes"*, **R2** noted, *"Yes we are starting to do that now. We are not doing that too much but we doing that"* and **R3** that *"It's also not the way we would like it to be, but we are starting to do that"* were made to the question on whether the CUT is now using interactive web technologies and training staff on how to use them. The respondents also gave the following answers on the impact of online training:

R2: *"We did not implement it for cost cutting; we implemented it because you address a wider scope of lecturers. They also get to use the tools while they learn about them. They don't just learn the tools that they are not using".*

R1: *"Yes it's a more practical way of doing it. As she said, I want to reiterate on that far wider scope that is covered".*

R3: *"I think in cost cutting is the fact that lecturers do not have to be all at the same place, because that is the principle of flexible learning. Where they can actually now at any time of the day, they can access the training. They do not have to be all on a certain slot and in that sense then lecturers will always be able to continue with their classes without having to stop their classes".*

R4: *"We also won't have to travel to Welkom campus lecturers because it's also accessible to them".*

Thus, although it was not a premeditated, the responses showed that online trainings contribute to reducing costs associated with previous traditional training set-ups. Therefore, online web technology activities eliminate the need to travel between campuses and the associated costs. In addition, staff productivity is not affected negatively because staff members do not have to leave their work to attend a physical training session.

- ***Online surveys and printing and stationery***

Staff members benefit from the efficiencies of web tools during the conducing of t surveys within and outside the campus, and this reduces stationery and printing costs. All respondent agreed collectively that this is the case at CUT: *"yes, yes, definitely"*. Stationery and printing are the main costs saved by web technology implementation. However, financial efficiency is not an envisioned benefit of implementing online surveys. The reasons for using online surveys are listed below:

R1: ***"****You don't print anymore".*

R2: *"It is efficient, it's so much easier and quicker, you don't have to print out survey papers and distribute them to each person. The system collects data for you".*

R3: *"And data is immediately available".*

R4: *"People are so much willing to respond to online surveys".*

R2: *"You get a much better response rate. If you send out a physical questionnaire, you get a very low response. But for online one there is a bigger response".*

Some of web tools can even assist is data analysis as indicated by ***R2:*** *"We don't have to pay anyone for data analysis, it does it for you".*

8.4.2.6 Other operations that are altered or replaced by the use of web technologies

Web technologies help solve problems quicker without disrupting daily work engagements of staff members. **R3** noted that: *"We use it (Blackboard) quite a lot for example if a student or lecturer has a problem, he simply takes a picture and sends it through and we immediately see what the problem is and solve it. So, it's not necessary for a student or lecturer to leave their space to solve a problem. They could also ask each other. Students could ask peer students for example."* They also facilitate the efficient auditing of teaching and learning as confirmed by **R2** that: *"Another operation that I can think of that's been altered is when you look at reflective practice audits. For instance, engineering is audited in four years; health is audited in five years. Normally a lecturer has to compile a portfolio of evidence. It could be test paper or whatever they have to give in a certain format. Now we can just give auditors access to their online pages. So that's something that I know saves a lot of time, but I am not so sure about the cost".* A further comment by R1, indicates that the cost reduction effects are in the area of printing and stationery. **R1** commented that: *"Well it does save costs because we don't have to print it out the full portfolio; we just sent an electronic one and they do assessments on that."*

In addition, the discussion groups asserted the role that web tools in other areas such as the assessment forensic auditing. **R3** noted that: *"Just to add, we did have court cases where students or lecturers do something wrong and there are no clear audits of what happened. We could see for instance on a test how many minutes or seconds did the student spent on each question. We could see that he starts with question 1 and spends one minute or two, but with question 5 he spends half an hour. So that is easily available evidence that can be printed and it was not available previously when we do assignments or tests."* Another comment on web-based forensic auditing of assessment matters was made by **R1**. The respondent noted that: *"I know of a case from Welkom campus where a student claimed that he couldn't submit an assignment because e-Thuto was off, and I could just go back to the logs and see that ok he was online during that time for about seven minutes and he could have submitted. So that was evidence that the student is just trying to get out. So, we now have ways of proving what transpired on a test which we did not have previously. Another operation that I wouldn't say it has replaced entirely but has definitely replaced to some extent is obviously research data base. Instead of using the library we now have EBSCO host, ProQuest, online web, google scholar, you are not going to books anymore for research. So, the library doesn't have to buy so many books because we have access to them all for the research side. In that sense we must take into account the web technology that's available for the library for research specifically and all the electronic resources that are available through the library, you cannot take that away."*

8.4.3 Factors prohibiting the smooth implementation and measurement of web technologies

Other factors prohibit the growing implementation of web technologies. For example, the sharing of videos is constrained by the cost of things like bandwidth. Researchers identify broadband

connectivity as a factor that inhibits the functionality and growth of web tools used in research (Grosseck, 2009:480). This is normally the case in the South African context where infrastructure support is not as efficient as in the developed world (Armstrong & Franklin (2008:2). Respondent **R1** noted that, *"I think something that you should take into account also is the role of the infrastructure specifically network infrastructure on the campus, that plays a very big role, if we don't have good connection on campus we cannot continue with e-learning. So that is part of the e-learning strategy, but that is not part of the work of e-learning department. It's the IT people that supply that. That is something that we can't ignore. You will have to take that into account somewhere."* The comment indicates that the challenges of proper internet connections and technical support still exists and stand as an inhibiting factor to the smooth implementation of web technologies at universities and particularly in South Africa. The same difficulties of infrastructure and internet connections have been acknowledged within the vision and strategic plans, as noted in the statement that *"the complex challenges around student internet access as well as the limited ability of infrastructure security, maintenance and reinvestment capacity".* Another problem to the optimal utilisation of web tools, namely uneven utilisation, is perceived by **R3** to be a result of varying objectives by users: *"We can't see what the students have learned. We work with lecturers the whole time and it makes it difficult to see the outcome at the end of the road. Most of the time it depends on the lecturers and the progress that they have made and their needs have and all lecturers do not have the same needs."*

The respondents were asked to make additional remarks as part of the conclusion to the group discussion. **R1 made the comments that**: "*Thank you, I would like to make another final remark. Something that you must somewhere take into account in your study is that there is a difference between a calculation from an accountant or auditor's point of view, where you calculate certain figures and decide that is the benefit. The point is learning and teaching is different and you must use an adapted formula if you really want to do it that way. Because it's just not always possible to measure teaching and learning. Somewhere in your study, you will have to address that issue specifically to make it clear. This is because that is also one of the big problems that we as lecturers and e-learning people experience with top management in the sense that they want figures and it's just not always possible to give figures for everything because we are working with people and not machines that will produce a certain amount of things. We are working with people and we are building people, and our product is not a tangible product but it is actually what the student has learned and that you cannot measure."*

This above additional contribution supports the view that financial benefits are perceived inversely between disciplines. Ross (2009:4) notes that the financial practitioners' view of ROI differs from discipline to discipline and this rivalry extends even to the academic setting. Top management's view of what constitutes a benefit is similar to that of financial practitioners, as they want

measurable success, which appears to be a difficult issue to e-learning staff members. Similarly, El-Sayed and Westrup (2011) argue that management accounting's view of what constitutes benefits has been an inhibiting factor to the adoption of web tools because of lack of a proven financial wealth or that of satisfactory formulae.

8.5 Chapter summary

This chapter addressed the last three research questions of the study. A consideration of the second research question led to the establishment of the potential effects of web technologies on the financial health of the University. The reality at CUT is that there are some good things deserving celebration, which can lead to good financial benefits. Yet these good practices are too isolated to warrant a sustained and long-lasting success for the benefit of the institution at large. In affecting the operational expenses of the University, the technologies automatically affect cost cutting and profitability within the SCI. However, it is difficult to ascertain this when the phenomenon of web tools is not formally implemented. Ina addition, a consideration of the SFP revealed that web technologies have the potential to transfer the operations of the University to the web space, thereby eliminating reliance on physical space and resources that constitute non-current assets. Correspondingly, it is not easy to ascertain this factor when the university largely depends on archaic methods of facilitation.

It was observed that, while addressing the third and fourth research questions, the well-known techniques for measuring profitability and performance of assets have not been used by the University in evaluating web technologies, nor does the framework exist internally. According to the focus group discussions, the qualitative nature of the variables affected by web technologies within teaching and learning environments present a major challenge on attempts at measurements of this nature. Although there are suggestions in literature that benefits, including cost cutting of things like printing, stationery, communication and transport can be determined with relative ease, such attempts have not been made within the context of the study nor have they been found in existing literature. An argument raised by the researcher is that the phenomenon is usually viewed as one of the alternatives to operational procedures, which leads to it being ignored.

These study findings set a background and rational for developing the proposed framework for optimal use of web technologies and the measurability of benefits.

CHAPTER 9: DISCUSSION OF FINDINGS, FRAMEWORK DEVELOPMENT, CONCLUSIONS AND RECOMENDATIONS

9.1 Introduction

Chapter 7 of the study focussed on the findings of the study concerning research question 1. Chapter 2 went further to concentrate on the findings of the study as they relate to research question 2, 3 and 4. This chapter discusses the findings of the study and develop a framework for solving the identified problems. The chapter starts by discussing the results of the critical literature engagement on various realities around the adoption of web technologies by IHLs. It also recapitulates on the objectives and research questions of the study as well as explain the related findings. A framework for implementing web technologies for financial benefits based on the problems that relate to the research findings of the study is developed. The assumption here is that, an implementation of web technologies in a manner suggested by the framework may bring us closer to measuring their abilities. Further recommendations are made in order to assist the University with ways of maintaining an effective use of web-based tools. The chapter concludes with a discussion on the potential users of the framework, the implications of the study to future research endeavours, and the unique contributions and limitations of the study.

9.2 Review of literature research findings

The adopted formal LMSs in the IHLs are supplemented by other social media applications to allow users maximum opportunities afforded by web technologies. The most popular web-based LMSs are Blackboard, Sakai and Moodle, which are normally entrenched with modern generations of web technologies to modernise and make them relevant to perceived current learners needs (Bradford *et al.,* 2007:302; Isaacs, 2007:20; Unal & Unal 2011:3; Apereo Foundation, 2016). The achievement of optimal web technology usage occurs in cases where users spend more of their operational time online. However, it was found out that most of the attributes of web technologies are underutilised with most users in universities world-wide concentrating on uploading material for students to download. Nonetheless, very insignificant accomplishments are mentioned about the holistic usage of web technologies, which include proficient use of assessments and collaborative features, thus indicating that users spend a very brief time online (Whitmer, *et al.,*2016).

Institutions are experiencing an increasing demand for education and escalation of resource shortages and these have encouraged universities in SA to strive for cost efficiency by implementing web technologies (Dlalisa & Van Niekerk, 2015:2, 3). Initially, web technologies were implemented mainly to enhance learning and to fulfil the perceived needs of the intended learner users (Armstrong & Franklin, 2008; Thinyane, 2009:413). Therefore, the issue of cost efficiency is currently topical while that of enhancement of learning, although important, has long been in literature. Web technologies are a trusted solution to the problems of scarcity because of

their ability to address more people with less efforts (Penzhorn, 2013). This leads to the deduction that there is need for institutional policies that tie together the enhancement of leaning and cost-efficient use of web technologies. Such policies should be rigorous enough to effect meaningful and detectable change rather than present suggestive attitudes.

A good implementation of web technologies yields various benefits. These benefits have the potential to reduce operational costs of Universities by replacing various cost bearing procedures. A good implementation transforms the core business of a university as well as transfer most of it to the web space thereby saving resources (Unal & Unal 2011:3; Veletsianos, 2010:3). Web technologies also enable teaching and learning to occur free of the boundaries of time and space (Getting, 2008). The implications of these facts are that institutions could save financial resources by preventing expenditure on irrelevant physical assets. Cost cutting abilities in the areas of printing, stationery, communication, travelling, transport and accommodation are obvious benefits of creating a virtual space for most of the daily engagement within universities. Web technologies reduce the need for printing and spending heavily on stationery by allowing bulky material to be shared online. Printing and stationery costs are also saved through online information publicity that replaces traditional notice boards. We technologies reduce the need to travel for meetings and other work-related engagements by creating a virtual space of engagement between lecturers and students. Most benefits of formal platforms like Blackboard are harnessed when used not just for content sharing and announcements but also as assessments and collaborative tools. These features ascertain that the users spend more time online carrying out daily responsibilities and interacting with one another (Whitmer, *et al.,* 2016).

Management of organisations insist on establishing measurable financial benefits as a condition for the approval of budgets for the purchasing of web technologies (El-Sayed & Westrup, 2011:1). However, the challenge to measurement is prohibited by the fact that a fragment of the denominator components to measuring the financial benefits is difficult to determine. Some studies have argued that measurability is possible provided that measurable objectives are set prior to implementation (Mangiuc, 2009:79; Romero, 2011:147; Gilfoil & Jobs, 2012:644). On the other side, lack of measurable objectives is a clear indication that most organisations blindly adopt the tools hoping to enjoy the reputation of having the latest web implements. It may also mean that most implementations of web technologies arise for a fear of being left behind. In such circumstances, a failure to measure financial benefits cannot be related to the lack in the tools but to a very low and sporadic utilisation of the tools that would not impact meaningfully on the financial status of enormous orgainsations such as universities. Implementing web tools without clear plans means that many organisations end up planning as they go along. While it is advisable to adjust some plans during usage, clear plans and focused benefits are advisable before implementation (Gilfoil & Jobs,

2012:644). Web technologies should be established as a means to achieve cost effective operations. Authorities such as the DHET have established that web technologies should be used achieve efficient operations, hence, universities need to setup policy driven financial objectives of web technologies. This approach will help organisations to achieve institutional impact that is easily detectable. Currently, the uneven utilisation within universities prohibit any attempt to measure impact (Armstrong and Franklin, 2008:5; Lehmkuhl, 2014:4).

9.3 Review of data analysis results

The following findings relate to the four research objectives and the attributed research questions investigated in the study.

