FACTORS IMPEDING THE USAGE OF ELEARNING AT A TELECOMMUNICATION ORGANIZATION IN SOUTH AFRICA: BRIDGING THE GAP WITH CLOUD SERVICES

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DECLARATION

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I declare that the topic *"FACTORS IMPEDING THE USAGE OF ELEARNING AT A TELECOMMUNICATION ORGANIZATION IN SOUTH AFRICA: BRIDGING THE GAP WITH CLOUD SERVICES"* is my own work, and that all sources I have used and quoted in this study have been acknowledged by myself and referenced accordingly using the Harvard referencing style.

P. Mere	28 September 2020
SIGNATURE	DATE

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ABSTRACT

With the enormous competition in the industry, organizations must frequently find better ways to embrace organizational learning. This research study advocates eLearning to be one of the best methods for organizational learning, and this is the study's main area of interest. This research explored a case at a telecommunication organization named ComTek (pseudonym). The research study addressed a problem of eLearning low usage rate, which resulted in ComTek not meeting their set learning targets during the time of the study. The usage rate was measured using the number of enrolled assessments. The study uses qualitative methods to propose a conceptual framework to understand the causes of low eLearning usage. This conceptual framework illustrated the use of the activity theory elements to understand the problem of eLearning low usage, paired with the use of cloud computing services to access eLearning, and the use of content delivery techniques to help understand eLearning low usage. This conceptual framework took advantage of cloud services like Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

This research study focused on the periods from 2016 to 2017 for collecting data and creating an understanding of the research setting, while other data was derived from historical documents about the phenomenon studied. During this period, there was inadequate literature about cloud computing and other aspects to consider within the domain of telecommunication organizations. The literature study, therefore, comprised of literature from different domains. During the study, ComTek used eLearning with the aid of learning management systems (LMS) to manage learning and leverage employee skills.

During the period of the study compared to other years, about 50% of assessments had a usage rate of below 80%, a standard target established by ComTek as a benchmark, placing compliance and training at a low rate. Of the 50% of assessments, some were just above 40% in usage rate, were of a high stake, and were in the categories of compliance and training assessments. While this was the case, this study did not consider the technical implementation of the application systems involved, and did not create any form of intervention, but focused on understanding the activities that were involved in the learning environment. This research study used a paradigm that was constructive and interpretive in nature, using qualitative methods with the belief that there were multiple realities in understanding the situation at ComTek and possible solutions to it.

To unpack the multiple realities, an exploratory case study was conducted as a research approach. In this study, the researcher used multiple data collection methods, including open-ended questionnaires and unstructured interviews.

KEYWORDS: eLearning, LMS, Moodle, Learning Styles, Cloud Computing, Cloud Service, IaaS, PaaS, SaaS, Learning Objects

DEDICATION

I dedicate this research to my mother and father who have always taught me that education is the key to any success in the world. I further dedicate this research study to all students who are in the same space of trying to complete their studies but find it hard and difficult to complete. I want to tell them to remain steadfast and take it one step at a time. Soon it will all be done.

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Mere, P. and Naidoo, R., 2016. Embracing Learning Styles in an Organization’s eLearning Environment. *Quality and Equity*. Commonwealth of Learning (COL) and Open University Malaysia (OUM), 2016-11

Mere, P. and Naidoo, R., 2016. Perceived ease of use and usefulness of Elearning in an organization. *3rd International Conference on Electrical, Electronics, Engineering Trends, Communication, Optimization and Sciences (EEECOS/E3COS)-2016*

CHAPTER ONE
Introduction and background to the study

1.1. Introduction

The topic that presents this research study is, “FACTORS IMPEDING THE USAGE OF ELEARNING AT A TELECOMMUNICATION ORGANIZATION IN SOUTH AFRICA: BRIDGING THE GAP WITH CLOUD SERVICES”. This topic addressed an understanding of influences which may contribute to the low usage of eLearning within the telecommunication space in South Africa. This topic also addressed cloud computing as a way to improve eLearning usage by taking advantage of cloud services.

Learning remains part of the most integral needs of an organization. At ComTek (pseudonym), a telecommunication organization in South Africa, learning and training was an important part of the business strategy during the time of this study. As traditional classroom training was expensive, the organization decided to use e-learning with the aid of learning management systems (LMS) to leverage employee skills, and manage their learning in the organization. At this point, ComTek had realised that although their eLearning environment was in place, they could, however, not reach their targets in usage, compliance and upskilling their employees.

Considering the importance of learning and training in ComTek, and the impediments of adequate usage, this research study aimed at deriving a new understanding of the causes of low eLearning usage at ComTek. To achieve this, the researcher followed a known information system theory, and used known research methodologies as guidelines towards understanding ComTek’s eLearning problem. This study used the Activity Theory (AT) to learn about stimuli perceived when ComTek employees and other stakeholders interacted with the eLearning environment and its tools.

With interest in ComTek’s situation, the researcher took a deep dive and emancipated in a study to unpack the causes of eLearning low usage at ComTek during the time of the study. From this emancipation, it was discovered that ComTek used Moodle and SumTotal as eLearning systems in the organization during this period. Because of cost and hosting issues with

SumTotal, the organization, however, was in the process of dismantling and discontinuing its usage.

Moodle is an open source system that was installed on the organization's local servers on their premises, while SumTotal was hosted by a vendor at the vendor's premises. Another tool that ComTek used for online assessments was the Question mark Perception (QMP) tool. The QMP tool was also installed on the organization's local servers on the premises. QMP was also a rented tool and was supported by a vendor during this time. Similarly, QMP was also in the process of being dismantled and discontinued like SumTotal. During the time of the research study, the organization was in an intense cost-cutting era.

The study at hand addresses the following case study problem:

During the time of the research study, ComTek had set a minimum target of 80% as a benchmark percentage for calculating eLearning usage and pass rate, but could not meet this minimum target during the period of the study. During mid-2016 to mid-2017 compared to preceding years since 2012 when eLearning was initially implemented at ComTek, about 50% of compliance and training assessments had shown a decline of below 80% in both usage rate and pass rate. Of the 50% of assessments, some were between 40% and 50% in usage rate.

The set learning targets, therefore, were not met during mid-2016 to mid-2017, and this caused a major drawback for the organization's investment in eLearning. During this time, ComTek measured eLearning usage by the enrolment of assessments. This research study addressed questions about factors impeding the adequate usage of eLearning in telecommunication organizations in South Africa. Contributory factors could have included but were not limited to less computer experience, low confidence, attitude and low ICT experience, low buy-in from users, lack of operational support, system failures, lack of incentives or compensation, or negative emotions including fear of the unknown, alienation, stress, guilt and anxiety, or other unknown factors.

To understand eLearning at ComTek, the researcher assessed the eLearning environment, interviewed participants, and sent open-ended questionnaires to respondents and other eLearning stakeholders. The result was a conceptual framework that helped to understand the low usage of eLearning at ComTek. The researcher argues that, if learners can have access to eLearning anytime anywhere, then the eLearning usage rate may improve. Learning anytime anywhere could be achieved by using cloud computing services like Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). This research study focused more on SaaS, than IaaS and PaaS, because there was no intended intervention or implementation planned. As part of an introduction to the holistic study, the researcher gives a brief understanding of eLearning and cloud computing next.

eLearning refers to the use of technology to improve teaching methods through standalone or distributed environments (Simoes, Rodrigues, Costa, & Proenca Jr, 2012: 56). ELearning is a self-learning concept with the aid or support of learning technologies. ELearning can also be classified as computer-based training (CBT), Internet-based training (IBT) or web-based training (WBT) (Bora & Ahmed, 2013).

During the time of the research study cloud computing was one of the top ten IT trends most businesses followed (Rivera, 2015). A cloud in cloud computing refers to the web as a space where computing has been pre-installed and is existent as a service, data, operating systems, applications, storage, and has processing power that is ready to be shared and used on an on-demand basis (Kalagiakos & Karampelas, 2011). A cloud that can be offered as a service to the public on a pay-as-you-go basis is called a public cloud, while the service is called utility computing (ibid). In cloud computing, services can also be provided through the internal data centres of a business, or from other organizations through a private cloud (Armbrust et al., 2010). Cloud computing also has benefits in cost reduction, quick and effective communication, security, privacy, flexibility and accessibility (Bora & Ahmed, 2013).

While ComTek measured eLearning usage rate using the number of enrolments of eLearning assessments, this study only focused on a few specific assessments provided by the organization as evidence data to build an argument. Access to a full batch of assessments was prohibited by ComTek as they had perceived the information to be strategic.

While low usage rate could have been caused by numerous causal factors, this study focused on understanding the people and their interaction with eLearning tools to achieve their eLearning goals. The researcher also looked at understanding how eLearning is presented. This section has introduced the research study while the next section elaborates on the purpose of the study.

1.2. Problem Statement

1.2.1. Problem Context

In this research study the researcher addressed a problem of low eLearning usage at a telecommunication organization in South Africa named ComTek. This section uncovers a myriad of factors that contribute to low eLearning usage, from similar research studies. While organizations could have well-planned strategies when embarking on eLearning projects, the extant literature highlights that eLearning systems/projects face several challenges. These well-planned strategies include ideal technology infrastructure arrangements, training and motivating teachers and learners, supporting management, and generally creating a conducive learning environment (Williams, Hussain, & Griffiths, 2010). These challenges affect both the learners and teachers.

The challenges affecting learners include social isolation, the long response time from the teacher, understanding course content and learning expectations, and the reliability of technology (Williams et al., 2010). Other challenges could be social challenges, like negative emotions including fear of the unknown, alienation, stress, guilt and anxiety, which could also hinder motivation and persistence of using and accepting eLearning (Dziuban, Moskal, Johnson, & Evans, 2017). Learners who partake in eLearning courses find it hard to fully embrace eLearning as a learning strategy (Dlalisa, 2017). Learning programmes are created to help learners develop their skills; however, these programmes do not consider the social context surrounding the learning goal (Larsen et al., 2017: 687).

The challenges affecting teachers include balancing time from creating to publishing content, arranging virtual meeting discussions, establishing a suitable structure, the teacher is unaware of learners' strong and weak points, duplication of multiple emails regarding the same topic, and reliability of technology (Williams et al., 2010). Some researchers argue that eLearning technologies are being used to facilitate course management and communication, and not course assessment (Dlalisa, 2017).

Njoroge & Nzuki (2017: 5-6) also indicate in their study that even though institutions may provide internet connectivity at the library, laboratories, and various hotspots, these connections were not adequately used for eLearning. They indicate in their research findings that respondents still complained about lack of internet, computers and skills, complexity eLearning and system, and limited time for online facilitation. Huang & Jao (2016: 117) argues in their research that motivation to learn is a major influence to training effectiveness. They say motivation includes elements like arousal, intensity, and direction towards learning.

While scientific evidence shows that some institutions experience different drawbacks in using eLearning, others have moved to cloud services for their data centres to acquire better benefits from service maintenance and reduced cost of operations (Aziz, Widyarto, Osman, & Marjudi, 2017). Perhaps the cloud could also be used to improve usage. There seems to be a number of cloud-driven eLearning research work within the higher education space (Aziz et al., 2017). However, within the telecommunication space in South Africa, cloud-driven eLearning has not been fully researched.

To date, very few research models, theories, and frameworks address cloud-based learning within telecommunication organizations in South Africa. This is where the researcher saw a gap to address this research study on. The researcher argues that, if ComTek wants to improve their low eLearning usage problem, and their investment in eLearning technology, they must move their eLearning to the cloud.

The research problem in this research study arises when ComTek had set a minimum target of 80% as a benchmark percentage for calculating usage rate and pass rate, but could not meet this minimum target during the time of the research study. During mid-2016 to mid-2017 compared to preceding years since 2012 when eLearning was initially implemented at ComTek, about 50% of compliance and training assessments had shown a decline of below 80% in both usage rate and pass rate. Of the 50% of assessments, some were between 40% and 50% in usage rate.

Scientific evidence from literature indicates that eLearning is not sufficiently used by learners for different reasons. The researcher argues that some of these reasons could equally be the cause of the low usage numbers at ComTek. The low usage of eLearning at ComTek has done more damage. It resulted in low compliance, low contribution to skills enhancement, and low recognition of the organization’s investment in eLearning. The organization knew this because it used this platform for disseminating knowledge and skills among employees. With this in mind, the researcher embarked on an investigation to better understand the contributing factors of low eLearning usage in telecommunication organizations in South Africa. The researcher did a qualitative case study using ComTek as a research setting. The research approach is explained next.

1.2.2. Research Approach

The above problem context indicates that learners were not fully inclined to use eLearning during the period of the study. Contributory factors could have been anything, such as less computer experience, low confidence, attitude and low ICT experience, low buy-in from users, lack of operational support, system failures, lack of incentives or compensation, or negative emotions including fear of the unknown, alienation, stress, guilt and anxiety.

While the low usage of eLearning systems could be caused by numerous causal factors, the current study only understanding three factors, (1) the eLearning technology used, (2) the presentation of eLearning, and (3) interaction of employee learners with their eLearning tools. This study used the activity theory as a guideline to address the three factors. This theory classifies the eLearning technology and LMS systems as tools or artefacts, the assessments as the object, the people as subjects, and the knowledge and skills as an outcome. The next section states the purpose of the study.

1.2.3. Purpose and Scope

In this study, the researcher developed a conceptual framework that was used to understand and address the causes of low usage of eLearning within telecommunication organizations in South Africa. The researcher also argues that learning anytime and anywhere can assist in improving the usage rate. Learning anytime anywhere, alternatively referred to as ubiquitous learning, can be achieved by using a cloud solution and taking advantage of available cloud services such as IaaS, PaaS and SaaS to deliver eLearning.

This research study focused more on SaaS, than IaaS and PaaS, because there was no intended intervention or implementation of software. IaaS, PaaS, and other technical aspects are only explained for additional understanding of cloud services.

Next, the researcher shows the research questions, and research objectives addressing the problem.

1.3. Research Questions

1.3.1. General Research Question

What new understanding can be derived from research that enables improved eLearning usage within telecommunication organizations in South Africa?

1.3.2. Specific Research Questions

- What new understanding can be derived on factors that contribute to low eLearning usage?
- What new understanding can be derived on eLearning requirements for improving eLearning usage?
- What new understanding can be derived on content delivery requirements for improving eLearning?
- What new understanding can be derived on technology that can be used to improve eLearning usage?

1.4. Research Objectives

The following objectives were addressed to understand the problem:

- To understand the factors that contribute to low eLearning usage.
- To understand eLearning requirements towards improving eLearning usage.
- To understand content delivery requirements towards improving eLearning.
- To understand a technology that can be used to improve eLearning usage.

The next section explains the rationale and motivation of the study looking at a personal, system, organizational and scientific perspective.

1.5. Rationale/Motivation

1.5.1. Personal Rationale

Interest in this topic was triggered by realising the importance and need for learning in organizations as a method for skill injection and employee retention. When the organization realized the inadequate usage of eLearning tools, and less-visibility in eLearning investment, the researcher saw an opportunity to problematise the situation and derive an understanding of the origin of eLearning low usage at ComTek.

1.5.2. System Rationale

At the time of the research, less was known whether the eLearning systems at ComTek could complement classroom learning regarding teaching, learning, writing assessments, collaboration, record keeping, course management and administrative tasks. In this case, the researcher had to consult with the stakeholders of the eLearning environment at ComTek to find out what features they desired to have in their eLearning environment that could substitute or complement traditional learning activities.

1.5.3. Organizational Rationale

The aim of this research study was to understand the origin of eLearning low usage at a telecommunication organization in South Africa named ComTek. The researcher knew that ComTek's eLearning solution was supposed to be worth the investment. The people factor surrounding the usage of eLearning technology in the organization played a major role in the output of this research as a contributing factor to the organization. The researcher consulted with the employees of ComTek and used the activity theory as a guide to understand if the eLearning technology implemented yielded good usage results.

1.5.4. Scientific Rationale

This study contributes to the body of knowledge by building a conceptual framework for understanding the low usage of eLearning in a South African telecommunication organization. The study suggests the use of SaaS (Software as a Service) cloud service to aid learning on the cloud. The researcher also explained other cloud services that could have been used if the aim of the study was to also intervene and implement. The conceptual framework in this study was an extension of the activity theory framework, but only focused on the subject, the object, and the tools or artefacts used in achieving cloud learning. For the sake of this study, the researcher had put less focus on the division of labour and the community elements of the activity theory.

1.6. Limitations of the Study

The timeframe to collect data from the organization was inadequate to comprehensively cover all aspects of the study. Thus, some aspects may have been left out to allow on-time completion of the study. A minimum of at least two years of data collection and observation was necessary to evaluate the learning environment with all other changes experienced in the organization, from the initiation time of the research, and onwards. The researcher aimed to see inclining graph levels of skills and pass rates over the first attempt of an assessment but not all the desired outcomes were feasible to achieve.

The study did not focus much on understanding the technical aspect of the eLearning system and did not have any intervention regarding the implementation of software. The study focused on understanding the eLearning environment at ComTek by creating a case and concluding with a conceptual framework for eLearning. The study also placed less emphasis on aspects of application design and application security. The study at hand, therefore, could have been impeded to an extent where technical aspects were not fully clarified but could be explored in future research. This research was qualitative in nature and, therefore, is not scientifically generalisable, as it was context driven and only focused on low eLearning usage.

Other limitations refer to the transformation of the organization during the time of the study where other participants were lost due to restructuring processes. Further responses, however, were obtained from other new respondents and this imposed a certain influence in the initial feedback. This could have been because of a lack of prior experience or being exposed to a new environment, which could have created biased responses.

1.7. Chapter Outline

This research study is divided into seven chapters, which start with an introduction and background chapter, followed by a literature review chapter, a research design and methodology chapter, a data presentation and analysis chapter, a discussion findings chapter, a review of conceptual framework chapter, and a conclusions and recommendations chapter. These chapters are respectively outlined next.

Table 1.1: Chapter Outline

Chapter	Chapter Heading	Description of the Chapter
1	Introduction and background to the study	This chapter discusses the problem statement, the research questions, the research objectives, the rationale and motivation of the study, and the limitations of the study. The problem stems from the problem context, the approach, and the purpose and scope of the study. The research questions are divided into general and specific research questions. The rationale of the study stems from a personal, systematic, organizational, and a scientific rationale.
2	Literature review	This chapter discusses the theoretical, conceptual and contextual background of the study. It discusses eLearning and its elements, and cloud computing and its elements. Then it discusses similar research studies, ending with a discussion and summary section.
3	Research design and methodology	This chapter elaborates on the research process, including the research methods and the research design. The chapter also shows how the researcher plans to do data analysis and elaborates on the credibility of the study. The last section in this chapter is a discussion and summary section.

Chapter	Chapter Heading	Description of the Chapter
4	Data presentation and analysis	The collected data are presented and analysed in this chapter. The data include open-ended questionnaire data that represents the interview data from remote respondents, document data, and unstructured interview data.
5	Discussion of findings	This chapter discusses and interprets the data collected in this study. Following the findings of the study, the research derives propositions.
6	Reviewing the Conceptual Framework	This chapter reviews the conceptual framework, and shows how requirements to curb eLearning low usage are mapped in the conceptual framework. This chapter shows how the researcher expands from a basic activity theory framework to an advanced activity conceptual framework that helps the researcher to understand where the cause of low eLearning usage is rooted from, and adds cloud services to help curb low eLearning usage.
7	Conclusions, recommendations and further research	This chapter concludes the study and discusses probable recommendations and further research.

CHAPTER TWO
Literature review

2.1.Introduction

Constructing an effective learning environment has been a journey of continuous improvement in the learning society. Learning has evolved over the years from a classroom-training approach to a computer training approach using compact discs and other external storage devices for learning content. Innovation has now introduced learning on the intranet and internet. This kind of learning is termed online learning or eLearning or even open distance learning as other researchers might mention.

While research continues to expand the learning horizon, it continually discovers new approaches to learning, including blended learning approaches that combine classroom learning with online learning. This study expands the mentioned learning approaches by exploring the possibility of eLearning on cloud technology. At first, it was important to explore the concept of eLearning, the concept of cloud computing, and the concept of combining the two technologies to see how they would fit into the conceptual framework proposed.

The researcher outlines literature from similar studies done by other researchers, shows the differences in their findings, and also acknowledges their contributions to this research work. This chapter shows the eLearning tools mentioned by other researchers and derives an understanding on how these tools can influence learning. This chapter also discusses learning objects and metadata, and how they both influence eLearning and enhance learning outcomes.

This chapter outlines guidelines and aspects to consider when planning for an eLearning project. The necessary stakeholders for an eLearning project are also defined here. When planning for an eLearning project, it is also critical to focus on content presentation and learners' learning styles. This may be another aspect to understand, that may impede the usage of the learning system. This chapter discusses different learning styles, and outlines the benefits and challenges of having eLearning as a learning approach.

This study aimed to understand low usage of eLearning and bring together eLearning and cloud computing services to build a conceptual framework for cloud learning. To expand this, a discussion on cloud services and cloud computing models is included. Furthermore, the chapter explains what is meant by cloud computing, the characteristics of cloud computing, cloud computing aspects to consider, and other related aspects about cloud computing. The chapter also discusses architectural models on how to implement eLearning on the cloud using cloud services.

In the discussion of cloud services, the researcher considers service providers as equally important. As a service provider, it is important to consider the algorithms used in the cloud to understand how resources in the cloud will be shared among users. Similarly, as a user, it is important to understand how your service provider intends to offer you the services to which you subscribe. Literature about resource allocation through these algorithms, as well as quality of service (QoS) aspects, are outlined in this chapter.

It is necessary to monitor services using monitoring tools to ensure service and resource availability at all times. More about cloud monitoring and cloud resource management is discussed in this chapter. Other aspects to mention from a literature viewpoint are the benefits and challenges of cloud computing. The blending of eLearning with cloud computing services is discussed to illustrate how cloud learning could be constructed. The next section discusses the theoretical, conceptual, and contextual background of this study.

2.2.Theoretical, Conceptual and Contextual Background

2.2.1. Theoretical Background

To build a conceptual framework that addresses the challenge of eLearning low usage, the researcher had to consider extant theories to help attain the correct eLearning philosophical stance. These theories had to address eLearning, as it is the main subject in this study. ELearning will be further discussed later in this chapter; however, Simoes, Rodrigues, Costa, & Proenca (2012: 55) describe eLearning as the use of information and communication technologies to advance traditional learning. Another technology that was used to help build this conceptual framework was cloud computing. Cloud computing provides eLearning services such as platform, software and infrastructure (Rivera, 2015).

While the latter technologies were used to build the conceptual framework, learners and other stakeholders who interacted with these tools also had to be addressed as part of this conceptual framework. The design of the conceptual framework thus required a theory that represented both the eLearning and cloud computing tools, plus the human element. The theory that closely matched these requirements was the activity theory. The activity theory indicates that "mediation through tools and technology is not a neutral process, the tools have an influence over the interaction between the subject and the object" (Hashim & Jones, 2007). In this study, the subject represents the human element, while the object represents the courses and the assessments.

In the activity theory framework, the activity is used to understand individual actions using tools (Hashim & Jones, 2007). The activity theory is rich regarding understanding how people interact with each other to do things using sophisticated tools in complex and dynamic environments (ibid).

Wangsa, Uden, & Mills (2011: 758) indicate the following advantages of using the activity theory:

- The real-life use of tools and technology in human interaction can be studied using the activity theory. In this study, the activity theory was used to assess and evaluate the interaction of content designers, learners, trainers, facilitators, system administrators and team managers on the learning management systems.
- Activity theory is a philosophical theory for understanding the human activities embedded in social practice and mediated by artefacts. By using the activity theory, the researcher managed to understand the learning activities of learners who were using both learning management systems, as well as how these learners interrelated.
- Activity theory provides a platform for understanding conflicts that arise because of various needs of users through contradictions and historical developments over time. By using the activity theory, the researcher discovered that learners were unhappy using the eLearning systems at ComTek for various reasons.
- Activity theory looks at practice as a complex activity that can be modelled. Using activity theory, the researcher managed to obtain the roles of stakeholders, the names of LMS systems used, how the participants used these systems for learning and could also map these activities to elements on the activity theory model.

- Activity theory allows different subjects in a community to share their experiences, histories, and how familiar they are with the tools used to work towards achieving an objective using different methods in their different divisions of labour. Learners at ComTek were from different backgrounds, different ages, and possessed different experiences in the work they did. Through collaboration as a community, they could share ideas on how to fulfil objectives, influence an outcome, obtain content, and articulate what was the best way to achieve results. They also shared ideas on best practices towards achieving a work-related result.

(Wangsa et al., 2011: 758)

Kinsella (2018: 497) shows the early-stage framework that represented the activity theory. In its early stages, the activity theory only had four elements as shown in Figure 2.1.

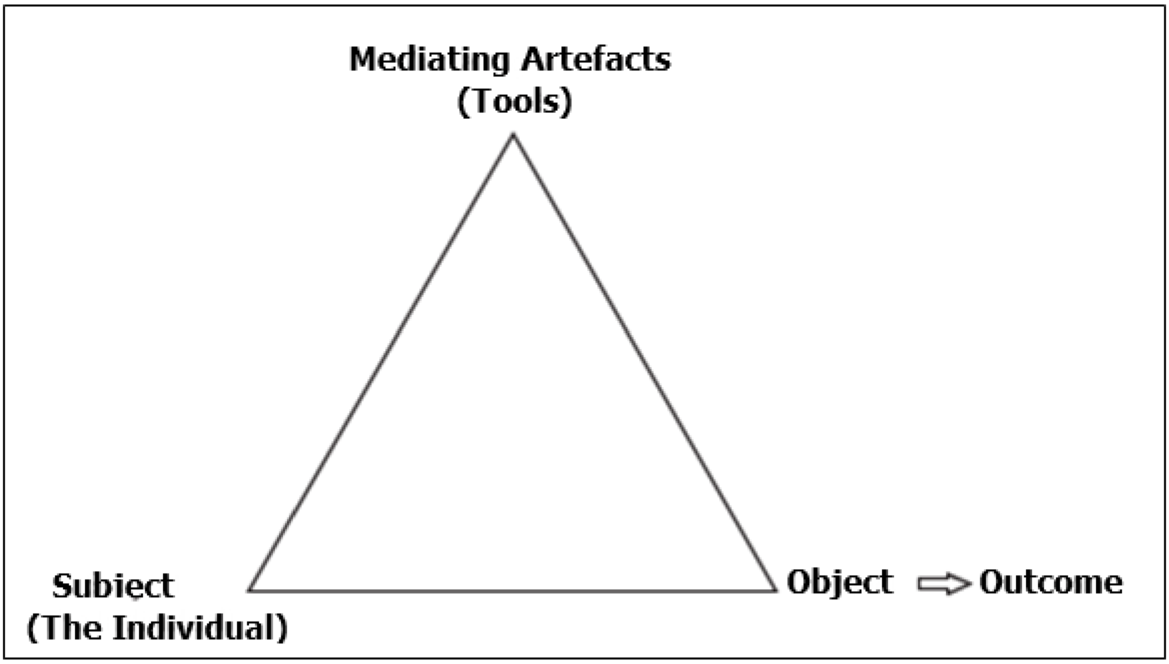

Figure 2.1: Vygotsky's first generation model of mediated action (Kinsella, 2018: 497)

The first-generation activity theory model had four elements, the subject, the object and the mediation artefacts, which translate to an outcome. In the activity theory, the actions by the subject are enabled by the mediation of tools (Larsen et al., 2017: 688). Examples of mediation artefacts are tools such as a paintbrush or of something to do with the mind, like language during questioning and discussions (Kinsella, 2018: 496). The activity theory is meant to explore the relationship between human behaviour within individual members of a group and their mediation using cultural artefacts that form a stimulus between members and the outcome of their mediation (Kinsella, 2018: 496-497). When individuals intervene and interact with artefacts, they enable change within the current culture of a setting by transforming an object into the desired outcome.

Figure 2.2 shows the expanded activity theory model that depicts the second-generation model.