9.3.1 Research Objective 1

The first objective of the study was: *To carry out an investigation of the nature of accessible web technologies for teaching and learning at CUT.* The following research question was asked: *What web technologies are accessible for teaching and learning at CUT?*

It was noted that the University adopted various web technologies to the extent that they cannot be listed. Therefore, a better way to conceive web technology reality in teaching and learning is by the core functions that they fulfil. E-Thuto is the main web technology adopted at institutional level of the University. Various other web technologies have been, and are still incorporated within e-Thuto. Moreover, other technologies are only accessible through e-Thuto even though they are not merged into it. Other isolated web technologies are allowed alongside this institutional platform at faculty level. Nevertheless, the only significant utilisation, since the implementation of web tools in 2002, began in 2009. In addition, the only growth recorded and celebrated is subject integration (CUT, 2015 – 2020: e-learning Strategy). Yet the problem with this recorded subject integration is that it principally shows the number of subjects registered online and offers a limited narrative on how online platforms are being used within the core functions of web technologies at subject, department or faculty levels.

Although e-Thuto is a formal institutional platform, it is growing to become a very complex environment that is difficult to conceptualize. E-Thuto is a very large web platform that allows for the incorporation of many other tools. While some studies have revealed the underutilisation of functions like assessments and collaborations (Whitmer *et al.,* 2016), modifications and implementation of additional tools are still being carried out rapidly. This rapid incorporation of web tools has been witnessed at CUT, in spite of the acknowledged underutilisation. As a result, flexible learning envisioned through use of other web tools appears to contradict the formalisation aspect. Therefore, the reconciliation of flexible learning and formalisation of web tools through an LMS needs attention.

It should be expected that a formal LMS allows for some prescribed take-up of web technologies by staff members but it does not. There is no established and observable culture of web technology adoption by staff members that is directed by policy. Therefore, unequal and self-directed utilisation is the order of the day. The lack of a formalised institutional direction resulted in staff members using the tools that they prefer and that in their own ways. This leads to the difficulty of realising institutional benefits and detectable institutional impact. The focus group discussions revealed that the *Fees-must-fall* was the major stimulant to some minute online assessment, thus showing that the subtle utilisation is not as a result of staff incompetence. Instead, what is lacking is a clear direction and standard set by the university directing the institutional exploitation of web tools. Far too many technologies are available, and many more are regularly brought in, but what is lacking is an over-all custom of use. According to the RBT, in organisations where there are no wholistic strategies of implementation, what exists is the uneven spreading of technology across its functions which limits the advantages that are inherent within the resources (Bharadwaj, 2000).

9.3.1.1 Online Information Publicity

Online announcement is the main tool that fulfils the core function of online information publicity and one that is mostly utilised within Blackboard (Unal & Unal, 2011:27). Although it could play an important role in information publicity at CUT, there is no established culture of announcements. Respondent **R3** confirms this observation in the statement that, *"I think announcement plays a very important role but there must also be a culture of announcements on blackboard. So that one lecturer does not say an announcement in class, another one on notice board while another one uses blackboard".* Lecturers at CUT do not use announcements or any other online platform as a standard for information publicity. Institutional policies regulating assessments and student marks (CUT, 2017: Assessment policy; CUT, 2017; Assessment procedure; CUT policy and procedure on the administration of results) still require test marks, predicates and reassessment candidate lists to be published on central notice boards. Therefore, some manual processes are still being followed in making announcements to students, which contributes to less chances of reaching the intended users. The risk associated with manual publicity is captured here by **R3**, *"...I always explain it to lecturers that if you put an announcement on the board, the first student comes and reads it, the second one comes and takes a photo of it, and the third one takes the announcement from the board and the rest cannot see it. With blackboard you have the privilege that the announcement is always there and you have evidence of the date, time, minute and seconds that you put the announcement".*

9.3.1.2 Online Content Management

The use of e-Thuto for content management is mainly in the uploading of study material and study guides, which is a practice recognised by the e-learning strategy as indicative of elementary use of

the platform. Similarly, there is no wide spread institutional take-up of this core function, which limits the benefits that can be harnessed. The CUT 2015-2020 e-learning strategy also notes that:

"The use of Multimedia for course content delivery is also used by isolated cases and is increasing rapidly (about 20 academic videos are produced per month). This excludes videos recorded by lecturers themselves. There is however still a need to encourage academics to build this into their course offerings to supplement their traditional or known ways of teaching"

The observation shows that this feature is being underutilised at CUT and that little time is spent online just for uploading of material by lecturers and downloading by students. The optimal use of an online educational platform is achieved when staff members spend more time online and engage in more interaction and building of content. The building of content may also be through sourcing of information from various internet sites and recombination into one content (Rudman & Steenkamp, 2009:4). However, according the findings of the study, the staff members have only been uploading material and thus treating the intended users only as consumers of information and not contributors to content.

9.3.1.3 Online Assessments

The use of e-Thuto as an assessment tool leads to the achievement of a more pronounced use of web tools normally referred to as the evaluative patterns (Whitmer *et al.,* 2016). There is very little use of online assessments at CUT, although it appears to be growing. The main stimulant for growth has been external factors and these include the *Fees-must-fall* campaigns rather than an internal institutional direction. This threatens the continuity of this phenomenon and the benefit it has to offer because continuity beyond such external upheavals is not guaranteed. Therefore, there is a need for an internal institutional strategy that will constantly maintain this trajectory. The e-learning centre does not perceive the cost cutting benefits of online assessment in as much as it does efficiency. Another feature within e-thuto that can be used for online evaluations are discussion boards. However, the focus group discussions showed that **discussion forums, wikis, blogs and other collaborative tools** are not yet utilised as they should. Respondent **R1** states that, *"It is a case but it is not the way we would like it.*" Yet another form of assessments that is afforded by e-Thuto is online assignments to which the discussion forums showed that the culture is also too fragmented to allow for a wide spread impact to the institution.

9.3.1.4 Online Collaboration

Web technologies can be used to form online groups that work together on some projects. They can also be used to form virtual communities that discuss work-related matters on regular basis (Rudman & Steenkamp, 2009:3; Grosseck, 2009:479). The implications of online collaborations are that is university students can get into groups that work together to complete assignments, and

share material and subject related discussions under the supervision and contribution of the lecturer. At CUT, there is no reported application of these practices because much attention is put on uploading material. It means that there is less time spend online by all intended users. Meaning that much teaching and learning is still limited to class room environment. Hence, the university still relies on paper-based procedures and this will jeopardise any form of efficiency.

9.3.1.5 Non-Obligatory Institutional Policies

Globally, universities have had policies that only encourage rather than compel the use of web technologies. In such cases, universities have focused on availing the tools to enable possible take-up, which led to individualistic and free style approaches that have existed long enough as indicated in earlier research (Armstrong and Franklin, 2008:5). The e-learning strategy has a similar approach in its suggestive nature. It does not play the role of leading the university to web technology implementation but it only encourages a better usage. The analysis of this policy revealed that it does not carry the authority to direct a formalised institutional adoption. It follows therefore, that the University is spending regularly on tools that are not compulsory for staff members to use. Thus, the nature of the e-learning strategy at CUT is another major contributor to the meagre exploitation of web technologies. In addition, the assessment policies still support and direct staff members on manual procedures in the administration of assessments and handling of the related materials. This confirms even further that there is no holistic view of web technology implementation at CUT.

9.3.2 Research Objective 2

The second objective was: *To assess in detail the potential financial contributions of web technologies to CUT since their implementation.* The research question that was asked to address this objective is: *What are the potential financial contributions of web technologies to CUT?*

9.3.2.1 Rising operational costs

Web technologies have the potential to cut operational costs like printing, stationery, communication, and accommodation and travelling. However, the CCI notes that these costs were identified because they are threatening the smooth operation of the University (CUT, 2016: cost containment implementation). Although it was noted that the same costs declined in 2016 after some informal cost cutting initiatives, a 2017 memorandum by the Universities' ICT service delivery lamented again at the rising of stationery and printing costs as a result of an unhealthy reliance on paper-based processes. The CUT's ICT service delivery memo (2017) states that:

"Bulk printing has become a relatively high cost for CUT. Based on the analysis from Finance, we would like to appeal to Supervisors, Managers, Heads of Departments and Deans to monitor printing and the promotion of a paperless environment to budget holders, i.e. heads of sections, units, and departments"). These leads to the conclusion that web technologies are not used

optimally for CUT to achieve financial efficiency. It continues to affirm that there is no formally implemented policy that governs the cost efficiency of the institution's core business. Cost cutting is achieved through the reduction of reliance on manual procedures and utilisation of physical space while running the core business of an institution. At CUT, the CCI revealed that the University still relies heavily on these very same traditional arrangements. Therefore, reliance on manual procedures and physical space contributes to high operational costs at CUT.

9.3.2.2 Incongruent institutional policies

The University's vision and strategic plans envision a core business that is financially sustainable and incurs expenses based on value for money and sound financial control. The University's Framework for Sustainable Development identifies these goals under financial sustainability as indispensable in running the academic project. However, the e-leaning strategy focusses on efficiency only in terms of time and space. The TLP is also silent on financial sustainability and yet it is in line with the vision and strategic plans. Even though both were implemented in line with the vision and strategic plans, they are silent about any financial objectives envisioned by the vision and strategic plans. The cost cutting potentials of web technologies are known to the centre for e-learning, which is responsible for the e-learning strategy, but they only envision the enhancement of leaning as it appears within the teaching and learning policy. Both the SCAs and cost efficiency are considered as imperatives within the vision and strategic plans. Yet the two main policies that drive the core business strand of teaching and learning ignore any financial outlook of things. Therefore, this study found out that the cost-cutting abilities of web technologies are prohibited by these incongruences found between these policies on financial objectives.

9.3.2.3 Dissimilar departmental perceptions

The centre for e-learning perceives the use of web tools as necessary for the enhancement of learning but considers cost cutting as one of the coincidental outcomes. The respondents made the following statements:

R4: *I am not sure about envisioning, but we will automatically safe costs on printing, stationery, and other things.*

R1: *Cost cutting is not why it was implemented, it is a side effect. That type of benefit is not that much envisioned. If it becomes a why, then we must rethink all that we are doing at the University not only e-learning. Remember that our policy on teaching and learning is to implement Blended learning. Blended learning means that we want to make all these web technologies not only available to off-campus students but to on campus students. Our focus up to now is to improve learning. We do have to cut costs; in that sense we try to use the most efficient or the most effective one for what we can afford. We look at what we buy but the focus is the benefit for the students.*

Ironically, the finance department has been preaching cost cutting in view of the operational risks. This objective is confirmed in the statement by the CCI that *"The issue of cost containment is critical to CUT as much as it is for all other institutions of higher learning in South Africa"*.

As a result, an appropriate utilisation of web technologies is perceived by the Finance Department as a means to save costs and avail resources for other income generating activities' *"optimum space utilization not only saves costs, but creates opportunities for income generation through space utilization"*. The ICT service delivery of the University (see 8.5.2.1 above) has much the same view as the Finance Department. Above all, the strategic plan emphasises that the University's vision 2020 should be achieved through financially sustainable processes among other things. Therefore, it can be seen that the institutional organs do not speak the same language when it comes to cost efficient ways of running the core business.

9.3.3 Research Objective 3

The third research objective was: *To examine the effectiveness of current practices for assessing the financial impact of web technologies at CUT.* This objective was addressed by the research question: *How effective are the practices that CUT utilises to assess the financial impact of web technologies?*

In literature, modified ROI is considered as the only possible measurement technique to web technology implementation (Botchkarev & Andru, 2011:250). Similarly, the focus group discussion indicated that ROV is the only possible assessment technique based on the mixture of qualitative and quantitative variables of teaching and learning. The financial benefits of web tools are harnessed significantly when they are part of the objectives during adoption. Moreover, the proponents of this view argue that organisations should set measurable financial objectives in order to be able to determine the realised financial benefit (Mangiuc, 2009:79; Romero, 2011:147; Gilfoil & Jobs, 2012:644; LePage, 2014:1). The University does not have any procedure for assessing the financial impact of web technologies. There are various reasons behind this lack of assessment practice. First, the main objective of implementing web technologies is to enhance learning and for any financial benefit. Secondly, the financial benefits, like cost cutting, are only incidental if they exist. Thirdly, the university does not have enough resources and capacity to evaluate web technologies consistently and meaningfully that it cannot implement informed interventions to improve the quality of use. Fourthly, even if the capacity to measure usage were available, the freestyle approaches to web technologies by staff members would still make it completely difficult to have a measurable effect.

9.3.4 Research Objective 4

The fourth objective was: *To develop a framework for enhancing the financial benefits of implementing web technologies for teaching and learning at CUT.* The objective was addressed

through the following research question: *4. What is a possible framework for enhancing financial benefits from implementing web technologies for teaching and learning at CUT?*

Literature perceives that the measurement of the benefits of web technologies follows the setting of measurable objectives (see 8.5.3). There is further suggestion (Gilfoil and Jobs, 2012:642) that the level of implementation should also be considered in order to focus a subsequent measurement. According to Manguic (2009) a measurement should compare the organisational processes of the institution prior to the implementation of web technologies with those of the same institution following a certain period of time. Therefore, the financial benefits of web technologies can only be determined on condition that the above assertions are true at CUT.

The findings of the study are that there is no Framework or technique for assessing the financial benefits of the web technologies at CUT. The major reason is that the University, through the CeLET, does not perceive its returns in financial terms. The other reason is that the variables involved in teaching and learning are very different from those of organisations that produce tangible goods. Respondent **R1** noted that, "*We are working with people and we are building people, and our product is not a tangible product but it is actually what has the student learned and that you cannot measure."* Lack of measurement puts those who implement and use technology on isolated flanks with management who control budgets. Understandably, management demand that some quantifiable benefit be proven to them. However, the teaching and learning proponents see the benefits to be largely qualitative but necessary. Consequently, large sums of money are spent on resources whose financial benefit cannot be proven. The study, which was spurred by the assertions that web technologies should be detected through an assessment of replaced procedures, went on to establish that web technologies have the following potentials:

- Online information publicity has the ability to replace traditional information publicity methods like notice boards.
- Online content sharing has the potential to replace traditional ways of sharing course related material.
- Online assessments, including assignments and feedback, replace manual assessments and the related printing and stationery costs.
- Collaborative abilities of web technologies eliminate reliance on time and space bound teaching and learning thereby potentially saving the organisation from having to spend on infrastructure.