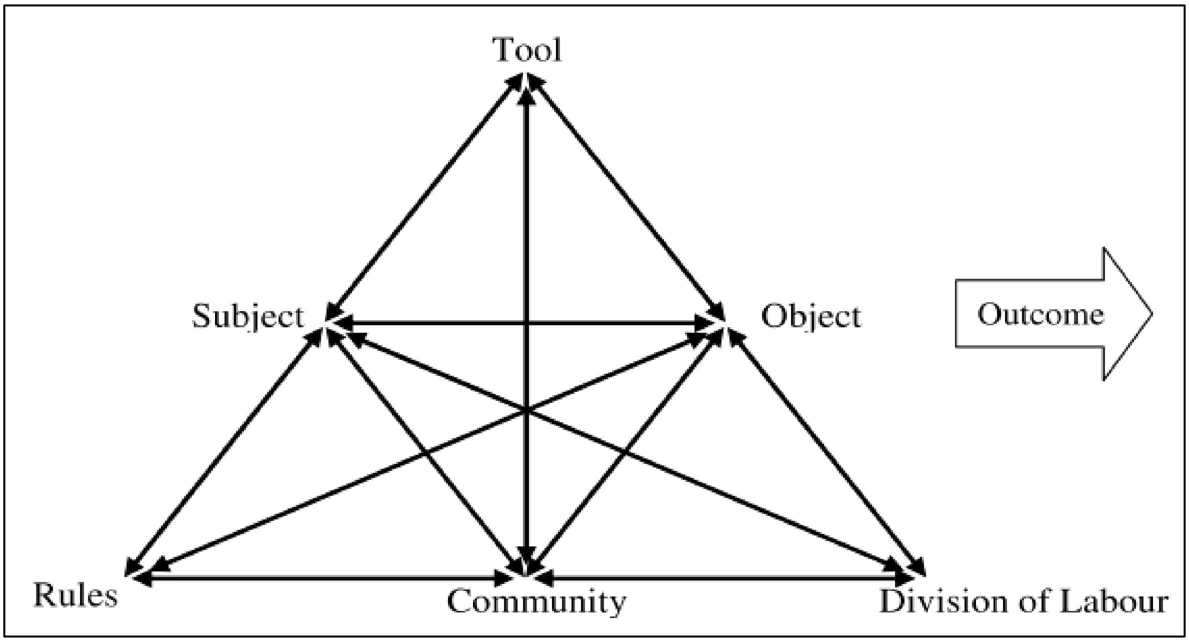

Figure 2.2: Engeström's second generation activity theory model (Hashim & Jones, 2007)

The second-generation activity theory extends the four main elements by adding three additional ones, which are the community, the division of labour, and the rules set (Hashim & Jones, 2007). The entire activity system is based on the community, its rules and its division of labour (Larsen et al., 2017: 688). The social, cultural, and political aspects of an activity are illustrated by the association between rules, a division of labour and the community (ibid). The subjects in the activity system usually tend to be biased, based on their educational history, background and experiences (Hashim & Jones, 2007). Figure 2.3 is an example where the activity theory was adopted and used in an art and design classroom setting.

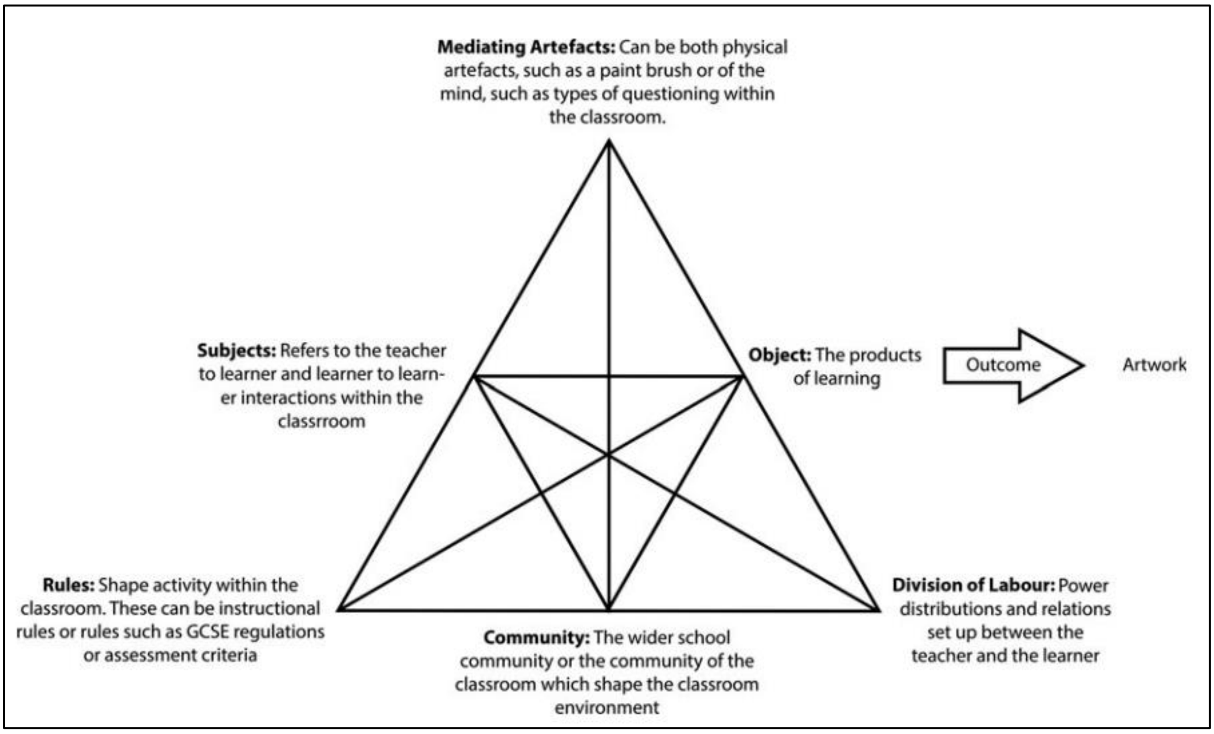

Figure 2.3: An example of an activity system for the art and design classroom (Kinsella, 2018: 499)

In Figure 2.3, the activity system illustrates the components of an activity regarding practices within the art and design classroom. The elements of the adapted activity theory in the example are described as follow:

- The subjects: Refers to the teachers and learners
- The artefacts: Refers to both physical and psychological effects
- The object: Refers to the product of learning
- The outcome: Refers to the artwork
- The division of labour: Refers to the power distributions and relationships between the teacher and the learner
- The community: Refers to the school community
- The rules: Refers to instructions, regulations and assessment criteria

(Kinsella, 2018: 499)

The educational environment operates under specific rules that affect the activity and sets boundaries based on curricula, policies, and performative and accountability measures (Kinsella, 2018: 498). The rules are referred to as the do's and the don'ts of the classroom and are externally determined. These rules provide teachers with guidelines for an activity, and they play a vital role in a successful activity. These policies ensure connectivity and cohesion in eLearning (O'Brien, Osbaldiston, & Kendall, 2014). Divisions of labour are shared between the teacher and learner.

The activity system contains elements such as viewpoints or voices, and historically accumulated artefacts, rules, and patterns of division of labour (Russell & Schneiderheinze, 2005: 39). While the activity theory has a goal to study the interaction between subjects, artefacts and objects, it also acknowledges that performance is not an action of an individual learner, but involves groups of learners who interact with each other using tools and artefacts on an object (Kinsella, 2018: 499).

Figure 2.4 quotes the work of Larsen et al. (2017: 691) who did research for the medical community illustrating the shared outcomes between the learners and the supervisors. The researcher uses their work to illustrate the use of the activity theory focusing on learners and supervisors who interact to produce shared outcomes, and not to focus on the medical aspect of the research.

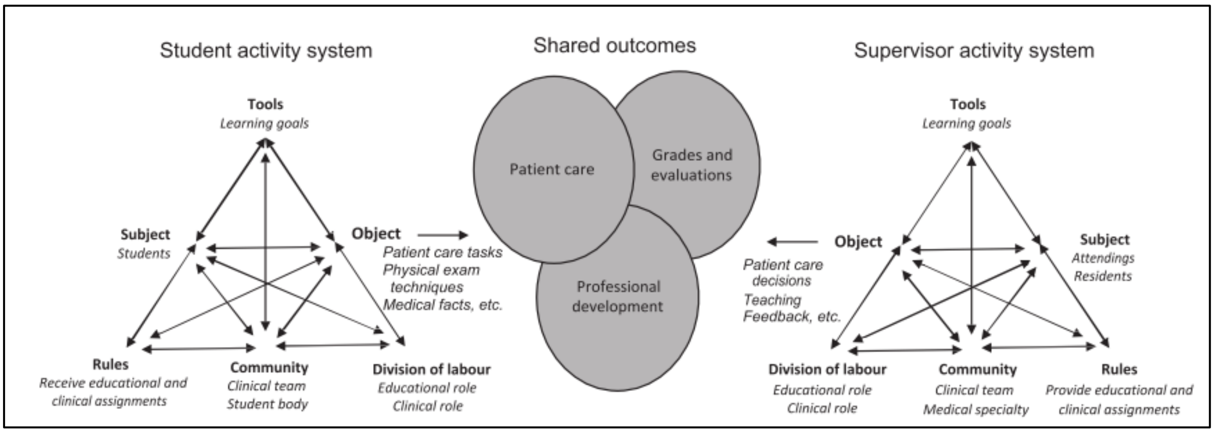

Figure 2.4: An example illustrating overlapping shared outcomes between learners and supervisors (Larsen et al., 2017: 691)

Larsen et al. (2017: 691) show the overlapping shared outcomes between the learners and the supervisors. They have used the activity theory twice in their model, first to show the learners' interests, and second to show the supervisors interests in learning. Kinsella (2018) indicates that the tools as seen in the model could be artefacts such as a paintbrush but could also be intangible mediating factors such as thinking.

In the example above, learning goals are classified as mediating factors or tools, while the objects are classified as care, tasks, techniques, and facts with a rule that assignments must only be of clinical and educational categories (Kinsella, 2018). In the customised model of Kinsella, the shared outcomes were expected to yield the care for patients, grades and evaluation, and professional development. Unfortunately, the three outcomes were said to always only overlapped partially and contradict each other, creating a tension between the supervisors', learners' and patients' threads. Figure 2.5 shows how Larsen et al. (2017) tie the knots between the subjects (learner and supervisor) and the tool (learning goal).

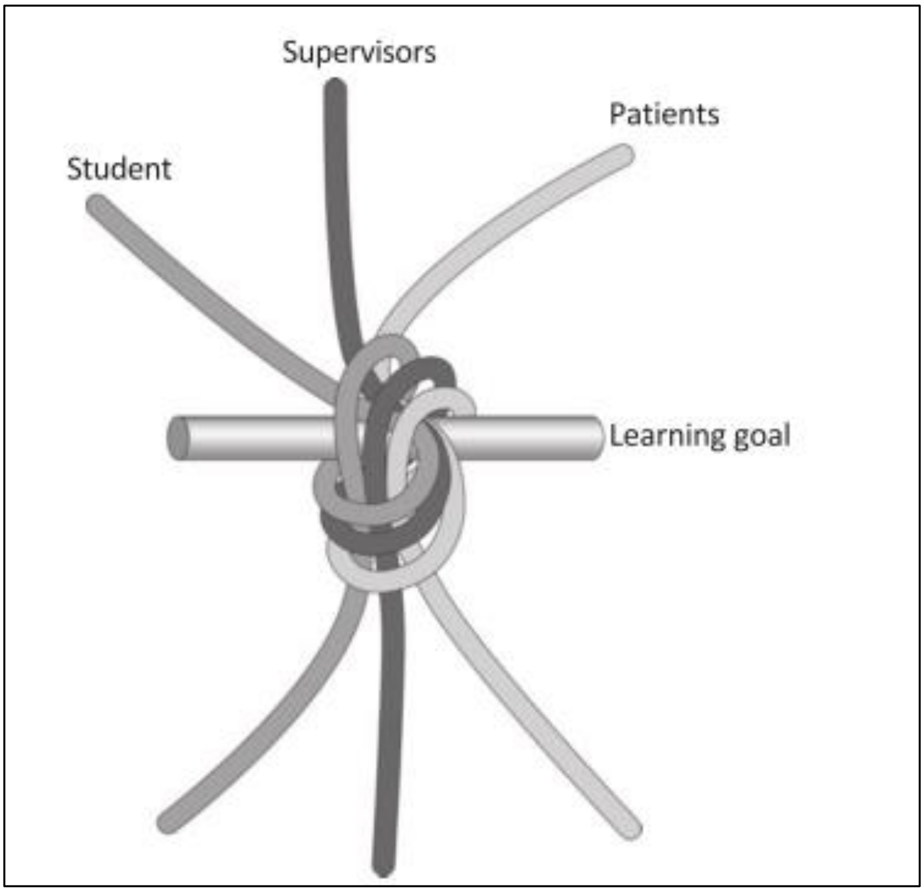

Figure 2.5: A knot as an example of how the elements of an activity system bind together (Larsen et al., 2017: 692)

The learners, supervisors and patients in Figure 2.5 are described as threads of the knot, and they form this knot around learning goals. The supervisor thread showed the importance of the supervisor in the activity system. In the example above, within the clinical space, most interviewed learners mentioned the supervisor as an important part for realising whether learning goals played a significant role in their clinical experience (Larsen et al., 2017: 692).

The learner thread reflects the level of engagement as an influence on the usage of learning tools. One level of engagement example is when the supervisor measures the learners' level of interest and commitment to goals (Larsen et al., 2017: 693). In the example knot, the patient threads are the determinants as to whether goals led to expansive learning or not. The learning goals are the artefact used by the learners and the supervisors to harness learning opportunities with patients.

Having knowledge on how other researchers have used the activity theory, Table 2.1 illustrates how the researcher prefers to describe the elements of the activity theory as they are used in the study.

Table 2.1: Elements of the Activity Theory as Used in this Study

Components	**Description**	**Example**
Subject	It is the individual or group of actors engaged in the activity	Subject matter experts (SMEs), instructional design experts (IDEs), technical design experts (TDEs) and production personnel (PPs)
Tools	It can be anything used in the transformation process (i.e. like a cutter or computer mouse)	Learning management systems (Moodle LMS)
Object	An object can be anything tangible or intangible such as a plan or even a creative idea.	eLearning course content, and assessments on products, organization ethics, health and safety

Components	Description	Example
		requirements, business continuity management, and other assessments not mentioned as part of the scope for this research
Outcome	The expected result or the goal that the activity tries to achieve	Improved eLearning usage. Knowledge gain on products, organizational ethics, health and safety improvements, business continuity management, and other learning improvements not mentioned as part of the scope for this research
Division of Labour	It refers to vertical power of status and how tasks are split horizontally between community members	Content designers: do content designing Learners: do eLearning Trainers: do training Facilitators: facilitate learning System administrators: do system administration Team managers: manage the team
Community	It negotiates and mediates the rules and customs that	ComTek centre for learning is the sample

Components	Description	Example
	describe how the community functions	representative of the community
Rules	It is the norms, traditions, or laws that exist in communities	It is mandatory for the learners to participate in assessments as they contribute to their performance agreements.

Extended from the work of Wangsa, Uden, & Mills (2011: 758)

This section created an understanding of the theoretical background to this study. The next section will explain the conceptual background.