9.4 A FRAMEWORK TO ENHANCE FINANCIAL BENEFITS OF IMPLEMENTING WEB TECHNOLOGIES

The framework in figure 9.1 below provides the solutions to the problems identified by the study. It proposes a way in which implementation of web technologies can lead to the maximisation of

financial benefits to permit measurability. A lack of clear and measurable objectives has been responsible for the failure to detect noticeable benefits. The framework proposes that the University should plan to benefit as well as set standards against which such benefits will be determined. Another impediment to financial benefit, detected by the findings, is that the financial benefits of web technologies have been detached from quality learning. The framework suggests that the two goals are not mutually exclusive. In other words, the University can achieve quality teaching and learning that is cost-effective. The implementation of the framework will lead to an optimal utilisation of web technologies within learner-centred approaches.

The vertical arrow (labelled targeted progressive growth of web technologies) in the figure above shows the direction of growth. It shows that level zero (L0) is the lowest level from which growth should begin and move towards other usages. The target by the University should be to grow to other levels of implementation continuously. The other small horizontal arrows point at targeted cost bearing items to show what every level of implementation should be focused on.

9.4.1 CASE TIME-BASED MEASUREMENT (CTBM)

The idea of time within the framework is borrowed from the well-known time-series analysis in order to suggest that the financial benefits of web technologies become noticeable over a given period. That idea of the effects of web technologies within a planned period is implied by Mangiuc (2009:76-77) who points out that an analysis of the structure of organisational operations prior to the incorporation of the tools should be carried out and compared with the state of affairs following implementation. A time-series analysis traces specific changes that can be attributed to a certain significant conversion within an organisation (Smith, 2015:162). For this work, the word '*CASE*' indicates that a case study analysis is an appropriate context to detect the effects of web technologies. Research has shown that the possibility of measuring the benefits of web technologies varies from organisation to organisation because of the unique objectives and context-based processes that they replace (Botchkarev & Andru, 2011: 245-69). The phrase *'TIME-BASED'* points to the idea that such effects may be detected over a certain time within a selected case. Therefore, the recommendation is that the planned operational costs targeted for replacement by web technologies should be established through a careful analysis of relevant documents, which may include financial statements and general ledgers of an organisation. The general ledger can assist in investigating such costs according to cost centres, and yet the financial statements will indicate what the effect has been at an institutional level. In addition, context specific documents that capture a better use of web technologies should be sought out and used.

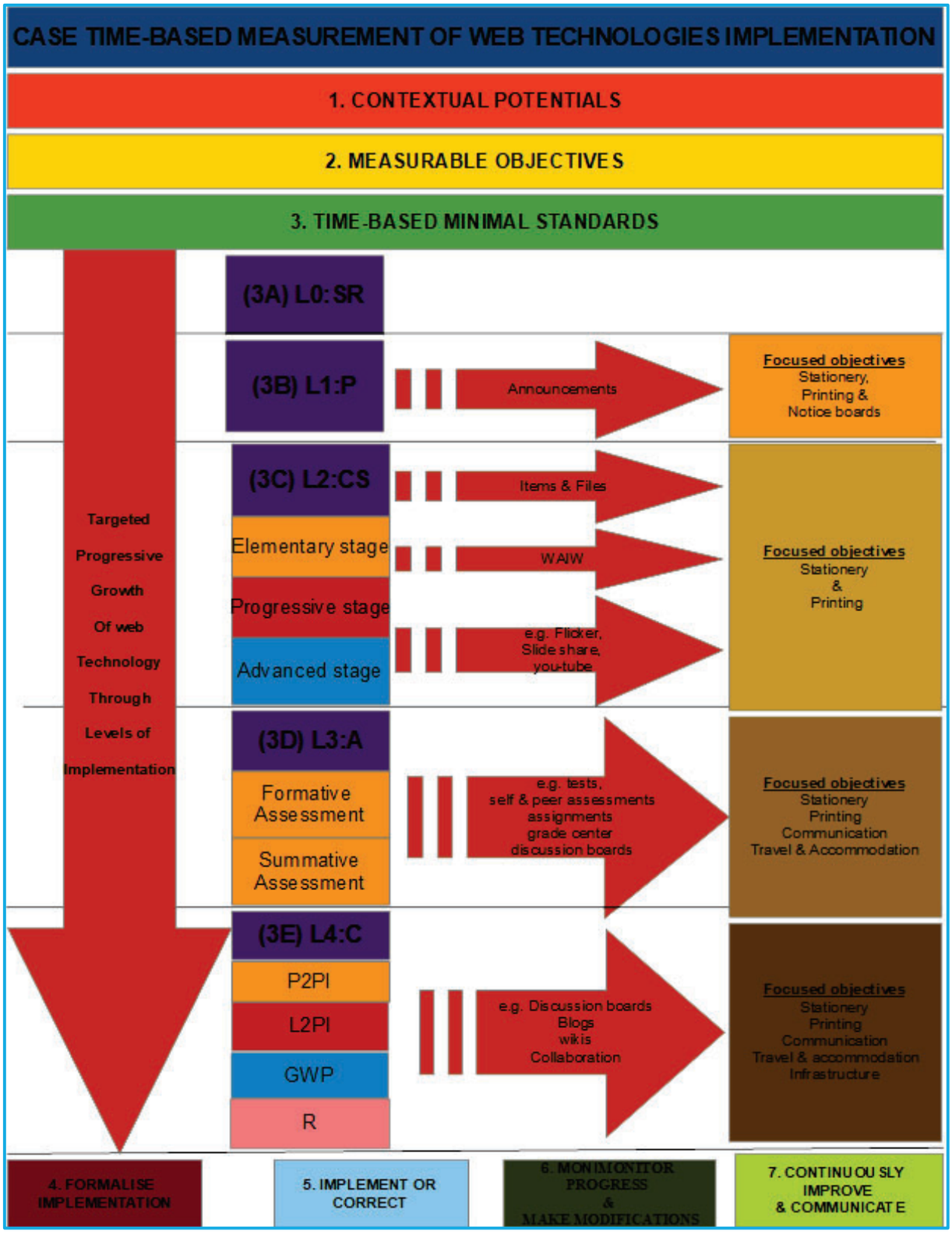


Figure 9.1: Case Time-Based web technology implementation

A time series design located within a single case design identifies a specific trend and its potentially opposing trend before conducting evaluation. A predicted time series pattern is normally based on the assumption that a certain occurrence has significantly influenced a certain change. In addition, a rival time-series is contrarily based on the assumption that such influence never occurred. A time series pattern is considered as that significant outcome, while the influencing factor is considered

an interruption of a time series. The actual data points are examined to determine the time series, the number of occurrences before and after an interruption was recorded, is actually true, (Smith, 2015:162). The implications of these assertions to the framework are that the core functions of web technologies should represent the independent variables whose impact on identified costs can be assessed over a number of days, weeks, months or years.

Another form of time-series approach is to follow a chronological approach by systematically tracing certain events over time from a specific moment in time. This approach allows a researcher to derive additional information that is not limited only to independent and dependent variables. Unsuspectingly, chronological investigations have been limited to descriptive studies for a while because of their strong cause and effect competencies. However, they can be used in explorative case studies to trace previously specified trends and their relation to a premeditated cause. Yin (2009:145) notes that, "*An essential feature is to identify the specific indicator(s) to be traced over time, as well as the specific time intervals to be covered and the presumed temporal relationships among events, prior to collecting data"*. The proposed CTBM depends on the implementation of web technologies that is formalised and implemented in a manner that is measurable within the set time frames. Standards and planned benefits should be established in order to make the possible measurement of web technologies.

9.4.2 DETERMINING THE CONTEXTUAL POTENTIALS OF WEB TECHNOLOGIES

The literature findings revealed that the setting of measurable objectives constitutes the prerequisite to measuring the financial benefits of web technologies. An adjustment made by this study is that the potentials of the tools within a specific institutional context should be determined prior to setting the objectives of web technology implementation. An adopting University should thoroughly determine the tools that have the potential to contribute specific financial benefits and how. Literature also establishes that web tools replace costly structures. Therefore, to achieve cost efficiency, value for money and sustainability principles envisioned within the vision and strategic plans the University should determine the tools that have the potential to replace avoidable cost bearing structures. What this means for the current study is that the web tools or features that have the potential to replace the identified costs should be determined and categorised under the core functions that they serve.

9.4.3 ESTABLISH AND COMMUNICATE MEASURABLE OBJECTIVES

The implementation of web technologies must serve the institutional vision and objectives so that they contribute to the overall success of the organisation (Gilfoil and Jobs, 2012:644). The e-learning policy at CUT does not respond to the institutional objectives of financial efficiency, sustainability and value for money. The establishment of these financial objectives should involve at the least various professionals from the Finance department, e-learning centre under the auspices

of teaching and learning, heads of departments and operational management in consultation with the intended users. A combination of the financial and e-learning fraternity will assist in reconciling their seemingly unrelated tenacities for web technology implementation. Finally, the determination of the potential of the tools to a specific university context should be established in line with '*higher order'* objectives and these must be communicated to all stakeholders.

The objectives of implementing web technologies appear within the E-learning strategy in ways that is too abstract to be measurable. Apart from the absence of institutional adoption, there are no clear yardsticks that the University intends to achieve through the core functions of web technologies. There is a need to establish clear standards against which efforts can be measured. The major objective of cost-efficiency must be included within the e-learning strategy. Planning cost efficient operations guarantees that the organisation will be sustainable and has increased chances of continuity (Niemand *et al.,* 2006:8, 9, 17; Horngren *et al.,* 2008:975; Els, Erasmus & Viviers, 2014:75). It implies that an organisation should be able to utilise scarce resources in ways that do not threaten its financial wellbeing and pursuit of the core business (Cloete & Marimuthu, 2015:89). Web technologies should be implemented to achieve the financial benefit of cost cutting since they are obtained at a cost to the University and due to the pressure of scarcity and increasing demand for education. Any failure to strive towards this financial aspect in today's context will threaten any other plan that the University has. Financial standards, which do not compromise the enhancement of learning should be set. It is possible to achieve quality learning that is cost efficient so that there is both sustainability and continuity.

9.4.4 DEFINE AND ESTABLISH TIME-BASED MINIMAL STANDARDS

Although there has been reported growth in subject integration, it is not clear which subjects are registered on e-Thuto and which ones are active. The activities of those that are active should be known and compared. The term subject integration should be used to refer to the general idea of subject registration and utilisation of the core functions of publicity, content sharing, assessment, collaboration and management. In other words, subject integration only means that the web is a platform where these functions are carried out. The lowest and highest levels of subject integration should be registration and collaboration respectively. The decision by the University to administer marks using a platform like e-Thuto should lead to management functioning at the highest level. There must be a plan to investigate how these functions are used against set standards and within an intended period. There must also be a plan to measure the behaviour of specific operational costs against previously established standards.

9.4.4.1 LEVEL ZERO: SUBJECT REGISTRATION (L0:SR)

A subject that is registered on e-Thuto should be distinguished from one that is active. A registered subject should only mean that such a subject has been enrolled on the platform but is not active. Not

being active means that none of the core functions are being carried out. Therefore, any report on web technology implementation should state the status of a certain subject particularly if it is only registered on e-Thuto. A report must be able to state how many (and which) subjects are only registered compared to those that are active at faculty, departmental and program level. Failure to produce this image leads to some false hopes that the University is going somewhere with web technology implementation. Moreover, it contributes to the difficulty of focusing any strategies for growth.

9.4.4.2 LEVEL ONE: PUBLICITY (L1:P)

For online publicity of information, the expediency of announcements is limited by lack of uniformity within the institution. Since this feature is the simplest to use, it should be established immediately as a tool that should be used by all lecturers for all forms of announcements to students. The use of online announcements by all lecturers will lead to the replacement of all traditional costs of stationery and printing that relate to publicity. Lecturers who might have extra skills and tools should be allowed the flexibility to use them for announcements. Thus, the use of all other tools within and outside an LMS should not be blocked, however, for formality and control purposes, this feature should be the minimal standard requirement for announcements to students.

Therefore, the framework suggests that online publicity and the tools (mainly announcements) that serve that phenomenon should be implemented to target stationery, printing and communication that is linked to any form of publicity to students. Furthermore, the plan should be to detect or measure the replacement of the identified expenses over a given period.

9.4.4.3 LEVEL TWO: CONTENT SHARING (L2:CS)

There is no uniform way of sharing content using e-Thuto. Apart from some uneven incidences of sharing subject material, a few other practices exist around videos and audios. The E-learning strategy acknowledges that these and other practices constitute far less than what e-Thuto can offer. The study discovered that sharing of content is only encouraged but not prescribed by policy. Therefore, there is a need to establish a process that eradicates unnecessary printing of academic notes and material. The process can be established after a thorough study of the nature of the subjects and relevance of the processes. Although the findings indicated that printing of notes for students is no longer done, the fact that bulky printing is still a problematic issue points to the contrary.

The need for printing could be for lecturers to students, lecturers' personal notes, and for lecturer to lecturer sharing of documents. By policy, any printing for sharing notes with students should be immediately eliminated through online platforms while the printing of personal lecturers' notes can be allowed under a monitoring processes by HODs and Deans. The lecturer to lecturer sharing of

notes or material and associated printing can be eliminated by the use of a plethora of collaborative tools such as Office 365 and google documents. *One staff member recently showed the researcher a two-page document that had just been printed for the sake of looking at only 2 points and giving feedback.* Ironically, the above-mentioned applications are available at a cost to the University. There certainly are further costs incurred from printing other *'two or three pages'* throughout the University, hence there is a need to thoroughly investigate the staff printing needs so that the essential printing can be determined and monitored.