2.2.2. Conceptual Background

This subsection explains more about what the research study at hand articulated and argued about, using elements of the activity theory to build the conceptual framework. This study's aim was to understand possible causes of the low usage of eLearning at ComTek and to suggest guidelines to help unpack the case study at hand. Considering that ComTek already had an eLearning environment in place during the time of the study, the conceptual framework had to address the usage of eLearning during the time of the research study. It focused on learners who used eLearning, the eLearning tools at the time of the study, the courses and assessments during this time, and the goals or intentions of eLearning at ComTek during the same period.

To address the above issues, the researcher had to first interpret these issues using the activity theory elements, namely the tool or artefact, the subject and the object. The researcher was more interested in the three elements than the other activity theory elements because the main aim of the research study was to understand the human element as a subject, artefact as an enabler of eLearning, and eLearning itself as a platform. The three activity theory elements had to be projected in each of the four concerns that were addressed, which were eLearning low usage, eLearning requirements to curb low usage, content delivery requirements to curb low usage, and cloud requirements to curb low usage. Figure 2.6 shows the layout of the researcher's concept.

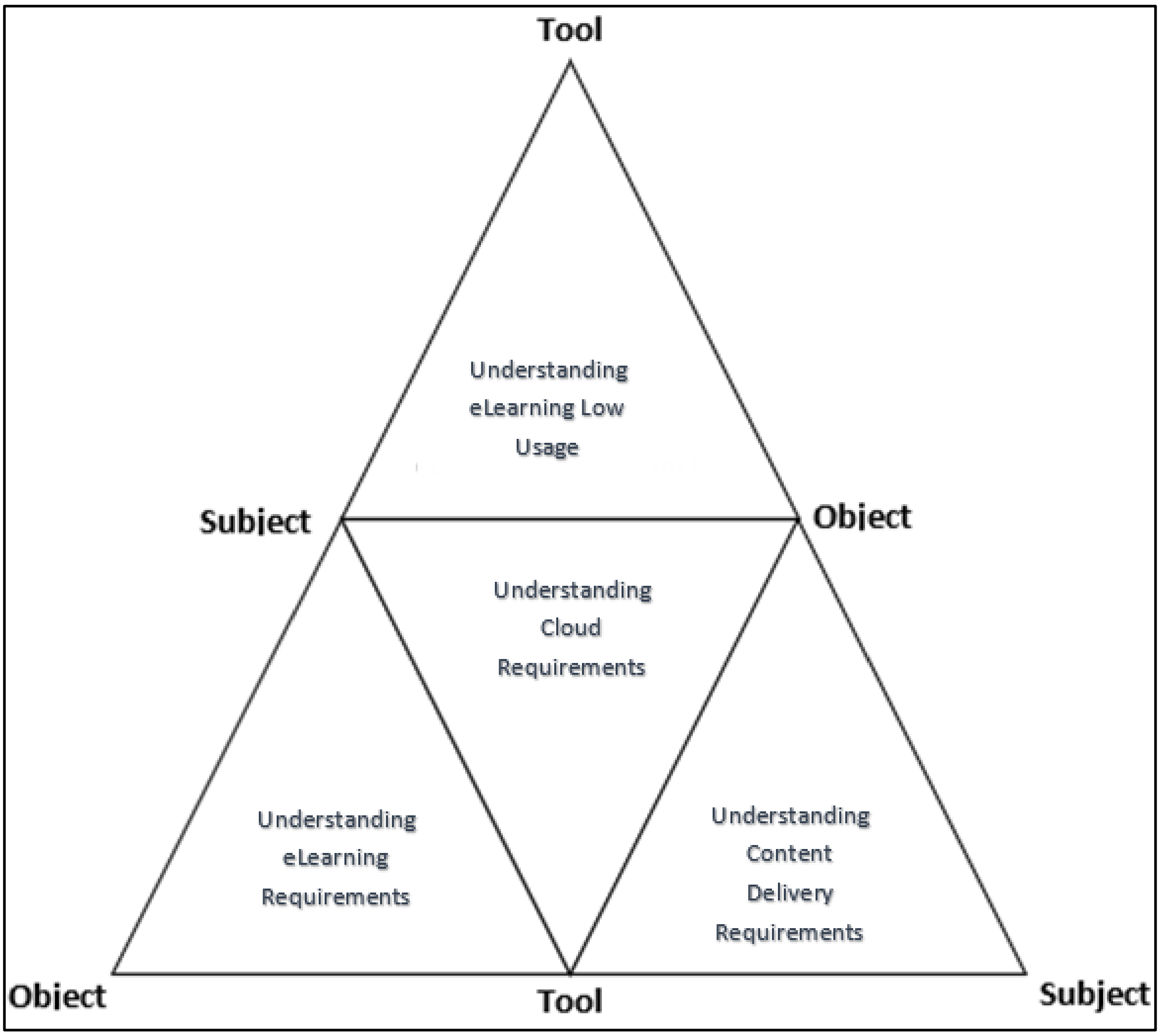

Figure 2.6: Conceptual framework for eLearning activities as extended from (Hashim & Jones, 2007)

In this conceptual framework, the subject, the tool or artefact, and the object were equally essential elements to consider for understanding eLearning activities at ComTek while addressing eLearning low usage, eLearning requirements, content delivery requirements and cloud requirements. By interrogating the eLearning tool, the eLearning subject, and the eLearning object, the researcher was able to create a better understanding of human behaviour and mediation using the tools, as Kinsella (2018: 496) also gives a similar guide in his study. While low eLearning usage remains the core concern for this study, the researcher needed to identify possible causal factors behind low usage. Williams, Hussain, & Griffiths (2010) elaborate on low usage challenges such as social isolation, the long response time from teachers, understanding of the course content and learning expectations, and the reliability of technology.

In Figure 2.7 the researcher expands the conceptual framework by explaining its different elements and sub-elements.

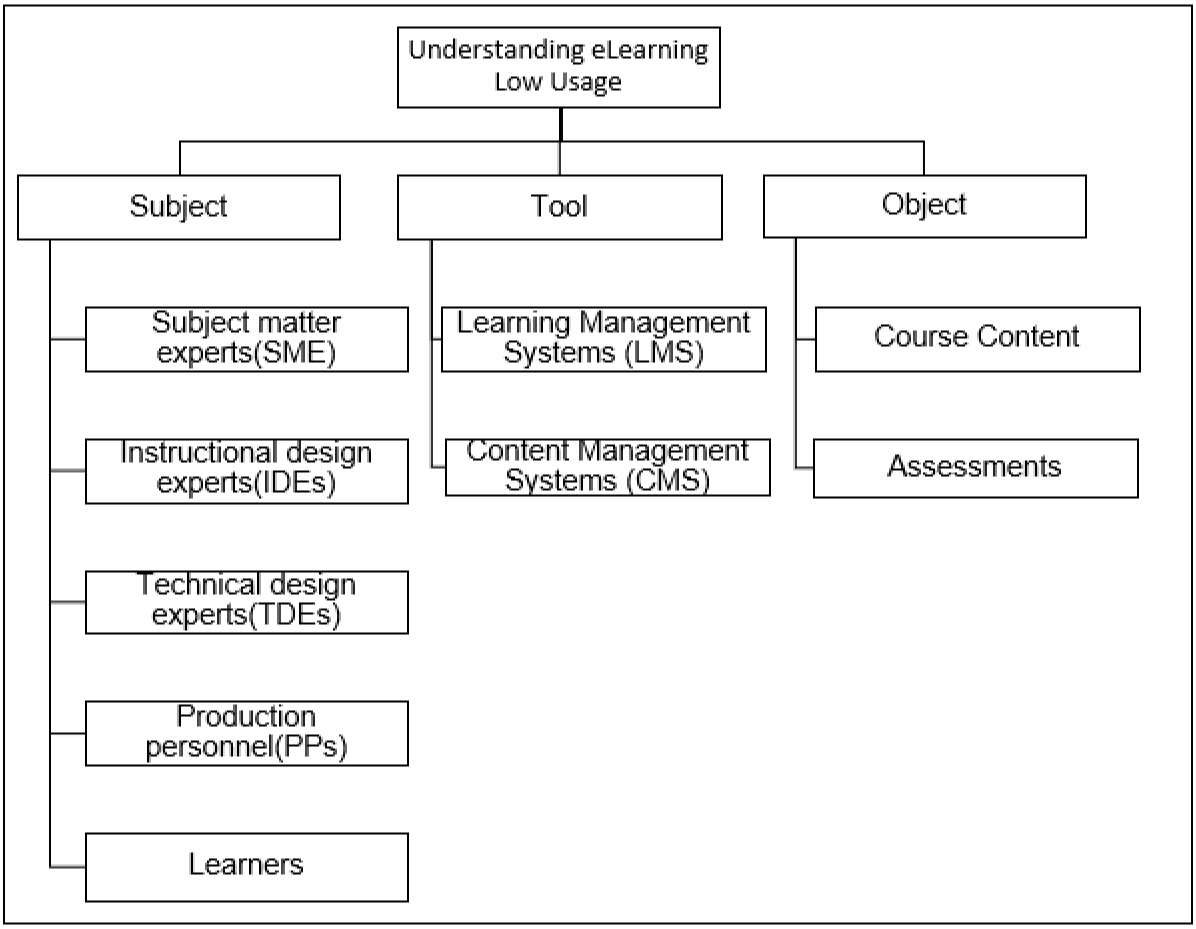

Figure 2.7: Conceptual framework - Understanding eLearning low usage

The conceptual framework derived an understanding of eLearning low usage at ComTek. The low usage problem could have been caused by the subject, the tools, or the object. The subject included the subject matter experts (SMEs), instructional design experts (IDEs), technical design experts (TDEs), production personnel (PPs) and the learners. The tool included the learning management systems (LMSs) and content management systems (CMSs). The object represented the course content and assessments.

While still in the process of creating an understanding of eLearning low usage factors at ComTek, this part of the conceptual framework focused on the subject, the tool, and the object as contributors to eLearning low usage. Figure 2.8 to Figure 2.10 addresses the necessary eLearning requirements, content delivery requirements, and cloud requirements.

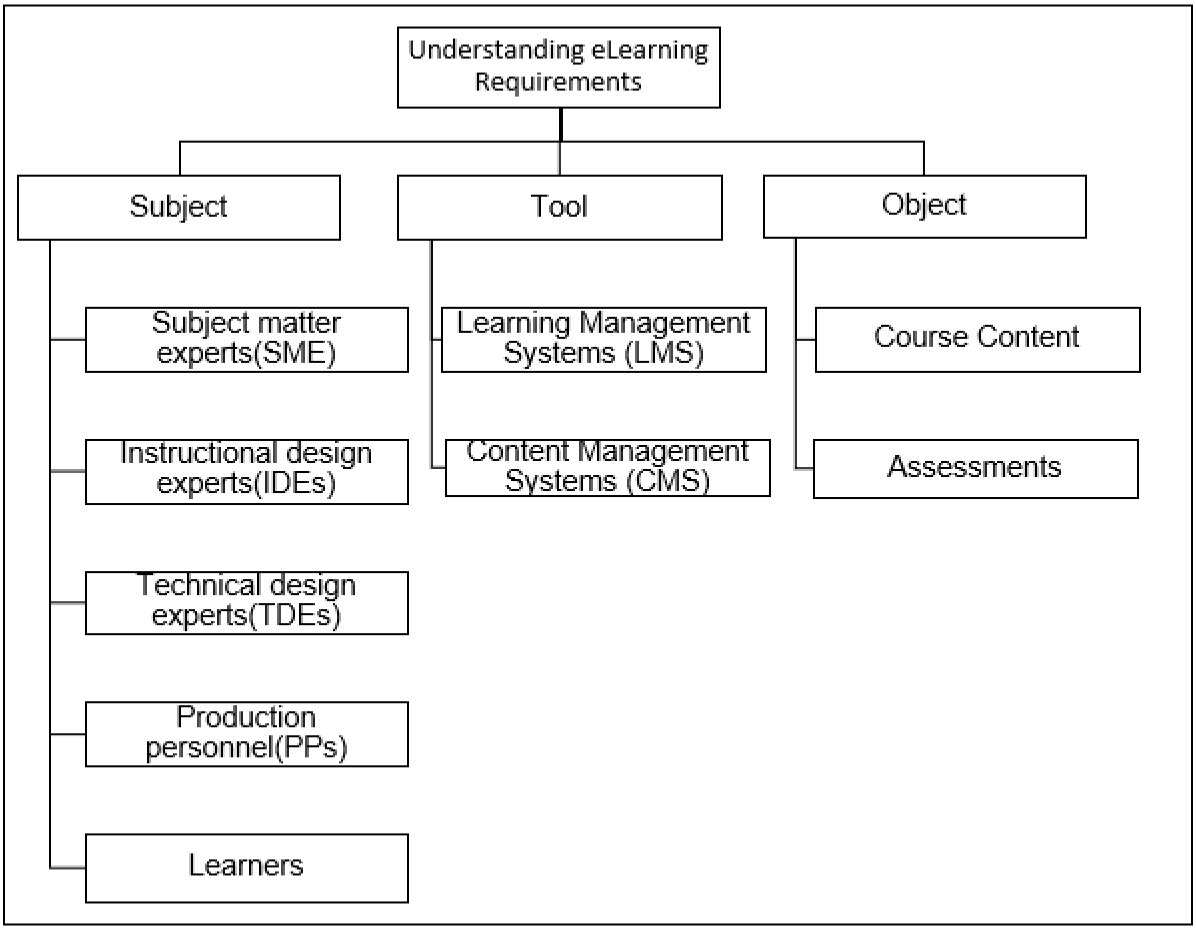

Figure 2.8: Conceptual framework - Understanding eLearning requirements

The eLearning requirements included the necessary subjects, the tools, and objects with which the subjects interact. By the subjects or stakeholders in eLearning, the researcher referred to subject matter experts (SMEs), instructional design experts (IDEs), technical design experts (TDEs) and production personnel (PPs). Ibarra-Florencio, Buenabad-Chavez, & Rangel-Garcia (2014) indicate in their study that the expert stakeholders are necessary for an eLearning project to be successful. The basic tools to enable proper eLearning are learning management systems (LMSs) and content management systems (CMSs), as Ganchev, O' Droma, & Andreev (2007) had mentioned in their study. The object represented the course content and assessments to be written by the learners in the eLearning course. In this research study, assessments such as product knowledge, organization ethics, health and safety requirements, and business continuity management were used as examples. Content delivery requirements are explained next.

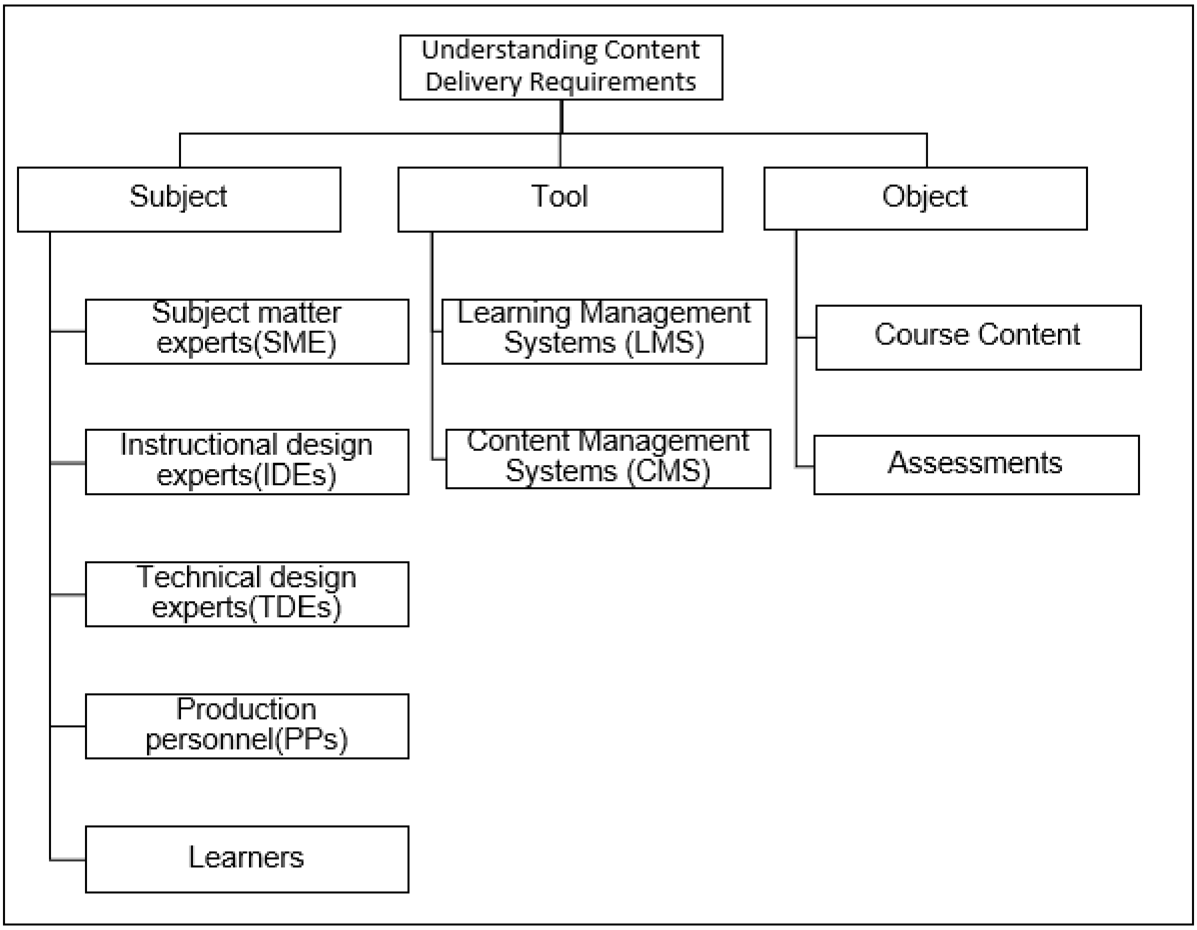

Figure 2.9: Conceptual framework - Understanding content delivery requirements

When delivering content, the researcher must consider a paradigm where learning is individualised, and must prioritise learners' learning styles for learning to take place seamlessly, as advised by Kostolanyova & Nedbalova (2017: 4). Content delivery requirements included the necessary subjects to deliver content, the necessary tools, and the objects with which to interact. Regarding this, the SME wrote content for the target topics and lessons as directed to targeted audiences, while the IDE designed the sequence of activities that have to take place for learning to occur. The TDE assists with the design of digital resources like sound and video, while the PP develops these digital resources using tools like Flash, Photoshop and PowerPoint. The PPs job includes organising the eLearning content into web pages using HTML embedded in LMS systems. The learners consumed the eLearning content and did assessments as required and in the sequence of activities addressed in the layout of the course. The LMS tool is used to deliver and track learning content, while the CMS is used to create and publish learning content (Simoes, Rodrigues, Costa, & Proenca Jr, 2012).

In a research study by Dziuban et al. (2017: 27), learners who experienced learning personalisation were able to compose different algebraic expressions more effectively. Figure 2.10 explains the cloud delivery requirements.

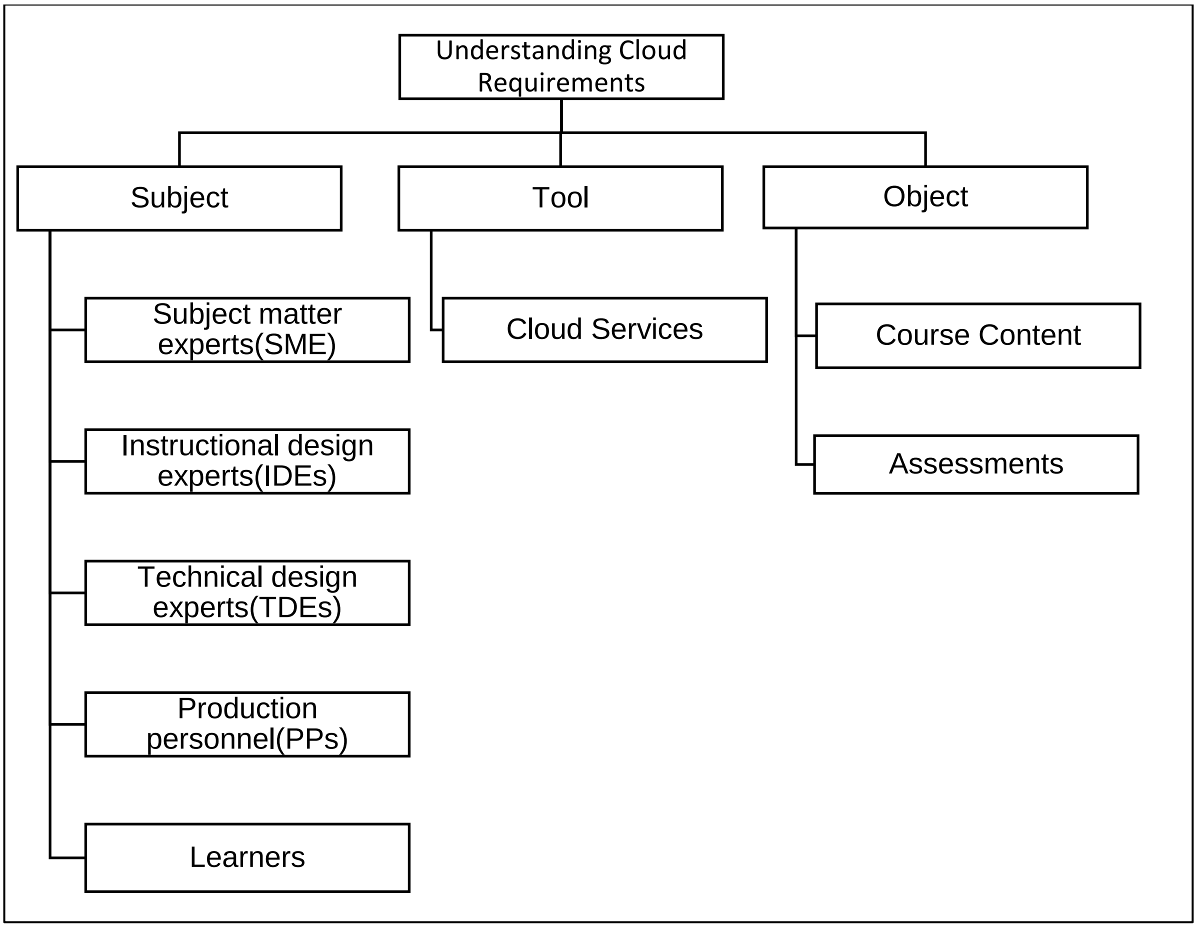

Figure 2.10: Conceptual framework - Understanding Cloud Requirements

The subject and the objects similarly refer to stakeholders and assessments as previously defined in other units of the conceptual framework. Stakeholders are subject matter experts (SMEs), instructional design experts (IDEs), technical design experts (TDEs) and production personnel (PPs). Assessments include products assessments, organization ethics, health and safety requirements, and business continuity management. The tools referred to the services offered by cloud computing like IaaS, PaaS and SaaS. With cloud computing services in place learners can study anytime and anywhere, while the organization saves costs as cloud computing services are fully maintained at a cloud service provider's premises. Zrakić et al. (2013: 302) define cloud computing as "an abstract, scalable and controlled computer infrastructure that hosts applications for the end-users". Bernal (2016: 64) defines cloud computing as a new way to decentralise data centres, virtualise infrastructure and platform and provide access to services through the Internet, unlike the traditional corporate LAN.

The next section elaborates on the contextual background of the study and is based on the literature studied. The contextual background forms a major element of the crux and base of this study.

2.2.3. Contextual Background

To date, very few research models, theories, and frameworks address cloud-based learning within telecommunication organizations in South Africa. The point of departure in this study, therefore, stemmed mostly from academic literature, which was supported with available industrial, organizational, and practical literature.

From the literature studied, the researcher deduced that learners who partake in eLearning find it hard to fully embrace eLearning as a learning strategy. This contributes to the low usage of eLearning, which is the main argument in this study. Dlalisa (2017) similarly argues that some studies revealed that academics use eLearning systems the least for assessments but more for course management and communication. Dlalisa claims that there is also a concern about learner readiness to accept and use LMS systems, and these factors include computer experience, confidence, attitude and ICT experience. Alias, Ahmad, & Hasan (2017) argue that diverse behavioural factors about learners create a challenge in analysing these learners and make it difficult to understand their needs and learning preferences. Not understanding a learner's needs and preferences of learning could contribute to eLearning low usage.

Isabwe & Reichert (2013: 256) argue that the privacy and security of information systems are crucial aspects of eLearning. They discuss issues of learners who have to asses each other's work, which can alienate learners from accepting the use of eLearning technology as a method for learning. Dlalisa (2017) argues that low usage of eLearning systems and the declined readiness in accepting and using eLearning results in the low buy-in from users and the low success rate of eLearning. Dlalisa points out that, low buy-in is a critical factor that results in a lack of acceptance and usage of LMS systems and needs to be addressed. Smit & Goede (2013) address issues about diverse backgrounds where some learners did not have access to personal computers for eLearning. The researchers also mention unexpected uses where learners could end up using video learning material for other unexpected uses resulting in reduced actual use of eLearning.

Other factors from an academic perspective that could contribute to the low buy-in or low usage of eLearning systems are the lack of operational support, system failures, lack of incentives or compensation to lecturers for their time and immense effort in using eLearning systems, and lecturers' demotivation (Dlalisa, 2017). Among the factors already mentioned, infrastructural constraints, demographic divides, staffing issues, organizational issues, learner issues and pedagogical issues also form part of factors that could cause low usage of eLearning (Bagarukayo & Kalema, 2015: 171). Negative emotions including fear of the unknown, alienation, stress, guilt and anxiety, could also hinder motivation and persistence of using and accepting eLearning (Dziuban et al., 2017: 27). Learners with better computer skills might be more at ease to use eLearning systems than less computer savvy learners are (Dlalisa, 2017b).

While the literature has mentioned that learning styles need to be considered in eLearning, Panda & Puhan (2015: 157) have a concern about acoustic learning for hearing aid users. They say the processed sound from speakers might limit the amount of gain and reduce sound and speech quality. Muljo, Perbangsa, & Pardamean (2018: 49) argue that online learning could create feelings of isolation among learners who might feel like they do not have a sense of belonging to their online learning community. They point out that the most common issues are communication and technical issues. Such issues could contribute to the low usage of eLearning. The researcher thought that eLearning aids issues of individualism better by allowing learners to express themselves without fear of being judged by others face to face; however, studies show that this might not always be the case, according to Muljo et al. (2018).

With a variety of advantages like synchronous and asynchronous learner engagement, accessibility, flexibility, self-paced learning, interactivity and increased availability and skill development, the buy-in and usage of eLearning can be improved (Dlalisa, 2017). Self-paced learning allows learners to work on training tasks as quickly or slowly as they prefer (DeRouin, Fritzsche, & Salas, 2005: 922).

In the study of Dziuban et al. (2017: 27), learners who experienced learning personalisation could compose different algebraic expressions more effectively. Another study they mentioned focused on cognitive and learning styles (active, reflective, sensing, intuitive, visual, textual, sequential and global) which as a result reduced the cognitive load and influenced a perceived increase in learning gains. They also found that the achievement, enthusiasm and excitement of online learners were due to the positive motivated emotions they felt about the flexibility of online programmes.

Stemming from an interest in the usage of eLearning in organizations, the researcher wanted to immerse himself into a qualitative single case study, using one of the biggest telecommunication organizations in South Africa. The researcher had access to this organization as an employee and had experienced eLearning shortfalls during the time of the study. To attain the latter, the researcher had to primarily investigate the organization at hand for such eLearning shortfalls and their causal factors. While the major shortfall or issue addressed in this study was the low usage of eLearning, Venugopal & Jain (2015: 427) point out that it might not be an easy task to measure learner engagement in eLearning. Learner engagement is directly linked to low eLearning usage.

For the sake of this research study, and for ethical consideration purpose, the researcher gave the pseudonym ComTek to the organization at hand. In the next passage, the researcher continues with a brief background about ComTek and the eLearning environment at hand during the period of the study.

During the financial years of 2015 to 2017, which depicts the period of the study at hand, ComTek was a South African telecommunication parastatal organization listed on the JSE (Johannesburg Stock Exchange) and doing well in its industry. During 2016, ComTek had employed just over 13 000 permanent employees, and in 2017 reduced its headcount to just over 10 000 permanent employees with the aim of creating a lean organization and focus on addressing a capability gap. During this period, clear business unit processes and a trading model were defined. As at 31 March 2017, the equity shareholding was as follows: Institutional shareholders at 51.8%, Government of South Africa at 39.3%, Non-institutional shareholders at 3.4%, Treasury shares at 3.3% and miscellaneous shareholding at 2.2%.