Beyond publicity (Level One), subject integration should be interpreted in terms of content sharing (Level Two). The researcher suggests a classification of content sharing into three stages. The University should clearly indicate, in the planning of the implementation of e-Thuto or its improvement, at which stage of content sharing they plan to be within a specific period. The three stages are outlined below.

9.4.4.3.1 ELEMENTARY STAGE (ES) (1)

A consideration of the build content function of e-Thuto (Figure 7.6) shows that the 'create' function only deals with the creation of Items and Files **(I&F)** by uploading an existing document from a computer. Therefore, the most elementary use of content sharing should be that of study material and study guides with students. Therefore, the assessment and reporting on subject integration that relates to content sharing should determine whether this elementary level is in question or not. In order to qualify to be at this stage, all study guides must be shared annually online and all subject units must avail course related items or files to the students.

9.4.4.3.2 PROGRESSIVE STAGE (PS) (2)

The create function level, which includes the sharing of Videos, Audios, Images and Weblinks **(VAIW)** (Figure 6.6), should also constitute the progressive usage of content sharing. The sharing of content using VAIW is considered by the researcher as an indication that the user has some additional skill above that of uploading material **(I&F)**. The E-learning strategy reported a minimal use and sharing of videos and audios. The strategy expected this to grow and thus this can reach a progressive stage when at least fifty percent (50%) of subject units begin to possess any of the four options of **VAIW** that is course related and includes the requirements of elementary stages.

9.4.4.3.3 ADVANCED STAGE (AS) (3)

An advanced stage should be used for other generations of web technologies starting with web 2.0. Figure 7.6 shows the use of Mashups in the form of flickr photos, slideshare presentations, Youtube videos, Blackboard open content and podcasting. The usage of these tools indicates the recombination competencies of the web 2.0 phenomenon through sourcing information from the web and recombining it into one content. It is this advanced stage of utilisation that is implied by

the E-learning strategy when it states that, "*e-learning is much more expansive than what we have for long kept ourselves busy with"*. If a module has a consistent use of one or more of these features throughout its units, it should be considered as having reached an advanced stage of content sharing. Over fifty percent (50%) of subject units should meet the advanced stage of content sharing.

9.4.4.4 LEVEL THREE: ASSESSMENT (L3:A)

Formative and summative assessments must be considered in the implementation of subject integration at assessment level. The E-learning strategy does not indicate any measurable goal held by the University concerning online assessments. As it stands, staff members make use of online assessment as and when they see it necessary. It is recommended that the university establish clear goals and time-frames on the intended use of web technologies for both formative and summative assessments. For example, a goal can be that by 2020, every lecturer should have fifty percent of the formative assessments online and hundred percent by 2022. The goal for summative assessment can be the achievement of a fifty percent of main evaluation online by 2022 and hundred percent by 2025. A careful analysis of the stationery, printing, travelling and accommodation costs related to these assessments will enable the establishment of a plan to replace the costs and make them measurable after a specified period of implementation. Formative assessments are composed of just two tests within a semester, which indicates that fifty percent stands for one test per subject and thus attainable. At the same time one test per 1 280 subjects (table 7.11) would mean tremendous savings in costs such as stationery and printing. There is only one summative assessment and reassessment per subject, which means that within a set time, the University can save all stationery, printing, transport and accommodation and invigilation costs that relates to these main evaluations. Therefore, the University needs to have clear goals so that it may become detectable whether there is progress or not. The E-learning strategy was, during the period of this study, too abstract to allow a clear assessment of institutional benefit and progress.

9.4.4.5 LEVEL FOUR: COLLABORATION (L4:C)

For online collaborations, e-Thuto can be used to facilitate four types of interactions. These include peer to peer interactions **(P2PI)** (1), lecturer to student interactions **(L2SI)** (2), group work projects **(GWP)** (3) and reflections **(R)** (4). The interactions can be done using collaborative tools such as discussion boards, blogs, wikis, embedded emails, and video conferencing. The discussion boards are the most useful and highly earmarked at CUT yet not fully utilised. A subject that meets collaborative requirements should be one that has at least one of the interactions in all of its units throughout a year. With regard to staff members, collaborative facilities like office 365 and google documents should be used for all academic projects to save time and costs of physical documents.

9.4.4.6 LEVEL FIVE: MANAGEMENT (L5:M) OPTIONAL

Management relates to the calculation and administration of marks after writing tests. This study does not recommend that this feature be transferred to e-Thuto or any other web technology other than the ITS system that is in use at this moment. The capturing of marks and minor administrations for both formative and summative assessment should fall within **TL:A** of the framework, while the issuing of marks for summative assessment should still remain a separate management responsibility. E-Thuto should be used for reference or verification in cases of disputes concerning the awarded marks.

9.4.5 FOCUS COST-CUTTING OBJECTIVES

The above-discussed levels of web technology implementation can lead to various cost reductions. The progression of technology implementation through the levels eventually leads to the reduction of additional costs, depending on the level of implementation. Thus, the University should target reducing the costs of stationery (measured in terms on the number of papers) printing (printing frequencies), travelling and accommodation (number and cost of travelling and accommodation arrangements) and communication (number of telephone calls and the related costs). However, the possibility of other costs, such as rates and taxes, electricity, maintenance, depreciations and impairments, should be considered as well. The levels of implementation and framework for the reduction of costs are discussed below.

9.4.5.1 FIRST LEVEL OF IMPLEMENTATION

Online publicity should seek to eliminate costs related to stationery and printing. The costs of printing announcements in the form of posters and paper format should be determined and targeted with online publicity. The costs particular to CUT include publishing marks and the announcement of tests dates as well as classroom postponements. Online publicity will eliminate cots for paper and printing and the maintenance of notice boards. This determination of possible saved publicity costs should focus at a specific level of web technology implementation in relation to the behaviour or growth of online publicity over a certain period.

Time-based analysis: Online publicity should be implemented to replace the primary costs of stationery and printing. The publicity should to replace traditional and manual ways of publicity like notice boards. Therefore, the continued growth of online information publicity within a context of declining manual-based publicity and identified stationery and printing, will definitely contribute to a specific amount of cost reduction.

9.4.5.2 SECOND LEVEL OF IMPLEMENTATION

The costs of printing and stationery targeted by online content sharing should be determined. This can be done through an analysis of the historic costs of performing the same duties manually. The

utilisation of content management and its proper categorisation within the planned levels will enable the University to establish the level of content sharing and specific cost reductions achieved over a given period.

Time-based analysis: Online content sharing should be implemented to replace stationery and printing material related to the facilitation of pedagogy. The determination of Online content sharing, the amount of manual content declined, and that of the increase or decline in number of students and subjects assists in establishing whether Online content would have contributed to a specific amount of cost reduction or not.

9.4.5.3 THIRD LEVEL OF IMPLEMENTATION

Similarly, the implementation of online assessments can be targeted by clearly established historic costs associated with formative and summative assessments, such as costs of stationery, printing, travel and accommodation, invigilation wages and salaries and storage of exam papers. The online facilitation of assessments reduces the need for these cost-bearing processes. The inverse implications of the replacement of manual processes on assets like buildings, rates and electricity will also become noticeable. Therefore, the implementation of online assessments will replace the following manual procedures:

9.4.5.3.1 Replacing manual formative assessments

Stationery and printing: There will be no need to print question papers, memorandums and answer sheets. As a result, the number of material used for assessments, which depends on the number of students and the number of subjects, will be replaced by uploading one test that is written by all students.

- University staff members should be encouraged to explore other forms of assessment such as open book tests to allow students to take tests from their offices or homes. The open book exam is especially encouraged for part-time and distant learning because online processes are becoming unavoidable and proficient for both the universities and students (Bon De Schryver, Hossana Twinomurinzi & Jordaan, 2011:7; Hough & Neuland, 2013:594; Penzhorn, 2013:71; Owusu-Ansah, *et al.,* 2015:34-35). As a result, learning will not be limited to the time and boundaries of the university. The move will also assist in offloading computer labs and other campus-based facilities.
- Invigilation: There will be no need to hire the same number of invigilators during assessments. Only those invigilators who might need to help with technical issues will be provided in cases where a test is being taken from a computer lab. Impliedly, an invigilator should be someone who has additional skills of utilising technologies.

- Most of the marking will be done automatically or manually online. This increases the chances of reliability and consistency as papers will be marked automatically according to the pre-set standard.
- Administration of marks: All lecturers should enter their own marks into the ITS system instead of submitting manual and electronic mark sheets to administrators.
- Primarily, the onus should be with the lecturer (not a department) to make sure that all marks are correct.
- Secondarily, the onus to make sure that all marks are correct rests with the student and this improves the leaner involvement and responsibility throughout. Learners should have access to the marks entered into the system immediately after they have been marked. A provision should be made to allow a student to acknowledge by means of electronic signature that their marks are correct.
- Publication of all test and calculated course marks should be made on student portals instead of central notice board. Students should view their marks on student portals immediately after a test has been marked to allow them to lodge a complaint with their lecturer as soon as they can.
- Once a lecturer has captured formative assessment marks, according to established datelines, the marks should reflect immediately for the Exam Department to determine the course marks. The responsibility of the Examination Officer will still be to determine the course mark of every student per subject. However, these processes should be carried out at an individual student basis with pre-set automatic calculations. The Exam Department must recalculate that student's course mark after all the marks have been entered, and a student approved that their marks are correct.
- The examination department should no longer publish the preliminary course marks on the central notice boards. The publication of course marks should be made on student portal with the students expected to verify whether their marks are correct.

9.4.5.3.2 Replacing manual summative assessments

- The marking of an examination takes place immediately after it has been written by students. Online assessment ascertains the safety and security that assessment policies advocate for, since there is no need to manually handle sensitive assessment papers and records.
- The accuracy of marking increases as it replaces the manual process of calculation and putting total marks on front pages of the answer sheet and calculating percentages. The following manual processes and paper work will be replaced.

11. The recording of marks into a printed EXAM MARK SHEET
12. The capturing of marks into a SPREADSHEET for printing.
13. The capturing of marks on a printed ASSESSMENT MARK CONTROL FORM (LS 107.3)
14. The capturing of a printed RE-ASSESSMENT CANDIDATES (LS 103) list

15. Submission of all of the above documents to the moderator
16. Submission of all the above documents and answer sheets to the HOD for verification and signature
17. All of the responsibilities that are carried out by the ARC as contained within the Assessment procedure of 2017 will be eliminated (refer to chapter 5). The turnaround time for marking and moderating scripts will be reduced.

9.4.5.3.3 Revision of examination department responsibilities

The lecturer's inputting of all marks into the ITS system leaves the exam department with the role of verifying and calculating the students' final predicate. However, the lecturer will still perform the role of marking after students have written the examination. The moderation of online tests will become even much easier because online evaluations will adhere to validly, reliability, manageability and directness rules of examinations. Therefore, the lecturer has the responsibility of entering marks into the ITS system after the moderator of his work and the following steps can be performed immediately as prescribed.

18. The PRELIMENARY MARKS CALCULATION SHEET using collaborative tools
19. The printed FINAL MARKS CALCULATION SHEET using collaborative tools
20. The Lecturer's approval using collaborative tools
21. The moderator's approval using collaborative tools

9.4.5.3.4 The revision of the AGU's responsibilities

- The AGU will still produce and publish an assessment schedule online.
- There will be no need to number seats in the examination venue. Students with the required identification who qualify to seat for the examination should be allowed into the venue.
- They will no longer contact assessors to collect scripts for marking, since the written examination will self-submit and reach the examiner.

9.4.5.3.5 *Revision of invigilators responsibilities*

The Chief invigilator will still have the responsibility to check that the venues are arranged properly and fit for the purpose. He/she no longer has the task of collecting assessment material form the AGU one (1) hour before the allocated starting time of the exam because the following documentation will be replaced already:

- *"The necessary question papers;*
- *The necessary stationery;*
- *The chief invigilators' report and mark-sheets; and*
- *The attendance slips (to be completed by students participating in the assessment)"* (CUT, 2017: Assessment Procedure).

9.4.5.3.6 Handling of test papers and examination books

"Test papers, test books and assessment books are classified as confidential documents with a high risk, and should be treated as such. All test papers, test books and assessment books are only valid if the CUT logo appears on them. The copying services officers make a number of copies on requisition form. Extra copies are added for the library and Information Services (LIC), and are kept in a storeroom until after assessments" (CUT, 2002: Policy and procedure on the handling of test papers and examination books). Online assessments should allow for his intention to be fulfilled better than any manual procedure with little or no cost.

The transferring of assessments to the web eliminates or reduces the following costs:

- Purchasing of test papers, test books and examination books from a supplier.
- Verifications made by the Assistant Assessment Officer that the correct quantity has been delivered.
- High level of security around the assessment material mentioned above.
- Space for keeping all the assessment material.
- Requisitions for test papers by faculties on a specific form (LS225) for the main tests and the obligations of further security of this material.
- Examination books from the Examination section during examination as there will be no need to deliver a specific number of examination books and question papers to venues .
- Checklist for stationery that involves all examination books that were delivered to the venue and reconciliations between the submitted and utilized material.
- The examiners responsibility to make sure that material like completed or incomplete test papers, test books and/or examination books from venue do not leave the venue in the hands of students.
- Storage of completed examination books according to national archive prescriptions
- The costs of storing of Completed examination books by Stuttafords Archiving Services for five (5) years and the Examination Department's responsibilities for making such arrangements.

Time-based analysis: The meeting of an increase or maintenance of constancy in the number of students and subjects with a decrease in the amount of targeted stationery and printing will make online assessment to be considered as having contributed to the replacement of these stationery and printing costs.

9.4.5.3.7 Travelling and accommodation

The costs of travelling and bookings for accommodation in order to conduct invigilation of summative assessments will also be targeted through the third level of implementation.

Time-based analysis: Provided that the need for travelling and accommodation for assessments still existed, and that the related travelling and accommodation decreased during the time when online assessments increased significantly, then online assessments will be viewed as having contributed to reduced travelling and accommodation.