During this period, ComTek offered services like voice, data and content, SMME solutions, mobile solutions and devices, application and content management solutions, fibre, voice over internet protocol, cloud-based private branch exchange, fixed-line look-alike, broadband solutions, enterprise solutions, optical and carrier solutions and infrastructure sharing. By the year 2016, ComTek had achieved a functional separation in the organization by launching three business units of names withheld in this study to uphold ethical considerations. In the years 2015, 2016 and 2017 respectively, spending on training and development was just over 300 million Rand, 382 million Rand and 218 million Rand.

Considering the amount ComTek spent on training and development during this time indicates that ComTek was keen to invest in learning and skills development and could afford to implement a proper eLearning infrastructure. For the reason that ComTek had embarked on transforming into a lean organizational structure and was constantly reducing its cost factor, it was worth the value to fully embrace eLearning as a learning and training strategy to further reduce training cost.

With the deep dive taken into ComTek's eLearning environment, the researcher engaged with executives, senior management, operational managers, and key employee stakeholders from ComTek's learning department. The outcome of the engagement was transcriptions in the form of interview feedback, emails and technical eLearning documents from key technical individuals at ComTek.

This data revealed that ComTek used Moodle as systems for eLearning. Field employees and contractors were frequently required to do assessments during working hours on this system. Most of these assessments were of high stake, and necessary for business continuity and performance management, while others were health and safety (SHE) specific. The time spent on these assessments tended to interfere with productivity, as employees had to physically travel to the organization premises from their remote sites to complete these assessments. Some of the employees had to share remote access points with limited network connectivity, which resulted in slow responses.

A simple solution would be to schedule on-premises hours per employee regularly to do these assessments as they are critical to business; however, this could still create a time effort and compromise productivity. The learning environment at the time of the study only allowed access from inside the organization's premises behind the organization firewall. External access was via a Citrix platform that connected to the organization's network using the learners’ network credentials for authentication. This kind of access was slow, and the connection was frequently lost due to network glitches.

During the period of the study, ComTek had implemented Moodle to replace their outdated systems, namely Virtual Campus and question mark perception (QMP). Virtual campus tools can blend in with face-to-face teaching, supports innovative teaching, authoring, communication, monitoring, self-learning and self-assessment (Navarro, Cigarran, Huertas, Rodríguez-Artacho, & Cogolludo, 2014: 252). ComTek indicated in their historical documents that they required an LMS system that could allow but is not limited to assignment submission, chat, discussion forum, files upload/download, grading, online news and announcement, online quizzes, surveys, a wiki and webcasting.

Among other requirements, from archive documents, ComTek initially required a system that had the following features:

- Scalability indicates a system’s ability to maintain quality performance or service under an increased system load by adding resources.
- Modular and extensible means the implementation must comprise modules with high cohesion and low coupling, which is a strong indicator of the inherent maintainability and adaptability of a software system.
- Technology compliant indicates the capability of hosting SCORM (Shareable Content Object Reference Model) compliant courseware.
- Accessible means the LMS must be accessible to both internal and external learners.
- Security compliant means the LMS must adhere to IT security architecture principles.

Among these requirements, some of the organization’s eLearning shortfalls shared were the low usage of the eLearning systems and the low assessment results. The low usage was determined by the rate at which the learners failed to enrol in an eLearning course, complete the course, and pass the eLearning assessment.

Several graphs below illustrated the average usage rate and the average scores of ten selected sample assessments. In the graphs, the orange/lighter colour represents the average usage rate, and the blue/darker colour represents the average scores. Figure 2.11 to Figure 2.17 illustrate the eLearning usage rate graphs from mid-2016 to mid-2017.

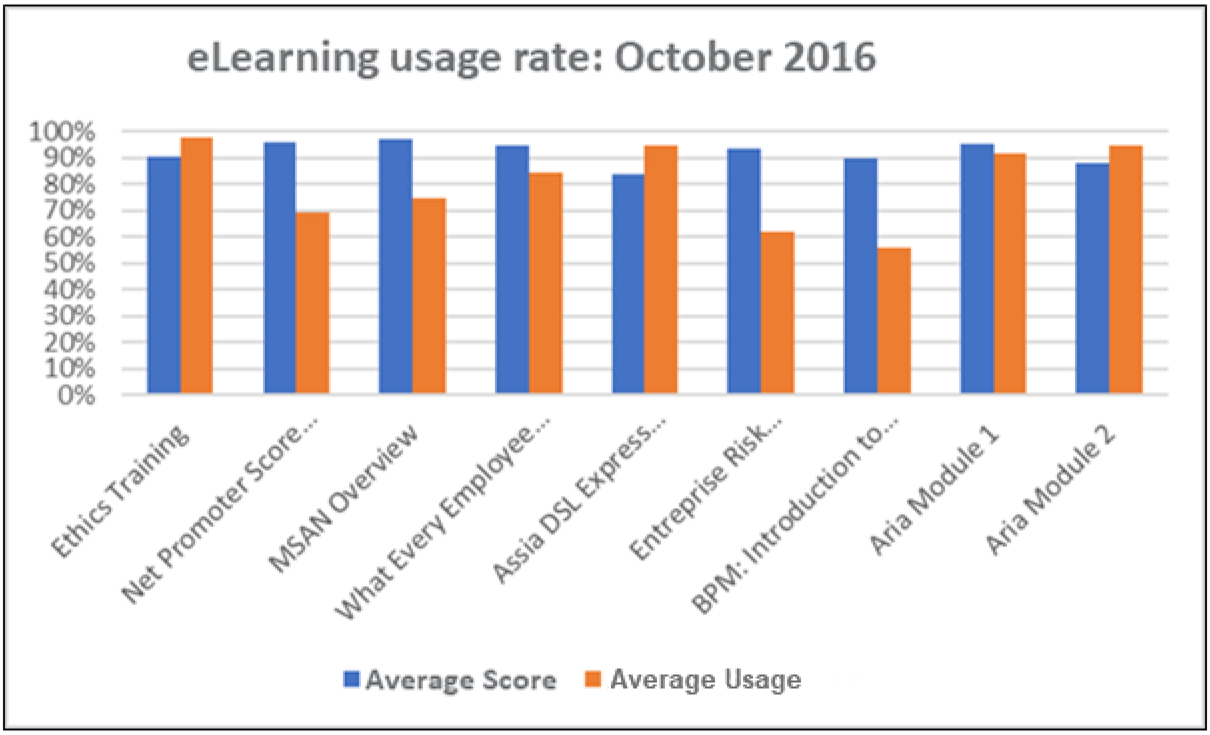

Figure 2.11: ComTek's eLearning usage rate of top 10 assessments for October 2016

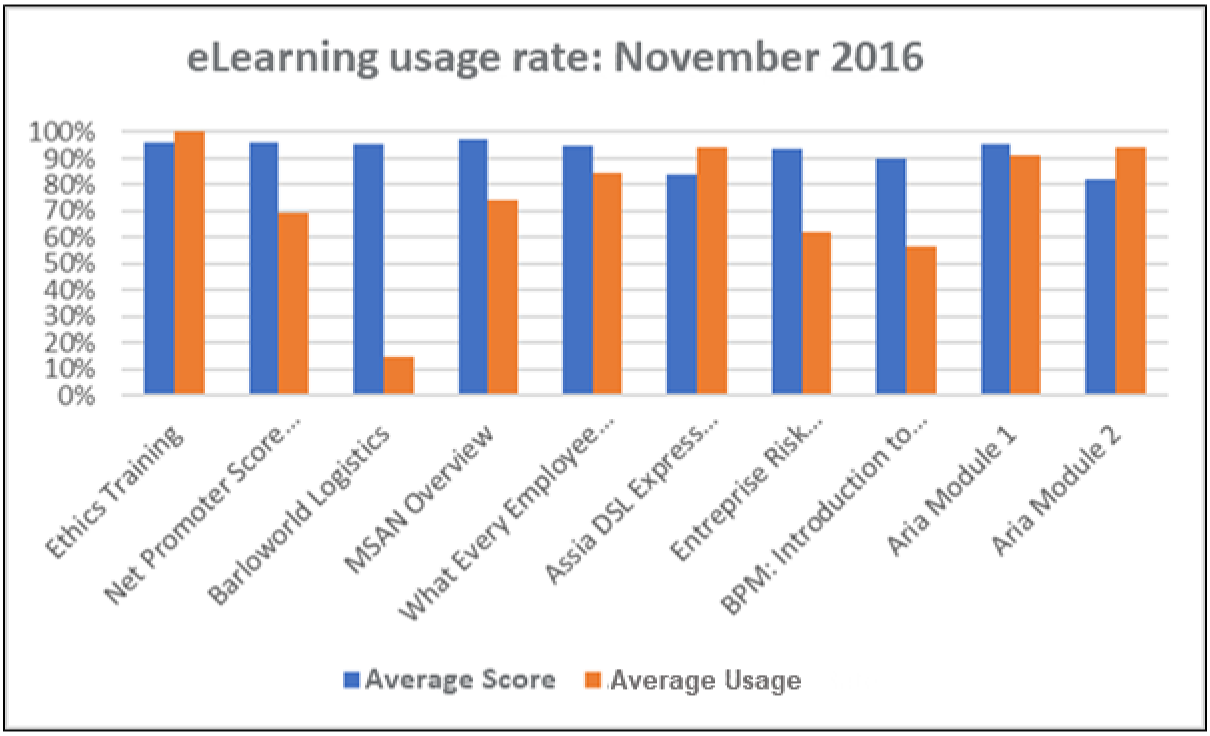

Figure 2.12: ComTek's eLearning usage rate of top 10 assessments for November 2016

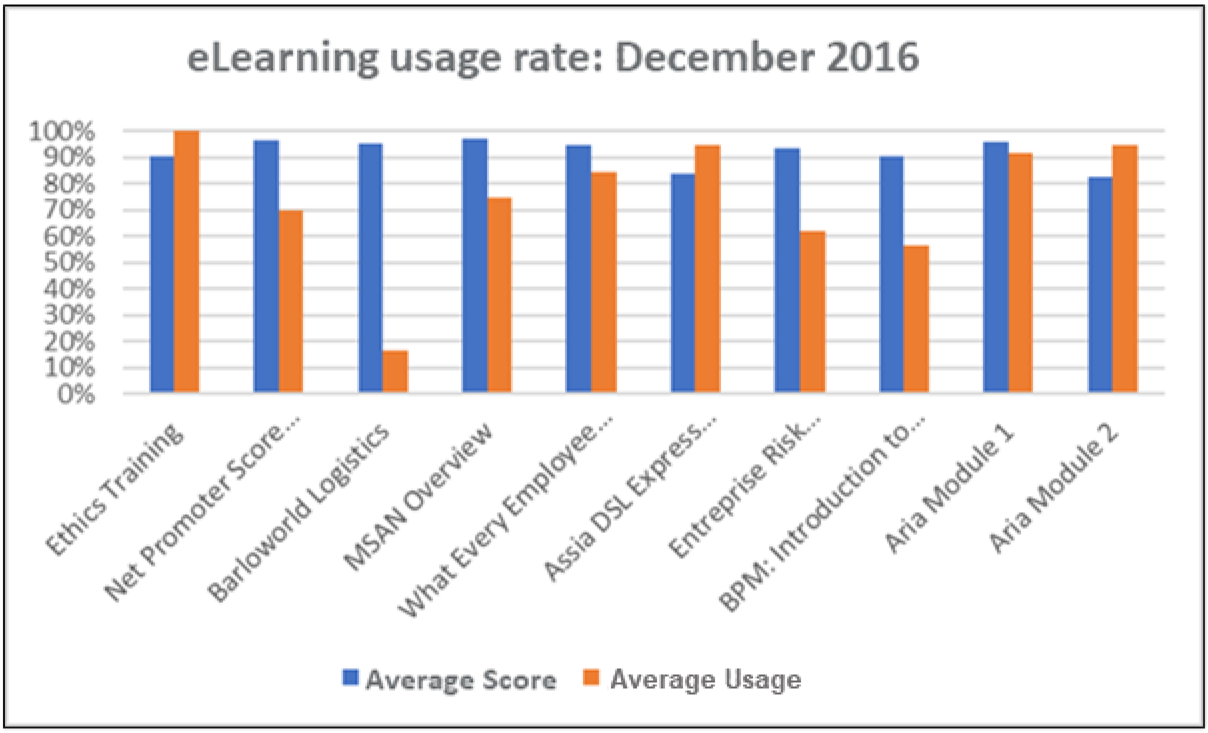

Figure 2.13: ComTek's eLearning usage rate of top 10 assessments for December 2016

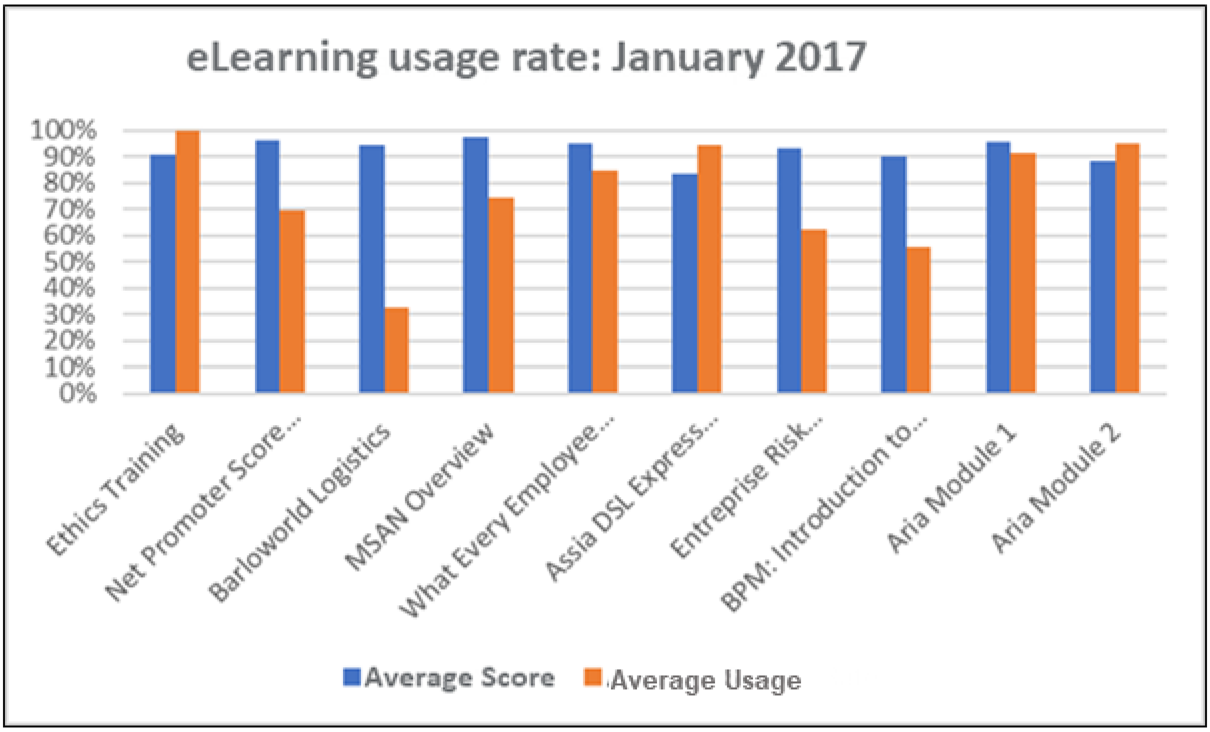

Figure 2.14: ComTek's eLearning usage rate of top 10 assessments for January 2017