9.4.5.4 FOURTH LEVEL OF IMPLEMENTATION

The university should use online collaborations to reduce stationery and printing that could not be affected by other levels of implementation. For example, publicity, content sharing and assessment cannot replace the stationery and printing related to the personal lecture notes and shared material between staff members. However, these materials can be kept on online platforms such as e-Thuto, Office 365, google documents and web-based clouds. The same documents can be shared with other staff members for collaborative projects. Students can be tasked with online projects that demand them to collaborate with each other and in that way replace tedious manual work that needs space and time management. There is also an additional travelling and accommodation that can be replaced by further online collaboration. For example, beyond travelling to administer manual assessments, staff members may need to travel to offer classes in other campuses, meet their post-graduate learners or for meetings, workshops and trainings. Hence, wed technologies, e-Thuto in particular, should be used to target such costs with this level of implementation. The fourth level of implementation should therefore target replacing:

9.4.5.4.1 Stationery and printing

This relates to the manual processes of handling notes for lecturers, the sharing of information among colleagues, student project collaborations, and working on manual papers between lecturers and students.

9.4.5.4.2 Travelling and accommodation

Online interactions targeted at replacing another type of travelling and accommodation especially that relates to meetings among colleagues, meetings between lecturers and students at postgraduate level and some workshops and trainings.

9.4.5.4.3 Communication

Online communication will replace traditional uses of telephones within and between campuses and beyond the organisational frontiers.

Time-based analysis: If it can be established that online collaborations have grown over a specified period of time, and the previously targeted processes have been reduced together with their associated costs, then online collaborations will be linked with this change.

9.4.6 FORMALISE IMPLEMENTATION

The setting of measurable objectives must be followed by rigorous and systematic ways of enhancing the use of the technologies for both increased utilisation and financial benefit. Flexibility within teaching and learning with web technologies should not result in lecturers' use of the tools that they want when they see it necessary. Various types of web technologies have been made available at faculty level and by the e-learning centre at institutional level to permit the idea of flexibility. Staff members have been given an indirect choice of which tools to use, hence, there is no guarantee that the tools will be used and this leads to too many dissimilar and uneven practices that are difficult to conceptualise.

The solution to uneven practices is to institutionally formalise the use of e-Thuto while still encouraging the idea of flexibility. The University should officially accept and implement specific core functions of e-Thuto at faculty, departmental and staff member levels. Flexibility should mean that staff members' utilisation of web technologies is not limited to the core functions of e-Thuto. However, there must be a minimum standard that all staff members are expected to meet. Nonetheless, staff members should be allowed to use other technologies that are within and outside e-Thuto. This approach will not limit the capable staff members' use of e-Thuto but it will help ascertain that there is minimum progress among those who are lagging behind. In the long run and as the progression continues, the gap between the first and the late movers can be expected to close.

9.4.7 IMPLEMENT OR CORRECT

It is necessary, for an organisation that has already started with the implementation, to correct its plans and practices based on the framework. It cannot be overemphasised that the implementation of this proposed framework should be done after careful study of institutional contextual needs and *'higher order'* objectives as embodied within Vision 2020 and strategic objectives.

9.4.8 MONITOR PROGRESS AND MAKE MODIFICATIONS

Beyond the implementation stage, an organisation needs to establish an ongoing monitoring process of whether the set goals are being achieved or not. According to Gilfoil and Jobs (2012:644), an organisation may need to make adjustments after comparing actual performance and results with the planned yardsticks. The framework recommends the consideration of the following guiding questions before any alteration of plans:

- What is/was the objective of implementation of web technologies?
- What is/was the planned benchmarks of implementation?
- Are we certain that we are on the right track and pace to achieving the objectives within the set time limits? Alternatively, a question can be;
- Are we achieving the planned goals of implementation?

- What processes need to be fast tracked or modified?
- Who is the main role player in fast tracking or modifying the process?

The outcomes of this process have to be communicated to the key stakeholders or role players. The university needs to establish a process that consistently captures and compares real-time operational costs and web technology fluctuations. Since the two factors fall under two different departmental overseers, both departments will need to collaborate on this mission and should be assisted with resources and personnel for this purpose. Such a process will help provide the university with more accurate measures of the impact of web technologies on such costs so that when a measurement is conducted, it will mainly be to glean information that is already available. Otherwise, the challenge of investigating too bulky historic information may render the task very tedious, inaccurate, or even close to impossible.

9.4.9 CONTINUOUSLY IMPROVE AND COMMUNICATE

The statement by Gilfoil and Jobs (2012:644) that, *"No matter how good the results, improvement is always possible and desirable"* is instructive. Throughout the life of web technologies, the University should continually evaluate the processes with a readiness to improve or modify and communicate with all role players.

9.5 Users of the framework and their roles

A discussion is carried out on the implications of the framework to various stakeholders in order for the University to benefit a meaningful growth in web technologies. The following stakeholders have a stake in the implementation of the framework.

9.5.1 Policy makers

Exploitations of web technology has been allowed and limited at the same time by the authority that is implied within the overriding policies and procedures. Policy makers at CUT need to revise their documents based on the framework in order to permit measurable and beneficial use of web tools. They need to make sure that the e-learning policies of the university are at par with other higher order policies so that they address the vision of the University in a clear and visible way.

9.5.2 Management

They are responsible for allocating budgets for the purchasing of resources that include web technologies such as Blackboard. They are always interested in measurable benefits of web technologies. The framework can help them with intentional but realistic financial objectives. It will also help reconcile their requirements for technology implementation with the reality as perceived by the e-learning centre.

9.5.3 Financial department

The financial fraternity is responsible for assisting the University with sound financial information and guidance towards the establishment of a financially healthy organisation. The fraternity may use the framework to determine the financial goals that are possible through the use of web technology and how that can be achieved. They may also be obligated to adopt systems and procedures that consistently capture the progression of all operational costs in ways that reveal relationships between such costs and institutional conventions such as the use of technology.

9.5.4 Teaching and learning

The teaching and learning wing should be viewed as the major user of this framework. They are responsible for the implementation of web technologies through the centre for e-learning. The e-learning centre is also responsible for the implementation of web technologies and reportage on its growth. The framework might help the wing to revise their policies and implementation approaches. If they cannot measure whether there is a benefit or not, it will become difficult for management to support web technology projects in the long run. The framework serves as a tool that the e-learning centre can use to address the expectations of management.

9.5.5 Researchers

Researchers should be responsible for finding more beneficial utilizations of web technologies on a continuous basis. They can help find out current trends, motivations, benefits and predict the future patterns of web technology that can inform current practices. They can evaluate the relevance of the framework to the present and future opportunities and challenges.

9.5.6 Deans and Heads of departments

Deans and Heads of departments should be viewed as having an oversite role to the use of web technologies at faculty and departmental levels. They can use this framework to assess the level of implementation, encourage improvements and report to the University management about the quality and level of growth of web technologies within their area of oversite.

9.5.7 Lecturers

Lecturers should know the potentials and objectives of using web technologies at their institution so that their actions will work towards that. They need to know what is expected of them and when. Moreover, they need to know and appreciate the potentials of the tools that they have in combatting resource scarce environments and helping them perform their duties with less efforts. They should view web technologies as an opportunity to grow and make their work better.

9.5.8 Students

Students are the major customers of the web technologies. They should know how the tools are meant to help them eliminate unnecessary costs for themselves and the institution. They should understand that the financial health of the university is also for their benefit and as such must strive

at assisting their University achieve this goal. In addition, students must use web technologies as an opportunity for them to grow in technological skills that they need even beyond university life.

9.6 Recommendations of the study

The following additional recommendations are made in order to improve the reliability of web services and continuity. The recommendations focus on infrastructure, network issues, policies and the capacity of e-learning centre.

9.6.1 Infrastructure and network issues

The issue of poor infrastructure and network issues has been a major impediment to reliable web technology implementation for a long time. It will continue to be a problem if universities are not clear, resolute and systematic on what they want to do with web technologies and how they want to do it. The financial resources of the University will be spread between too many processes including those that can be avoided or replaced by available technology. The University should have clear intentions on what they want to achieve with web technologies and within set time frames. The established clarity will be followed by the necessary processes of diverting the financial resources to envisioned trajectories and thus begin to reduce the problems of unreliable network set-ups that are essential to powering web services.

As a result of the University's implementation of web technologies, it will result into the replacement of unnecessary infrastructure and related costs like electricity. It will further result into the diversion of finances saved to powering and maintaining smooth internet connection. The study does not recommend that some infrastructure be blindly replaced without a careful analysis of its purpose. However, there must be a real analysis of which infrastructure is needed *vis-à-vis* that which is not. For example, the growth in use of web technologies depends on student access through smart phones. Therefore, in the long run, it cannot be expected that computer labs will still be the major locations for students' access to internet. Nevertheless, computer labs will be necessary for writing formative and summative assessments under a controlled environment. The University will be afforded a chance to divert the soon to be idling resources like halls to other income generating activities, which could result in substantial income for powering internet connections. The financial resources gained from the university's replacement of unnecessary stationery, printing, travel and accommodation and communication with technology, can be diverted again to improving connections. The finances involved in powering the internet will be less than those saved from the replaced processes, hence, the university will have a better financial standing.

9.6.2 Institutional policies

A meaningful success of the strategic vision depends on the policies that direct the core business of the university, which is the e-learning policy and the teaching and learning policy. The University

must revise these policies to address the increasing number of students coming into the higher learning, scarcity of resources and increasing operational costs. The policies must be revised to match more accurately with the strategic vision of the University and address the financial efficiency, sustainability and value for money issues. Failure to target these issues with policies means that the achievement of the objectives will take time.

9.6.3 Training and web technology expertise

The university's aspirations for technology are very high. They are mentioned in almost every recognised strategy or policy. However, these goals depend on the technological proficiency of users. The University should consider making the knowledge of web technologies (teaching with technology) one of the contributing aptitudes to successful recruitment. There must also be clear goal on how many lecturers should be able to use which levels of the framework and by when. At the moment, taking up a training on web technologies is not compulsory. There must be clear but reasonable requirements for every lecturer to grow the knowledge that will help the university to achieve its goals. Staff members should be considered as the main contributors to the success of web technology implementation; hence they must receive adequate and continuous training.

9.6.4 Capacitate e-learning centre

It is recommended, with a view towards improving the evaluation ability of web technologies by the E-learning Centre that, the centre be capacitated with additional staff members and resources. The main focus of these personnel should be to evaluate the use of web technologies in a detailed way and in accordance with established standards and goals. The production of detailed reports by such personnel will;

First, help to highlight the successful and poor implementations in terms of core functions, **Secondly,** it will show which faculties, departments or courses would be behind on specific core functions, and

Thirdly, improvement plans will be thoroughly informed and focused on problem areas.

9.6.5 Establish departmental alliances for financial evaluation

There is a possibility that the necessary expertise on identifying the benefits of web tools are unknowingly available within the borders of the University but they are fragmented through different fields. As a starting point towards unifying this professional knowledge, the e-learning centre, information and communication services and the financial department should be tasked with the responsibility of determining the financial benefits and standards related to web technology implementations. In that relationship, the financial department will bring expertise on financial evaluations while the e-learning centre contributes the understanding of web technologies within the unique teaching and learning environment, and the IT fraternity offering the technical expertise.

The sole involvement of the e-learning centre will result in a leaning towards the qualitative objectives. There has always been a rivalry between the financial fraternity's view of things such as ROI and others from sectors such as marketing who are more qualitative in their view. However, these knowledge zones created in a context where differing views can be found within one organisation, such as within a University, can be used for the advantage of the organisation.

9.7 Contribution of the study

The unique contribution of the current study is that it establishes clear standards against which a measurement may be attempted. Other studies like that of Gilfoil and Jobs (2012) have only mentioned the setting of measurable objectives as a requirement to a future determination. However, the present study extends that the potential of specific tools to contributing financial benefits should be determined. When it is only suggested in general terms that web technologies contribute certain benefits, institutions habitually rush to implement the tools without a clear plan of what benefits to target and with which tools. Moreover, while previous studies only suggested the idea that web technologies contribute operational changes over a period of time, the present study established that a time-based approach akin to time-series is a basis for measurement.

9.8 Recommendations for further research

The struggle to measuring the financial benefits of web technologies in quantifiable ways is far from being over. There is need for a resolution to this struggle. Future studies will have to continue the search for quantifiable financial benefits in this arena. The current practice of sloping towards the modified ROI should not hinder the search for financial measurements. It may mean the devising of new methods and encouraging the accounting field to accommodate these new techniques. Future studies can start by evaluating those benefits that are easy to measure and progress through some '*trial and error'* towards other benefits. A dynamic area such as that of technology is expected to be different in the future. What is difficult to measure presently may be less difficult in the future. Therefore, a longitudinal case may be conducted in the future as it considers that a follow-up study may be conducted based on previous studies (Yin, 2009:46-65; Olivier, 2014:99).

Another area of research that can be done in the future is the practical implementation of a time-series analysis of web technologies. This study will consider days, weeks, months or years as data points within which the predictor and dependent variables can be analysed. A comparative study of one university's faculties, departments or courses' use of the core functions of web technologies is also recommended for the future. The value of such a study will be to show how the nature of a subject or program affects the implementation of specific core functions of web technologies.

9.9 Limitations to the study

- Because web technologies are implemented in fragmented ways and not for financial benefit, it was not possible to device a financial measurement.
- Apart from those displayed by official documents, views from the financial department are not part of the findings due to their distanced role in teaching and learning technology implementation and the fragmented nature of implementation that renders a financial detection impossible.
- Because of the limitations of resources and time constraints, the scope of the study was limited to University teaching and learning. Other studies can include all other University functions and/or the entire core business constructs.
- Since the current study was conducted within one single case, the findings cannot be expansively generalised.

9.10 Conclusions

The main purpose of the study was to develop a framework to implement web technologies for financial benefits and measurability. As a result, a framework that proposes the setting of measurable standards was developed. The absence of such a framework or established standard of measurement makes this framework a unique contribution. The suggested solution to some patchy utilisation of web technologies is the formalisation of web technologies and the establishment of minimal standards that all lecturers should be expected to meet within a reasonable time. The framework will remain relevant by considering and serving the institutional vision and strategic plans and sustainability imperatives. Moreover, it functions as a wake-up call for the University to reconsider its processes and survival prospects in the changing world.

9.11 Bibliography

Accenture. 2009. Web 2.0 and the next generation of Public Service. Available on: www. accenture.com/.../Accenture_Public_Service_Web_2_dot_0_in_Public [Accessed on 2nd December2009].

Ambe, CM., Evengelou, O., Govender, B., Koortzen,PJ and Ziemerink,J. 2008. Cost and management accounting, 2nd Edition. South Africa: Van Schaik.

Apereo Foundation. 2016. Sakai. https://www.sakaiproject.org/why-sakai Date of access: 9th May 2016.

Armstrong, J and Franklin, T. 2008. A review of current and developing international practice in the use of social networking (Web 2.0) in higher education. Franklin Consulting.

Badenhorst, J. 2015. Extent of e-learning at universities of technology – our strengths for our future. New Generations Science 12 (1):1-18.

Bagarukayo, E and Khalema, B. 2015. Evaluation of e-learning usage in South African universities: A critical Review. International Journal of Education and Development using Information and Communication Technology. 11(2):168-183.

Baker, R. 2010. On the Definitions of Income, Expenses and Profit in IFRS. *Accounting in Europe,* 7(2): 147-158. DOI: 10.1080/17449480.2010.511892

Bansal, 2012. Printing and stationery expenses. Learn accounts. Available on: http://www.letslearnaccounting.com/printing-and-stationery-expenses. [Accessed on 14th January 2012].

Barnes, D., Fintan Clear, F., Dyerson, R., Harindranath, G., Harris, L & Rae, A. 2010. Web 2.0 and micro-businesses: an exploratory investigation. *Journal of Small Business and Enterprise Development,* 19(4): 687-711.

Bashir, M.,Afzal, M. &Azeem, M. 2008. Reliability and Validity of Qualitative and Operational Research Paradigm. Pakistan Journal of Statistics and Operation Research. 6 (1):35-45.

Bennett, S., Bishop, A., Dalgarno, B., Waycott, J and Kennedy, G. 2011.Implementing Web 2.0 technologies in higher education: A collective case study. *Computers and Education Journal,* 59 (2012) 524–534.

Berger, P. & Nasr, N. 1998. Customer lifetime value: marketing models and applications. *Journal of Interactive Marketing*, 12(1):17-30.

Bhimani, A, and Bromwich, M. 2010. Management Accounting: Retrospect and Prospect. London. Elsevier/CIMA.

Bitzer, EM. 2017. Working towards doctorateness: workshop for PhD research candidates at the Central University of Technology, Bloemfontein on 1-2 August 2017.

Bughin, J and Chui, M. 2010. The rise of the networked enterprise: Web 2.0 finds its payday. Available on: http://www.mckenzyquarterly.com/article_page.aspx?ar=2174. [Accessed on 29th December 2010].

BlackBoard. (2010). BlackBoard Incorporation. Available on: www.blackboard.com [Accessed 25 May 2010].

Bloomberg, LD and Volpe, M. 2016. Completing your qualitative dissertation. A road map from beginning to end. Third edition. London: Sage.

Bon, A., De Schryver, T., Twinomurinzi, H and Jordaan, D. 2012. Less (in context) is more (Creativity): M-Learning as a short lived idea at the University of Pretoria.

Bosch, T.E. 2009. Using online social networking for teaching and learning: Facebook use at the University of Cape Town. Available on: http://dx.doi.org/10.1080/02500160903250648. [Accessed on 19th November 2009].

Botchkarev, A and Anduru, P. 2011. A Return on Investment as a Metric for Evaluating Information Systems: Taxonomy and Application. *Interdisciplinary Journal of Information, Knowledge, and Management,* Volume 6 (2011):246-265.

Bradford, P., Porciello, M., Balkon, N and Backus, D. 2007. The blackboard learning system: The be all and end all in educational instruction? *J. Educational Technology Systems,* 35(3): 301-314.

Brown, S., 2010. From VLEs to learning webs: The implications of Web 2.0 for learning and teaching. Interactive Learning Environments, 18(1):1-10.

Brown, J. S & Adler, B. 2008. Minds on fire: Open education, the long tail, and learning 2.0. EDUCAUSE Review, 43(1), 16–32.

Bharadwaj, AS. 2000. A Resource-Based Perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly* 24(1):169-196.

Bughin, J and Chui, M. 2010. The rise of the networked enterprise: Web 2.0 finds its payday. Available on: http://www.mckenzyquarterly.com/article_page.aspx?ar=2174. [Accessed on 29th December 2010].

BusinessDictionery.com. (a) 2016. Customer equity. Available on: http://www.businessdictionary.com/definition/customer-equity.html. [Accessed on 16th October 2016].

BusinessDictionery.com. (b) 2018. travel and entertainment expense. Available on: http://www.businessdictionary.com/definition/travel-and-entertainment-expense.html. [Accessed on 18th October 2018].

Cassell, C. 2015. Conducting Research Interviews for Business and Management Students. 1st edition. United Kingdom: SAGE.

Central University of Technology, Free State (CUT) academic workload model, 2015.

Central University of Technology, Free State (CUT) annual report, 2012.

Central University of Technology, Free State (CUT) annual report, 2013.

Central University of Technology, Free State (CUT) annual report, 2014.

Central University of Technology, Free State (CUT) annual report, 2015.

Central University of Technology, Free State (CUT) annual report, 2016.

Central University of Technology, Free State (CUT) annual report, 2017.

Central University of Technology, Free State (CUT) Archives, 2017

Central University of Technology, Free State (CUT) assessment policy, 2017

Central University of Technology, Free State (CUT) assessment procedure, 2017

Central University of Technology (CUT), Free State. 2015. E-learning strategy 2015-2020 and beyond. Bloemfontein, (D S 15.3.7 Doc 7 A).

Central University of Technology, Free State (CUT) innovation in Teaching and Learning, 2016.

Central University of Technology, Free State (CUT) (Memo) ICT Service bulk printing monitoring, 2017.

Central University of Technology, Free State (CUT). 2017. Official Calendar.

Central University of Technology, Free State (CUT) policy and procedure on the administration of results at the CUT, 1999.

Central University of Technology, Free State (CUT) policy and procedure on handling of test papers, as well as test and examination books.

Central University of Technology, Free State (CUT). 2016. Strategic plan 2015-20.

Central University of Technology, Free State (CUT). 2014. Strategic Operational Plan of the Academic Division.

Central University of Technology, Free State (CUT) Sustainable Development Framework.

Central University of Technology, Free State (CUT). 2010. Vision 2020 and Strategic Plan 2010-2015 and 2016-2020.

Chartered Institute of Management Accounting. 2009. A strategic approach to disruptive technologies. Britain.

Choudhury, N. 2014. World Wide Web and Its Journey from Web 1.0 to Web 4.0. International Journal of Computer Science and Information Technologies, 5 (6): 8096-8100.

Cloete, M and Marimuthu, F. 2015. Basic accounting for non-accountants. 2nd Edition. South Africa: Van Schaik.

Constantinides, E and Fountain, S.J. 2008. Web 2.0: Conceptual foundations and marketing issues.*Journal of Direct, Data and Digital Marketing Practice,* 9(3):231-244.

Cook, N. 2008. Enterprise 2.0. *How Social Software Will Change the Future of Work.* Aldershot: England. Available: Gower Publishing Ltd.

Creswell, JW and Garret, AL. 2008. The "movement" of mixed methods research and the role of educators. South African Journal of education, 28:321-333.

Cruz, RD. 2014. The theory of cost and profit. What is cost? Available on: http/:prezy.com. [Accessed on 11th May 2014].

Dahar,T and Lazarevic, B. 2014. Emerging instructional technologies: exploring the extend of faculty use of web 2.0 tools at a Mid-western community college. Springer Science & Business Media B.V. 58(6):42-50.

Dunlap, JC & Lowenthal, PR. 2011. Learning, unlearning, and relearning: Using Web 2.0 technologies to support the development of lifelong learning skills. In G. D. Magoulas (Ed.), E infrastructures and technologies for lifelong learning: Next generation environments. Hershey, PA: IGI Global. DOI: 10.4018/978-1-61520-983-5.

Department of Higher Education and Training (DHET). 2014. Policy for provision of distance education in South African Universities in the context of integrated post-school system, Government Gazette, 7th July 2014. Pretoria. DHET.

Dlalisa, FS and Van Niekerk, B. 2015. Factors affecting the post implementation adoption and usage of Blackboard amongst academics at DUT. In: 9th annual teaching and learning in higher education conference. Re-imagining higher education policy implementation. Durban 21-23 September 2015. University of Kwazulu Natal: Complexities, challenges and possibilities, p.2-15.

Economist Intelligence Unit. 2007. Serious business. Web 2.0 goes corporate. Available on: http://znconsulting.com/insights/eiu-report-serious-business-web-20-goes-corporate/ [Accessed on 4th May 2007].

Edmonds, WA and Kennedy, TD. 2017. An applied guide to research designs. 2nd edition. United Kingdom: SAGE.

Education technology, 2017. The new CU eLearning System - Blackboard Learn 9.1. Tools for Common Teaching Activities. Available on: http://www.cuhk.edu.hk/eLearning/c_systems/elearn/bbnews/. [Accessed on 23rd October 2017]

Elowitz, B. and Li, C., 2009. The world's most valuable brands. Who's most engaged? Available on: http://www.rankingthebrands.com/PDF/Engagement%20Scores%20top%20100%20brands%202009.pdf. [Accessed on 21st July 2009].

El-Sayed, H, and Westrup. 2011. Adopting enterprise Web 2.0 collaborative technologies in business: The implication for management accountants. *Chartered Institute of Management Accountants.* 7(4):1-9.

Else, G., Walt, R., Wet SR, and Meyer. 2012. Fundamentals of cost and management accounting, 6th edition: LexisNexis. South Africa.

Els, G., Erasmus, P and Viviers, S. (eds.). 2015. Corporate Finance. A South African Perspective: South Africa: Oxford University Press.

Fitchman, RG. 1992. Information Technology Diffusion: A Review of Empirical Research. *ICIS,* 195-206, 1992

Gachago, D., Ivala, E., Backhouse, J., Bosman JP and Bozalek, B. 2013. Towards a shared understanding of emerging technologies: experiences in a collaborative research project in South Africa. *The African Journal of Information Systems.* 5(3): 94-105.

Gay, LR., Mills, GE., and Airasian, P. 2009. Educational research: Competency for analysis and application, 9th edition. Upper Saddle River, NJ: Merrill/Pearson Education.

Gallaugher, J. & Ransbotham, S. 2010. Social media and customer dialog management at Starbucks. MIS Quarterly Executive, 9(4): 197 – 212.

Gartner Inc. 2016. Gartner IT Glossary. Total Cost of Ownership. Available on: www.gartner.com. [Accessed on 14th October 2016].

Getting, B. 2007. Basic definitions: Web 1.0, Web. 2.0, Web 3.0. Available on: http://www.practicalecommerce.com/articles/464/Basic-Definitions:-Web-1.0,-Web.-2.0,-Web-3.0/ [Accessed on 23rd June 2008].

Gilfoil, D and Job, C. 2012. Return on Investment for social media: A proposed framework for understanding, implementing and measuring the return. *Journal of Business & Economics Research.* 10 (11):637- 650.

Goo, M., Watt, S., Park, Y and Hosp, J. 2012. Web 2.0. A Guide to choosing web-based curriculum-based measurements for the classroom. Council for exceptional children. 45(2):34-40.

Grant, RM.1991. The resource-based theory of competitive advantage: implications for strategy formulation. *California Management Review* 33(3):114-135.

Grosseck, G. 2009. To use or not to use web 2.0 in higher education? *Procedia Social and Behavioural Sciences,* 1 (2009) 478–482.

Hargadon, S. 2008. Web 2.0 is the future of education. Available on: http://www.stevehargadon.com/2008/03/web-20-is-future-ofeducation.html [Accessed on 4th March 2008].

Hendler, J. 2009. Web 3.0 emerging. Available on: http://venturebeat.com/2008/01/14/shared~database~metaweb~gets~42m~boost. [Accessed on 14th January 2008].

Hinchcliffe, D. (2010). Why All the Fuss About Web 2.0?: Infonomics. 24(1): 26-31.

Horngren,C., Foster, G., Datar, social media and Uliana, E. 2008. Cost and management accounting in South Africa, 1st Edition: Prentice Hall.

Hough, J and Neuland, N. 2013. Web 2.0 usage in higher education in South Africa. South African Journal of Higher Education. 27(3): 590-606

Hyvonen, T., Jarvinen., J., Pellinen, J and Rahko, T. 2009. Institutional Logics, ICT and Stability of Management Accounting. An international scholarly journal of the European Accounting Association. 18 (2): 241-275.

InsideHigherEd. (2010). Blackboard buys Angel: Inside higher education organization. Available on: http://www.insidehighered.com/news/2009/05/07/bb [Accessed 12th September 2016].

International Business Machine (IBM). 2009. Governments in 3D: How public leaders can draw from virtual worlds. Available on: http://www.businessofgovernment.org/sites/default/files/Wyld3dReport.pdf [Accessed on 2nd December 2009].

International Institute of Business Analysis (IIBA). 2015. *Document Analysis*. [Video webinar]. Accessed on: https://www.youtube.com/watch?v=1z_x9i6b4O0 [Accessed on 28 November 2018].

Isaacs, S. 2007. ICT in Education in South Africa: SURVEY OF ICT AND EDUCATION IN AFRICA: South Africa Country Report.

Jaarsveldt, LC and Wessels. 2011. The application of Web 2.0 technologies by South African government. University of South Africa. 18(4): 63-79.

Jordaan, M. 2015. USING Blackboard collaborate as a reflection tools in service learning module. In: 9th annual teaching and learning in higher education conference. Re-imagining higher education policy implementation. Durban 21-23 September 2015. University of Kwazulu Natal: Complexities, challenges and possibilities, p.2-15.