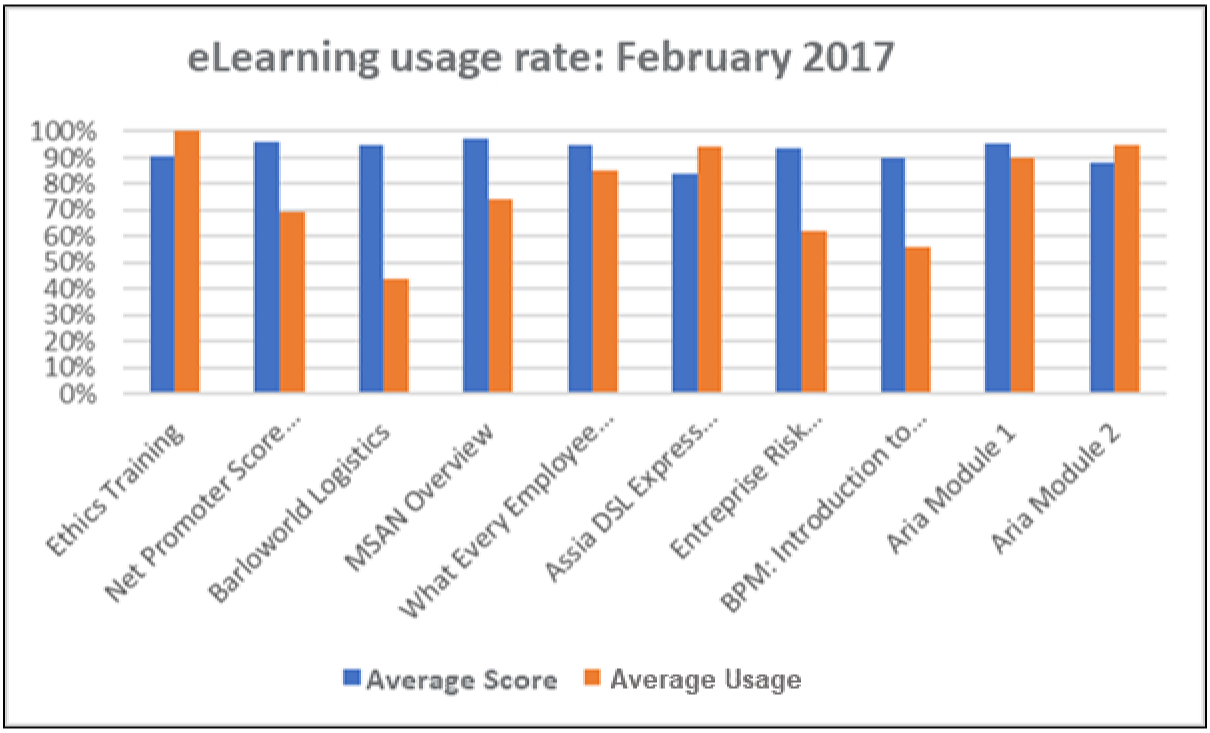

Figure 2.15: ComTek's eLearning usage rate of top 10 assessments for February 2017

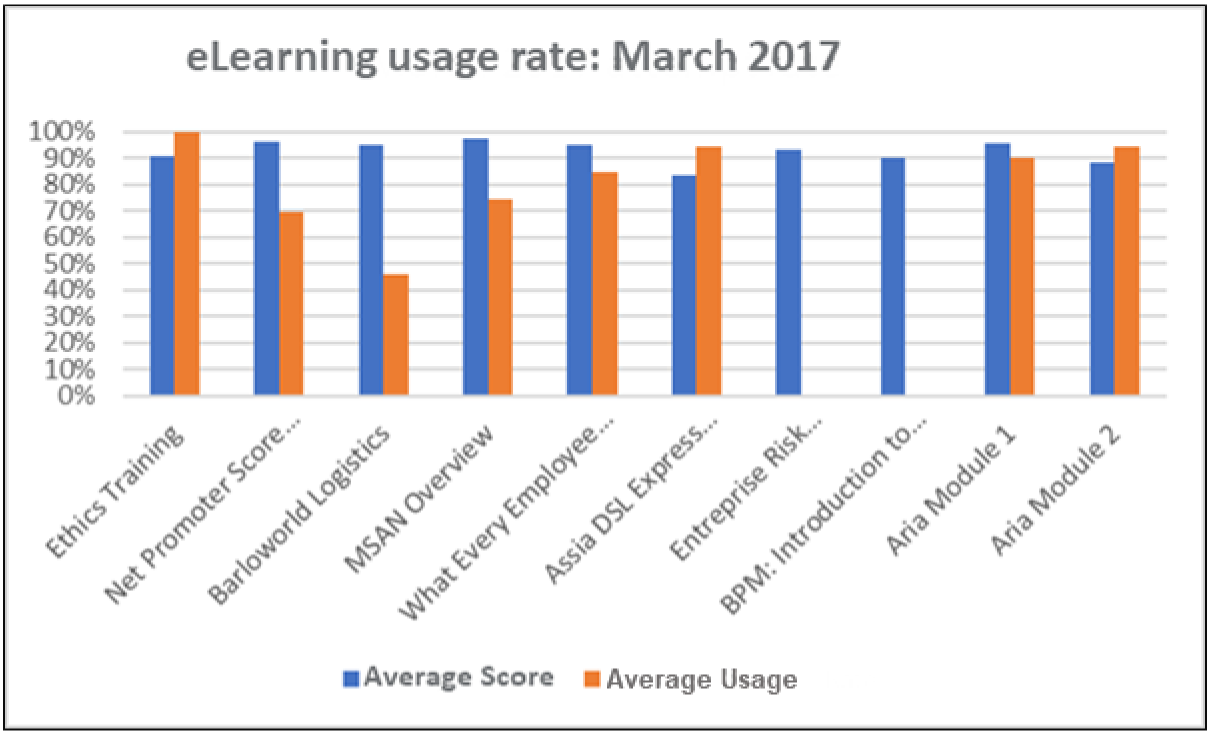

Figure 2.16: ComTek's eLearning usage rate of top 10 assessments for March 2017

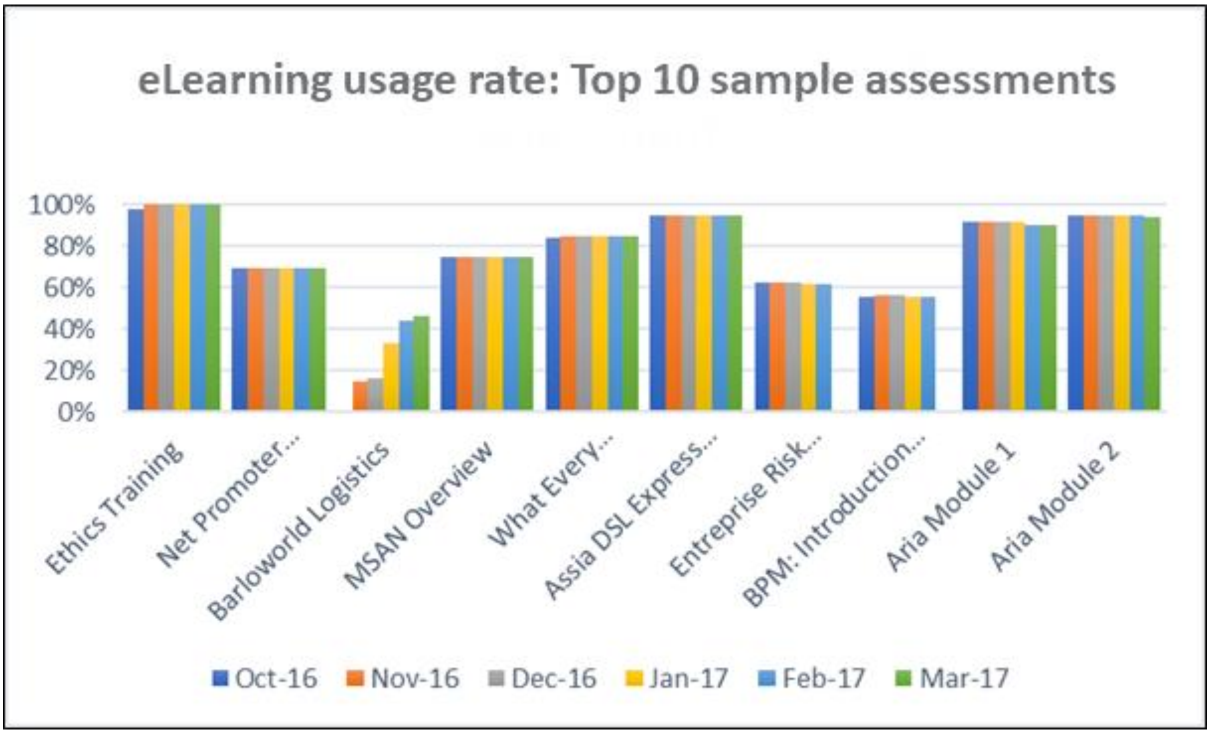

Figure 2.17: ComTek's eLearning usage rate of top 10 assessments over 6 months

All the above graphs were built from the actual results shown in Table 2.2 below.

Table 2.2: ComTek's Top 10 Sample Assessments Usage Results

Assessment Name	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Ethics Training	97.74%	100.00%	100.00%	100.00%	100.00%	100.00%
Net Promoter Score Basics	69.55%	69.56%	69.56%	69.58%	69.59%	69.60%
Barloworld Logistics	0.00%	14.90%	16.12%	32.83%	44.08%	45.96%
MSAN Overview	74.59%	74.39%	74.39%	74.37%	74.39%	74.39%
What Every Employee Should Know About Health and Safety in the Workplace	84.25%	84.52%	84.52%	84.52%	84.92%	84.91%
Assia DSL Express ClearView	94.53%	94.45%	94.40%	94.40%	94.35%	94.33%

Assessment Name	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Ethics Training	97.74%	100.00%	100.00%	100.00%	100.00%	100.00%
Enterprise Risk Management	62.03%	62.04%	62.04%	62.01%	61.98%	61.96%
BPM: Introduction to the System	55.77%	56.61%	56.61%	55.45%	55.83%	59.29%
Aria Module 1	91.46%	91.42%	91.55%	91.46%	90.27%	90.11%
Aria Module 2	94.63%	94.34%	94.34%	94.75%	94.58%	94.27%

The highlighted assessments in Table 2.2 had a usage rate lower than 80% and were part of elements that could have contributed to the decline in the overall usage rate of assessments at ComTek. Table 2.3 below is an extract from Table 2.2 of the assessments showing only those assessments where the usage rate was low.

Table 2.3: ComTek's Sample Assessments with Low Usage

Assessment Name	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17
Barloworld Logistics	0.00%	14.90%	16.12%	32.83%	44.08%	45.96%
BPM: Introduction to the System	55.77%	56.61%	56.61%	55.45%	55.83%	59.29%
Enterprise Risk Management	62.03%	62.04%	62.04%	62.01%	61.98%	61.96%
MSAN Overview	74.59%	74.39%	74.39%	74.37%	74.39%	74.39%
Net Promoter Score Basics	69.55%	69.56%	69.56%	69.58%	69.59%	69.60%

Following the above extract, a graphical representation was produced below in Figure 2.18 for better reading.

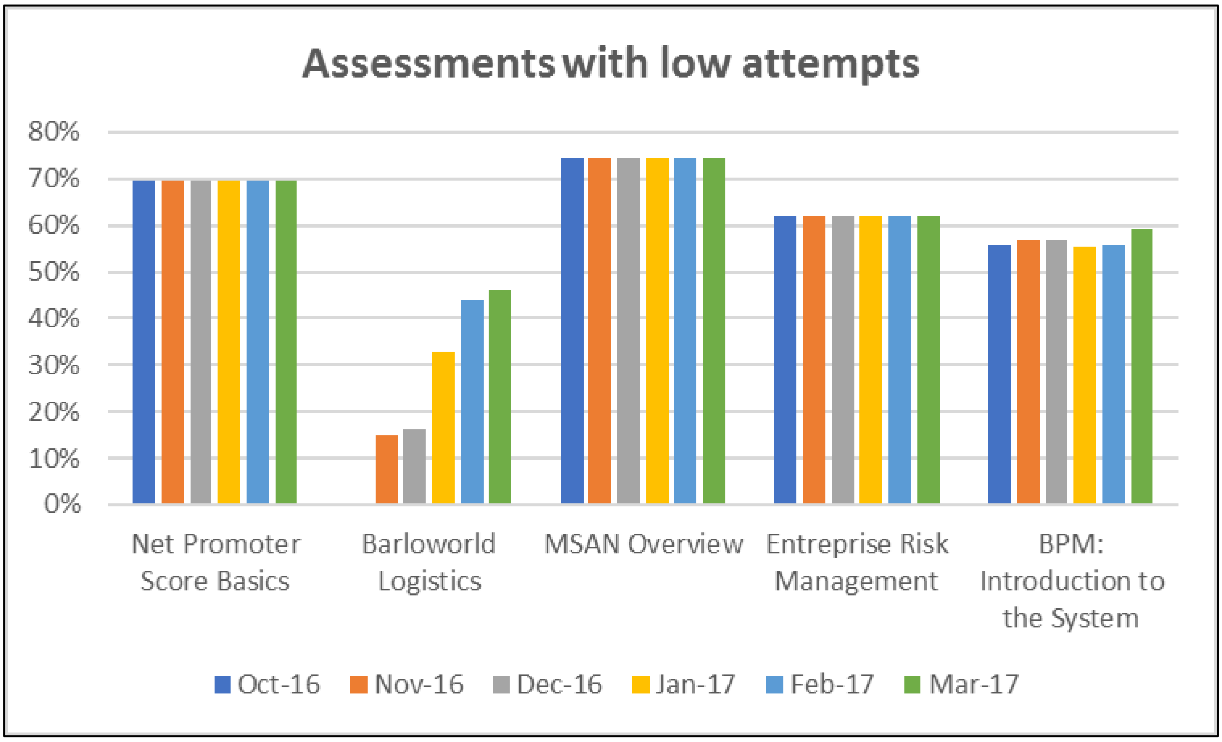

Figure 2.18: Summary of ComTek's sample assessments with low usage

Looking at the summary graphs above, the Barloworld Logistics had the lowest usage rate for mid-2016 and mid-2017. In October 2016, there was no entry for the Barloworld assessment because the assessment was new, and learners had not yet started enrolling for the course according to ComTek. In November and December 2016 until March 2017, the usage-rate started improving, which could have been a good sign that the investment on eLearning was surfacing and growing. This being the case, assessments like BPM: Introduction to the System, Enterprise Risk Management, Net Promoter Score Basics and MSAN Overview, have had a stagnant trend during the 2016/2017 period. These assessments did not meet the requirements of the organization's benchmark of 80% since October 2016 until March 2017, and as a result, low usage on eLearning was reported as an issue to address.