Kaske, F., Kügler, M and Smolnik, S. 2012.Return on Investment in Social Media – Does the Hype Pay Off?: Towards an Assessment of the Profitability of Social Media in Organizations. In: 45thInternational Conference on System Sciences, Hawaii4 January 2012. IEEE: Computer Society, p.3898-3907.

Katsifli, D., 2012. The impact of Blackboard software on education globally over the past 10 years: With a focus on the measurable benefits from using Blackboard Learn software and related technologies. Technical report, Blackboard Inc., USA.

Kew, J and Watson, A. 2010. Financial accounting introduction. 3rd Edition: Oxford University Press South Africa.

Klonoski, E. 2008. Cost-Saving Collaboration: Purchasing and Deploying a Statewide Learning Management System.Available on: http://www.innovateonline.info/index.php?view=article&id=69. [Accessed April 24, 2008].

Koppeschaar, ZR., Rossouw, J., Deysel, DJ., Sturdy, J., Van Wyk, H., Gaie-Booysen, Papageorgiou, K., Smith, C., Van der Merwe, CM and Schmulian, A. 2015. Descriptive accounting. IFRS focus. 19th edition. South Africa: LexisNexis.

KPMG International. 2008. Enterprise 2.0 tales from the trenches Available on: https://www.kpmg.com/CN/en/IssuesAndInsights/ArticlesPublications/Documents/enterprise-2.0-tales-O-0811.pdf. [Accessed on 14th November, 2008].

Kumar, R. 2011. Research methodology: A step by step guide for beginners. 3rd Edition.

Leedy, D. & Ormrod, E. 2010. Practical research. 9th Edition. United States: Pearson International.

Lehmkuhl, T. 2014. Towards Social CRM - A Model for Deploying Web 2.0 in Customer Relationship Management. Thesis (PhD). St.Gallen: University of St.Gallen, School of Management. Germany.

Linsey, T., Katsifli, D and Gipps, C. (2005) The costs and benefits of implementing a university-wide VLE: *Some real data, Journal of Science Education 6* (special issue): 27–29

Laudon, K.C and Laudon, J.P. 2014. Management Information Systems: *Managing the digital firm*. (13th Edition). United States: Pearson International.

Lwoga, L. 2012. Making learning and web 2.0 technologies work for higher learning institutions in Africa. Emerald Group Publishing Limited 29(2):90-107.

MacKeogh, K and Fox, S. 2009. Strategies for Embedding E-Learning in Traditional Universities: Drivers and barriers. Electronic Journal of e-Learning, 7(2) 147-154.

Mangiuc, D.M. 2009.Measuring web 2.0 efficiency. *Academy of economic studies*11 (1):74-89.

Martin, F. 2008. Blackboard as the Learning Management System of a Computer Literacy Course. *MERLOT Journal of Online Learning and Teaching*, 4(2): 138-145.

Matade, R and Rajeev, S. 2017. Comparative study of web 1.0, 2.0 and 3.0. In: 2nd International conference on recent trends in Engineering science, Humanities and Management. Ashoka Centre for Business and Computer Studies. India 2nd to 3rd February. www.conferenceworld.in.

Mathaba, S., Dlodlo, N., Smith, A and Adigun, M. 2011. The use of RFID and Web 2.0 Technologies to Improve Inventory Management in South African Enterprises: The Electronic Journal Information Systems Evaluation, 14(2):228-24.

Meyers, MD. 2013. Qualitative research in business and management. 2nd edition. Britain: SAGE.

Mihai, G. 2014. Some aspects of using web 2.0/enterprise 2.0 technologies in accounting. Available on: http//www.ann.ugal.ro/eco/ [Accessed on 14 August, 2014].

Mohapatra, S. 2013. E-Commerce Strategy. Text and cases. New York: Springer US. http://www.springer.com/gp/book/9781461441410. Date of access: 1 March. 2017.

Moodle. (2010). Moodle organization. Available on: www.moodle.org [Accessed on 25th May 2010].

Morris, D. (2008) Economies of scale and scope in e-learning, Studies in Higher Education, 33(3), 331-343

Mungofa, M.F and Peter, T. 2015. Social Media in Tertiary Education-Vhembe Further Education Training College Case Study.*The IAFOR Journal of Education,* 3(3):59-71.

Nazree, H.A. 2010. Data is the next "Intel Inside". Available on: https://hanazree.wordpress.com/2010/03/14/data-is-the-next-%E2%80%9Cintel-inside%E2%80%9D/. [Accessed on 14th March 2010].

Niemand, AA., Meyer, L., Botes, VL and VanVuuren, SJ. 2006. Fundamentals of cost and management accounting. 5th Edition. Durban: LexixNexis.

Nixon, B., Burns, J, and Jazayeri, M. 2011. The role of management accounting in new product design and development decisions. Chartered Institute of Management Accountants. 9 (1): 1-7.

Oates, BJ. 2006. Researching Information Systems and Computing. London. SAGE

Opensource.com. 2014. What is open source? Available on: https://opensource.com/resources/what-open-source. Date of Revision. [Accessed on 11th March 2014].

O'Reilly, T. 2010. What Is Web 2.0: design patterns and business models for the next generation of software. Available on: http://mpra.ub.uni-muenchen.de/4578/ [accessed on 23rd August, 2007].

Owusu-Ansah., C.M Gontshi, V., Mutibwa, L and Ukwoma, L. 2015. Applications of Social Media and Web 2.0 for Research Support in Selected African Academic Institutions. *Journal of Balkan Libraries Union,* 3(1): 30-39.

Page, EL. 2014. How To Measure Social Media ROI For Your Business Available on: http://blog.hootsuite.com/measure-social-media-roi-business/ [Accessed on 30th June, 2014].

Parson, S. 2006. Total cost of ownership (TCO): A brief tutorial. Available on: www.costquest.com/uploads/pdf/TotalCostofOwnershipTutorial_Jan06.pdf. [Accessed on 6th January 2006].

Penzhorn, C. 2013. The use of social media in teaching a campus-wide information literacy course. *Mousaion,* 31(3): 57—73.

Pietkiewicz, I and Smith, JA. 2014. A practical guide to using Interpretative Phenomenological Analysis in qualitative research psychology. *Czasopismo Psychologiczne – Psychological Journal,* 20 (1) 2014, 7-14.

Quinlan, C. Business research methods. United Kingdom: Cengage Learning EMEA.

Ramdeyal, P.K. (2013). The current state of play among staff and students at South African Universities of Technology. *Journal for new generation science,* 12(2): 77-99.

Repko, AF. 2012. Interdisciplinary research process and theory. 2nd edition. United Kingdom: SAGE.

Romero, NL. 2011. ROI. Measuring the social media return on investment in a library. Emerald Group Publishing, Limited. 24(2):145-151.

Ross, L. 2009. Beyond enthusiasm, making the business case for your organization's use of Web 2.0. Chartered Institute of Management Accounting (CIMA).

Rudman, R. and L. Steenkamp. 2009. Potential influence of Web 2.0 usage and security practices of online users on information management. South African Journal of Information Management 11(2): 1–13.

Rule, P and John, V. 2011. Your guide to case study research. First edition. Johannesburg: Van Schaik Publishers.

Rust, R., Lemon, K., & Zeithaml, V. 2004. Return on marketing: Using customer equity to focus marketing strategy. Journal of Marketing, 68 (1):109 – 127.

Ryan, B., Scapens, RW and Theobald, M. 2002. Research methodology in finance and accounting. 2nd edition. Britain: Thompson.

Sahd, L.M and Rudman, R. 2013. Using web 2.0 to improve service delivery. Available on:http://www.saiga.co.za/index_htm_files/AuditingSA_Summer1314_Using%20Web%202%20to%20improve%20service%20delivery.pdf.[Accessed on 14th November 2013].

Salkind, NJ. 2012. Exploring research. (8th edition). United States. Pearson education Inc.

Sapsford, R and Jupp, V. 2008. Data collection and analysis. (2nd edition) London; Sage publication.

Schneider, G.P. 2014. E-Business.10th Edition.United Kingdom. Course Technology.

Schniederjans, D., Cao, E.S. and Schniederjans, M. 2013. Enhancing financial performance with social media: An impression management perspective. Decision Support Systems, 55 (2013) 911–918.

Selwyn, N., Crook, C., Carr, D., Carmichael, P., Noss, R. and Laurillard, D. (2008), "Education 2.0? Designing the web for teaching and learning", Available on: www.tlrp.org/pub/documents/TELcomm.pdf [Accessed on 2ndJuly 2011].

Service, CLS, (eds.). 2009. Gripping GAAP. Your guide to international financial reporting standards. Durban: LexisNexis.

Severance, C., Hardin, J. and Whyte, A. 2008. The coming functionality mash-up in Personal Learning Environments. Interactive Learning Environments, 16(1): 47-62.

Shelly, BG., Cashman, JT, and Rosenblatt, JH. 2010. System analysis and design. (8th edition). United States: Course technology.

Shelly, BG and Rosenblatt. 2012. Analysis and design for systems. (9th edition). United States: Course technology.

Shuttleworth, M. 2008. Qualitative Research Design. Available on: http://www.experiment-resources.com/qualitative-research-design.html. [Accessed on 25th April 2012].

Smith, D. 2008. Web 2.0 and beyond: evolving the discussion. Available on: http://www.gartner.com/DisplayDocument?ref=gsearch&id=588707&subref=simple search [Accessed 20 June 2008].

Smit, LM. 2011. A framework for an affordable pricing strategy at the Central University of Technology, Free State. Thesis (PhD). Bloemfontein: Central University of Technology, School for Accounting.

Smith, M. 2015. Research methods in accounting. 3rd edition. Britain: SAGE.

Song, D and Lee, J. 2014. Web 2.0 and informal learning. Has Web 2.0 revitalized informal learning? The relationship between Web 2.0 and informal learning. Journal for computer assisted learning. 30(2014): 511–533.

Ssekakubo, G., Suleman, H. and Marsden, G., 2012. Learning management systems: Understanding the expectations of learners in developing countries. In *Proceedings of the IADIS International Conference, e-Learning* (pp. 251-260).

Stegman, N., Pietersen, ME., Van Schalkwyk, CJ. And Kopperschar, 2007. GAAP Applications. Corporate financial reporting. 4th edition. Durban: LexisNexis.

Thinyane, H.2009. Are digital natives a world-wide phenomenon? An investigation into SouthAfrican first year students' use and experience with technology. *Computers & Education Journal,* 55 (2010) 406–414.

Unal, Z and Unal, A. 2011. Evaluating and Comparing the Usability of Web-based Course Management Systems. Journal of Information Technology Education, 10 (2011):19-38.

Universities South Africa (USAf). 2016. Universities Funding in South Africa; A Fact Sheet. South Africa.

UNIVERSITY OF FREE STATE, FREE STATE. 2015. Learning with Technology at the UFS. Bloemfontein.

Van der Zande, MM., Gorter, R. C and Wismeijer, D. 2013. Dental practitioners and a digital future: an initial exploration of barriers and incentives to adopting digital technologies. *BRITISH DENTAL JOURNAL,* 215(2013): 1-5.

Veletsianos, G. 2010. Emerging Technologies in Distance Education.Theory and Practice.Canada: Edmonton. Available: AU Press.

Vigario, F. 2007. Managerial accounting. 4thEdition: LexisNexis.

Wanago, N. 2013.Effective web 2.0 for your class room. Available on: www.actonline.org.tutorials. [Accessed on 1st January 2013].

Weinberg, BD and Pehlivan, E. 2011. Social Spending: Managing Social Media mix. *Business Horizon*, (2011)54:275-276.

Welman, C., Kruger, F and Mitchel, B. Research methodology. 3rd edition. South Africa: Oxford.

Whitmer, J., Nuñez, N., Harfiel, T and Forteza, D. 2016. Patterns in Blackboard Learn tool use: Five Course Design Archetypes. Retrieved from http://blog.blackboard.com/research-in-progresslearning-analytics-at-scale/

Williams, C.H and Gray, E. 2009. Degrees of Openness: The emergence of Open Educational Resources at the University of Cape Town. *International Journal of Education and Development using Information and Communication Technology, 5 (5):101-116).*

Yin, RK. 2009. Case study research design and methods. Applied social research methods series. 4th edition. United States of America: SAGE.

Zheng, D.,Chen, H., Lusch, R and Li, S. 2010. Social Media Analytics and Intelligence. IEEEIntelligence Systems, 25(6):13-16.

APPENDIX A: Letters requesting permission to conduct the study

i) To the Registrar

Central University of Technology, Free State

Faculty of Management Sciences

06 DECEMEBR 2017

ATT: REGISTRAR
CENTRAL UNIVERSITY OF TECHNOLOGY (CUT)
FREE STATE, BLOEMFONTEIN

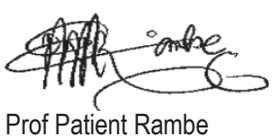
RE: PERMISSION TO UNDERTAKE A RESEARCH STUDY

This letter serves to confirm that Mr **Baptista Ratakane Maime** (Student Number 207010617) is CUT Doctor of Business Administration candidate under my supervision. The focus of his investigation is "**Developing a framework for measuring financial benefits of using web 2.0 within SA universities."**
The purpose of the study is to investigate the financial impact of Web 2.0 tools within a university context.

I kindly request that you provide him with institutional records from your office. The records that he needs relate to the usage of web tools and their financial impact at CUT for the purpose of completing his studies and production of research outputs. Attached is a list of documents that he will need.

For any further inquiries concerning his study, please feel free to contact the said student at 0727622930 or myself using the contact details below.