In this subsection, the theoretical, conceptual and contextual backgrounds of the study were identified. The next subsection briefly explains eLearning concepts and the elements necessary for attaining a successful eLearning environment.

2.3. ELearning

What is eLearning? eLearning, also known to other researchers as ubiquitous learning, integrates with wireless, mobile and context awareness technologies to help facilitate seamless learning, thereby improving the traditional learning process (Despotović-Zrakić, Simić, Labus, Milić, & Jovanić, 2013: 301). Simoes, Rodrigues, Costa, & Proenca (2012: 56) describe eLearning as using technology to improve teaching methods. The main layers of an eLearning ecosystem are infrastructure, content and application, while the modules used for managing this ecosystem are monitoring module, policy module, arbitration module and provision module (Despotović-Zrakić et al., 2013: 302).

ELearning can also be referred to as a tool that uses computer networks through the aid of electronic media like the internet, intranet, extranet and other networks to deliver learning content to users. It uses the web as a medium for communication, collaboration, knowledge transfer and training to support ubiquitous learning (Bora & Ahmed, 2013: 595). Next the researcher discusses eLearning models.

2.3.1. ELearning Models

ELearning models are graphical representations of how eLearning could be designed or planned. These models differ from organization to organization but in most cases have similarities of some sort. The first model is the model for adaptive eLearning education management by Kostolanyova & Nedbalova (2017: 4) in Figure 2.19.

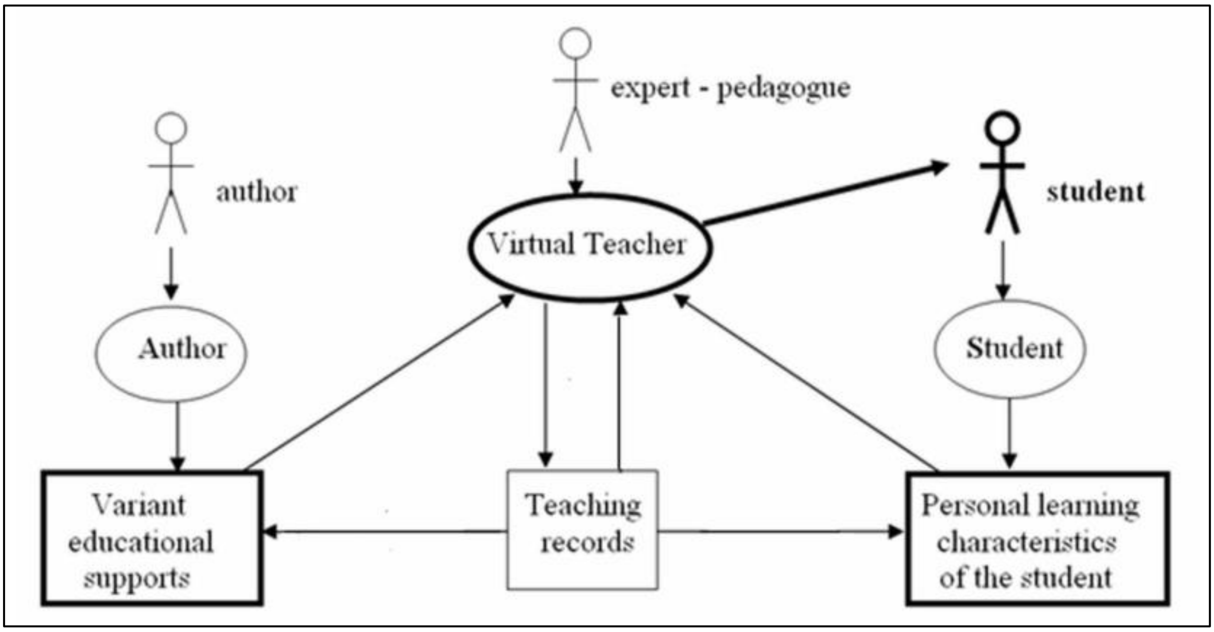

Figure 2.19: Basic model of adaptive eLearning education management (Kostolanyova & Nedbalova, 2017: 4)

Kostolanyova & Nedbalova (2017: 4) indicates that adaptive eLearning is a paradigm where learning is individualised and is dependent on individuals' characteristics, abilities to learn on their own, their current knowledge and eventually, their learning styles. They allude that, in this paradigm, learning is characterised by an individual learner's learning style, habits, preferences, motivation and approach to learning. They also say in traditional learning, the teacher teaches all learners using the same teaching method, not considering the learners' background, and this could impede on the learners' goal to learn.

Kostolanyova & Nedbalova (2017) argues that, by introducing adaptive learning, the teacher can still teach all learners in the same manner but not impede the learners' goal to learn, as the system is already capable of considering the learners' individuality and will present learning content and assessments according to their learning styles. They say to achieve this, the system must know the characteristics of the learner and must have the suitable study material to present to the learner.

The education process in the basic model of adaptive eLearning considers three modules, which are the learner module, the study material module and the virtual teacher module (Kostolanyova & Nedbalova, 2017: 4). The learner module is responsible for learning the learners' learning characteristics by imposing continuous instruction and tests. The author module creates structures of teaching aids presented as adaptive study materials. The virtual teacher module is responsible for creating adaptive algorithms for the personalised study environments and recording course content (ibid).

ELearning is used for network or online teaching. Network teaching is based on social constructivism where educational theory and practice are combined to support learners and teachers during teaching activities on a network teaching platform (Jin, 2012: 1711). Figure 2.20 illustrates a functional structure for network teaching.

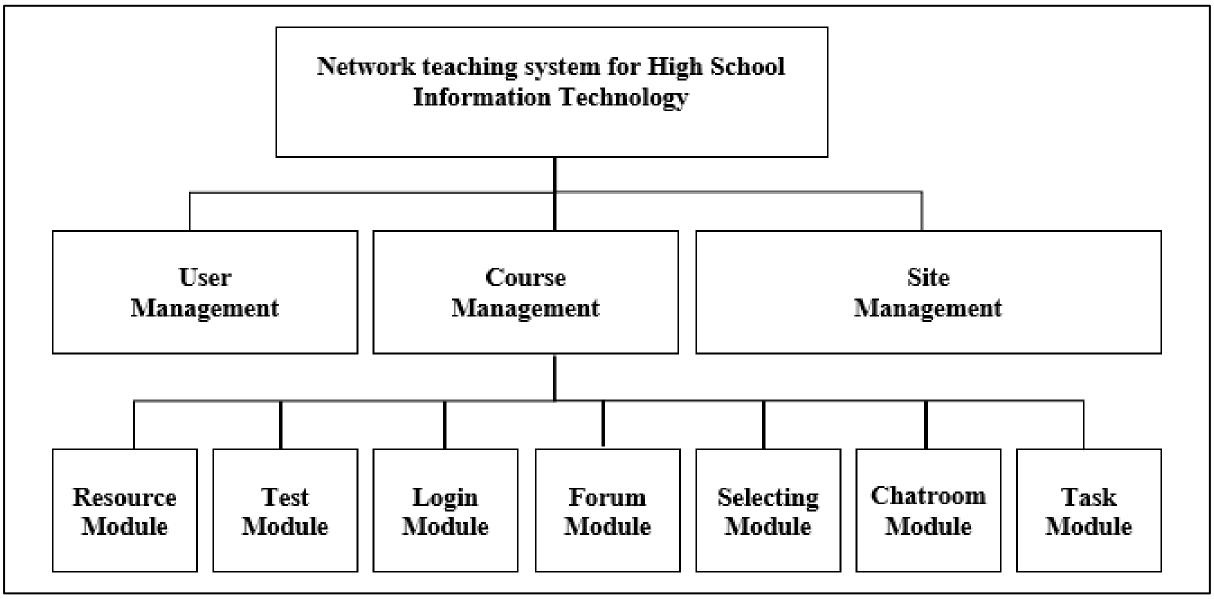

Figure 2.20: Main Functional Structure for Network Teaching System of High School Information Technology (Jin, 2012: 1711)

Jin (2012: 1711) indicates that network teaching consists of a user management module, course management module and a site management module. Jin says the user management module consists of stakeholders like super administrators, course creators or course developers, teachers and learners. Jin also indicates that course creators create new courses for teachers to teach their learners. Learners set up online profiles that include their photos, personal details and contact information. The course management module contains modules like resource, test, forum, selecting, chatroom and task modules (ibid). These modules are explained next.

- The resource module is used for file uploading and file management. These files can be of any format like PPT, flash, video, sound and other formats not mentioned here.

- The test module is used to test learners' knowledge and understanding of learning content to consolidate learning outcomes. The test module can be repeatedly used for all other tests that can also be taken several times.
- Learners use the logging module to record their learning problems.
- The forum is used for learners to share ideas.
- The selecting module uses polls for obtaining feedback after learners upload their work.
- The chatroom module caters for synchronous interactions during learning.

(Jin, 2012: 1712)

Jin (2012: 1712) indicates that the site management module establishes a network learning platform. The site contains activity modules with forty-three language packages to support different countries. Next the researcher explains eLearning tools.

2.3.2. ELearning Tools

Alsadhan & Shafi (2014) did a study to determine the significance of implementing eLearning. The outcome of the study was that, it is important to have interactive eLearning software tools along with eLearning implementation. They mentioned about eight software tools for eLearning, which are: Interactive learning software, Interactive whiteboard, E-Podium, Video conferencing tools, Learning Management Systems (LMS), Interactive Kiosk, Digital Signage, and Lecture Capturing Tool. They further mention that among the eight systems, the Interactive whiteboard, E Podium, Video conferencing tools, and Learning Management Systems (LMS) tools are absolutely necessary for eLearning implementation. Some of these tools are explained next:

- Interactive learning software – This is a set of tools used by teachers to manage their classrooms, and also promote collaboration between both teachers and learners.
- Interactive whiteboard – This an interactive device that displays a computer's desktop on large board with the aid of a computer and a projector. The interactive whiteboard is important for modern a classroom structure.
- E-Podium – This is a device used to control the components of a modern classroom with aid of special hardware and software packages.
- Video conferencing tools – These tools are used for virtual conferences and allow the creation of a virtual classroom. They are used by learners and teachers to connect to

lesson with their laptops or mobile phones via the internet, and allows course delivery to a broad audience worldwide.

- Learning Management Systems (LMS) – LMS software systems are used for document management and tracking of classroom events.
- Digital Signage – Digital signages replace the traditional posters, and are used to dissemination information through digital displays.

(Alsadhan & Shafi, 2014)

Andone & Ternauciuc (2017: 26) did a study to prove that using a virtual campus as a learning management system increases the chances to enhance learner performance. They incorporate Moodle and Web 2.0 technologies as their open education tools. In their research study they mention Open Educational Resources (OER) and Open Education Tools (OEP). OEPs are tools using free, open and adaptable software, while OERs include full courses and focus on content and resources delivery. The outcome of their study was that, the introduction their new OEP increased the interaction and communication level among learners. Tools like forums can improve communication among learners. Andone & Ternauciuc also mentions blogs, quizes, and wikis as other tools to use for eLearning.

Wan, Yu, Ding, & Liu (2017) evaluated the behaviour of learners when using an LMS called the Sakai LMS. They used crawler technology to develop a tool to extract and pre-process learning behaviour data automatically. This tools focused on the usage of a course to extract such information. They then used trace charts to visualize the data. The outcome of their study was proof that the use of an LMS provides a way to analyse learner behaviour, and Sakai LMS can be used for this and also to evaluate learner performance. Wan et al. (2017) mentions tools like discussion forums, resources, lessons, tests, polls, and quizzes, and assignments. They also mention the features below that helped them to evaluate learner behaviour, where they found that forums have the highest activity among others:

- Forum topics – Weekly number of topics created by a learner
- Forum views – Weekly views of forum contents created by a learner
- Lesson views – Weekly views of lessons contents created by a learner
- Resource download – Weekly resource downloads by a learner
- Chatting – Weekly messages sent by a learner
- Assignments lead time – The time between submitting assignments and the deadline

- Assignments score – Assignment Scores
- Quizzes lead time - The time between finishing quizzes and the deadline
- Quizzes score – Score of quizzes
- Quizzes time - Time spent by learner on quizzes

(Wan et al., 2017: 251)

Yue (2015) studied the Taylor's Integrated Moodle e-Learning System (TIMeS) focusing on collaborative learning. TIMeS is a collaborative tool for eLearning which incorporates tools like Question and Answer tools, White Boards/Slides, Blackboards, Discussion Boards, E-mails and Rosters. The outcome of Yue's study was that TIMeS is a useful tool for supporting collaborative learning. Apart from collaboration as the core of Yue's study, Yue elaborates on other eLearning tools like Game engine which is a tool for developing games for educational purposes. Teachers and educators can create, modify, design and adapt learning contents using the game engine. Yue also mentions web-based collaborative tools like wiki spaces, wikis, emails, Skype, MSN, Learning Management System (LMS), blogs, discussion boards, electronic conferences, and chat programs. Yue says most learners do not use collaborative tools such as discussion board, white board/slides, and rosters, but use emails, and Q & A tools.

Anggrainingsih, Johannanda, Kuswara, Wahyuningsih, & Rejekiningsih (2016: 273) compared the flexibility and maintainability factors of Moodle, Atutor, and ILIAS. They focussed on maintainability measurement, modularity measurement, and simplicity measurement. They found that Moodle source code was easier to maintain and modify compared to the ATutor, and ILIAS.

A study has been done to evaluate learning software (Ganchev et al., 2007). The study mentioned that national and international bodies