Thanking you in advance



Prof Patient Rambe
Associate Research Professor: Department of Business Support Studies

Contacts: +27 51 507 4064 | **Fax:** +27 51 507 3869 | **E-mail:** prambe@cut.ac.za

ii) To the director for e-learning and educational technology

Central University of Technology, Free State

Faculty of Management Sciences

04 SEPTEMBER 2017

ATT: DEPUTY DIRECTOR (eLET)
CENTRAL UNIVERSITY OF TECHNOLOGY (CUT)
FREE STATE, BLOEMFONTEIN

RE: PERMISSION TO UNDERTAKE A RESEARCH STUDY

This letter serves to confirm that Mr **Baptista Ratakane Maime** (Student Number 207010617) is CUT Doctor of Business Administration candidate under my supervision. The focus of his investigation is "**Developing a framework for measuring financial benefits of using web 2.0 within SA universities."**
The purpose of the study is to investigate the financial impact of Web 2.0 tools within a university context.

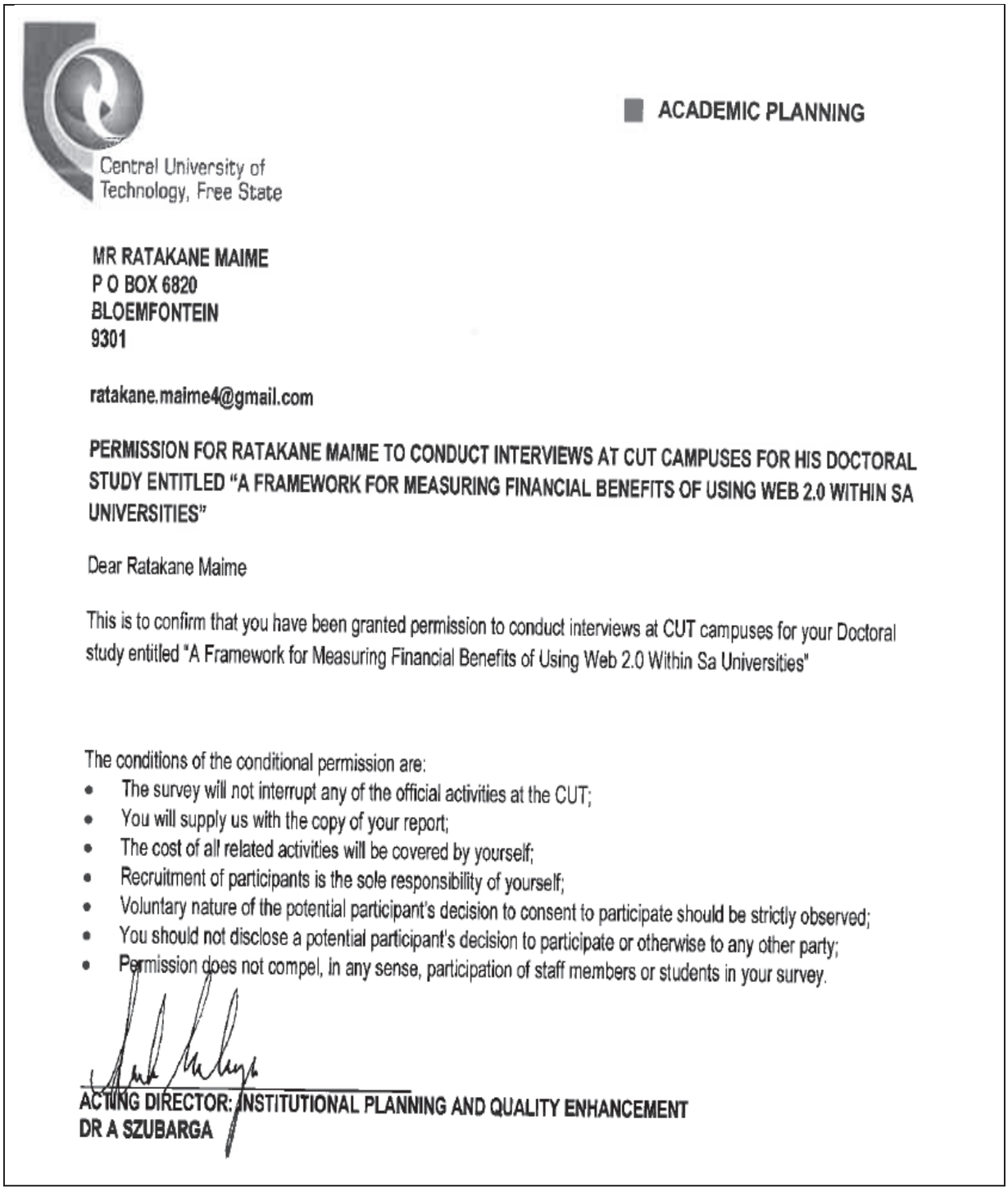
I kindly request that you provide him with permission to undertake his research in your department. The data will be collected in CUT's Department of Financial Administration and Center for E-Learning and Educational Technology at the Welkom and Bloemfontein campuses for the purpose of completing his studies and production of research outputs.

For any further inquiries concerning his study, please feel free to contact the said student at 0727622930 or myself using the contact details below.

Thanking you in advance

Prof Patient Rambe
Associate Research Professor: Department of Business Support Studies
Contacts: +27 51 507 4064 | **Fax:** +27 51 507 3869 | **E-mail:** prambe@cut.ac.za

iii) Institutional permission to conduct the study



Central University of Technology, Free State

ACADEMIC PLANNING

MR RATAKANE MAIME
P O BOX 6820
BLOEMFONTEIN
9301

ratakane.maime4@gmail.com

PERMISSION FOR RATAKANE MAIME TO CONDUCT INTERVIEWS AT CUT CAMPUSES FOR HIS DOCTORAL STUDY ENTITLED "A FRAMEWORK FOR MEASURING FINANCIAL BENEFITS OF USING WEB 2.0 WITHIN SA UNIVERSITIES"

Dear Ratakane Maime

This is to confirm that you have been granted permission to conduct interviews at CUT campuses for your Doctoral study entitled "A Framework for Measuring Financial Benefits of Using Web 2.0 Within Sa Universities"

The conditions of the conditional permission are:

- The survey will not interrupt any of the official activities at the CUT;
- You will supply us with the copy of your report;
- The cost of all related activities will be covered by yourself;
- Recruitment of participants is the sole responsibility of yourself;
- Voluntary nature of the potential participant's decision to consent to participate should be strictly observed;
- You should not disclose a potential participant's decision to participate or otherwise to any other party;
- Permission does not compel, in any sense, participation of staff members or students in your survey.

ACTING DIRECTOR: INSTITUTIONAL PLANNING AND QUALITY ENHANCEMENT
DR A SZUBARGA

iv) Permission from the Registrar to access institutional records

Central University of Technology, Free State

REGISTRAR

07 December 2017

Dear Professor Rambe

Letter of authorization to undertake a research study: Developing a framework for measuring financial benefits of using web 2.0 within SA universities

This letter will serve as authorization of Mr Baptista Ratakane Maime to undertake the research study entitled "**Developing a framework for measuring financial benefits of using web 2.0 within SA universities**" at our university, and in the process, making use of our university records.

Upon a review of the letter sent to us by your office, we are glad to offer Mr Maime an opportunity to conduct the same study as specified. All interviews, filed surveys, observations around the campus and the distribution of questionnaires are approved and will be duly mutually agreed between Mr Maime and the relevant business units. The same business units will know and act accordingly if some of the requested records are of a confidential nature.

If you have any concerns or require additional information, feel free to contact the Office of the Registrar through the Executive Secretary, Ms Nthabiseng Moeketsi on 051 – 507 3151.

Yours faithfully,

Dr N. Mrwetyana
REGISTRAR

Add Unit here • Private Bag X20539 • Bloemfontein • SOUTH AFRICA • 9300 •
Tel: +27 051 507 3151 • **Fax:** +27 051 507 0000 • **E-mail:** email@cut.ac.za • **Website:** www.cut.ac.za

APPENDIX B: Focus Group discussion Schedule

Date:	12th June 2017: 12:00 – 13:00
Venue:	Conference room - Centre for e-learning
No. of Participants:	Four

Introduction

My name is Baptista Ratakane Maime (207010617). I am a doctoral student within the department of Business Support Studies at CUT.

The title of the study:

A FRAMEWORK TO ENHANCE FINANCIAL BENEFITS OF IMPLEMENTING WEB TECHNOLOGIES AT CENTRAL UNIVERSITY OF TECHNOLOGY (CUT), FREE STATE

Thank you very much for setting aside part of your valuable time to participate in the following exercise. The information that you will provide in this discussion is meant to address the following research objectives. Should you be willing to get the transcription and/or the results of the study, the researcher will be glad to do so.

THE OBJECTIVES OF THE STUDY

1. To carry out an investigation of the nature of accessible web technologies for teaching and learning at CUT.
2. To assess in detail the potential financial contributions of web technologies to CUT since their implementation.
3. To examine the effectiveness of current practices for assessing the financial impact of web technologies at CUT.
4. To develop a framework for enhancing the financial benefits of implementing web technologies for teaching and learning at CUT.

Research question 1: What web technologies are accessible for teaching and learning at CUT?
This research question is mainly addressed by the e-learning Strategy: THE CENTRAL UNIVERSITY OF TECHNOLOGY E-LEARNING STRATEGY 2015-2020 and Beyond.

1. Evaluation of the **e-learning strategy: 2015**

d) Having looked at the e-learning strategy and according to personal observations, web technologies are available at CUT for teaching and learning:

- Comment on whether the above statement is correct or not.
- What web technologies are available at CUT?
- Implementation of web technologies at CUT begun in which year and month?

e) Comment on the validity of the following statements:

- Web technologies within the E-learning strategy refer mainly to the use of E-Thuto (Blackboard).
- E-Thuto contains most of the web technologies used for teaching and learning at CUT.
- Which year and month did CUT start using Blackboard?

f) Different versions of Blackboard exist in the market.

- What version was the first Blackboard at CUT?
- Which year and month did CUT start using the current version of Blackboard?
- What version of Blackboard is the current E-Thuto?
- Why did CUT choose the current version or to upgrade from the previous one?

g) Apart from E-Thuto, what other web technologies do staff and students have access to at CUT?

The progression of e-learning (or educational technologies) as described within the E-learning strategy has been enabled by the following institutional plans/policies. The following additional questions are meant to improve clarity on each plan and the progression of educational technology at CUT.

2. First plan for e-Learning and Educational Technology (2002 - 2004);

a) What was the purpose of this policy?

b) What were the limitations of the policy?

c) Which web based technologies (e.g. E-Thuto, WebCT) were implemented at CUT for teaching and learning since 2002 to 2004?

3. The Strategic Plan for Educational Technology (2004 - 2009);

a) What was the purpose of this policy?

b) What were the limitations of this policy?

c) Which web based technologies were implemented at CUT for teaching and learning since 2004 to 2009?

4. Revision of the Strategic Plan for Educational Technology (2009);

a) What inspired the revision of this policy?

b) What web based technologies were implemented for teaching and learning during that time?

5. The Improvement Plan (2010).

a) What inspired the implementation of this policy?

b) What web based technologies were implemented for teaching and learning during that time?

Research question 2: What are the potential financial contributions of web technologies to CUT since their implementation?

1. Through the use of web technologies for teaching and learning, does the University envision any financial benefits like cost cutting or profitability?
2. What financial practices are utilized by the University to assess these financial benefits?

Examples may include capital budgeting methods like:

Pay-back Period (PBP), Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index (PI) or Accrual Rate of Return (ARR).

Or Return on Investment Techniques like:

Traditional or modified ROI, Return On Asset (ROA), DuPont method of profitability analysis, Residual Income (RI), Economic Value Added (EVA)

Answer…

Research question 3: How effective are the practices that CUT utilises to assess the financial impact of web technologies?

According to your judgement:

1. **What is the relationship between the use of web technologies and behavior operational costs of the University?** (E.g Printing, stationery, meetings, transportation, travelling)
2. **What is the relationship between the use web technologies and profitability of the University?**
3. **Has the use of web technologies at CUT reached the level at which these benefits can be realized? Why do you believe so?**
4. **Do web technologies help staff reduce time they spend performing their duties?**

a) Is there a way in which your institution measures that?

b) How do you think this can be translated into a financial benefit?

Research question 4: What is a possible framework for enhancing financial benefits of implementing web technologies for teaching and learning at CUT?

Please explain your answer…

The following are the examples of main operations to be assessed for financial implications:

1. **Online announcements reducing the use of traditional notice boards.**

a) Do you believe that this is the case at CUT?

b) What is the reason for this?

c) How does this contribute to cost reductions?

2. **Online announcements reducing the use of traditional emailing facility.**

a) Do you believe that this is the case at CUT?

b) What is the reason for this?

c) How does this contribute to cost reductions?

3. **Online content sharing (course material, study guides etc) reducing printing costs**

a) Do you believe that this is the case at CUT?

b) What is the reason for this?

c) How does this contribute to cost reductions?

4. **Online content sharing (course material, study guides etc) reducing stationery costs**

a) Do you believe that this is the case at CUT?

b) What is the reason for this?

c) How does this contribute to cost reductions?

5. **Online tests and feedback reducing manual tests and the related printing and stationery costs.**

a) Do you believe that this is the case at CUT?

b) What is the reason for this?

c) How does this contribute to cost reductions?

6. **Online discussions through discussion forums, wikis, blogs and others reducing consultation time**

a) Do you believe that this is the case at CUT?

b) What is the reason for this?

c) How does this contribute to cost reductions?

7. **Online video conferencing replacing travelling and physical meetings.**

a) Do you believe that this is the case at CUT?

b) What is the reason for this?

c) How does this contribute to cost reductions?

8. **Online trainings replacing traditional training sessions**

a) Do you believe that this is the case at CUT?

b) What is the reason for this?

c) How does this contribute to cost reductions?

9. **Online surveys replacing or reducing printing and stationery**

a) Do you believe that this is the case at CUT?

b) What is the reason for this?

c) How does this contribute to cost reductions?

10. What other operations have been altered or replaced by use of web technology?

11. **Thank you very much for your participation to this study**.

a) Would you like to get the transcription of this discussion?

b) Would you like to get the final results of the study?

12. You are welcome to make some additional remarks if you have any.

Thank you once again.

Student name: Baptista Ratakane Maime (207010617)

Signature: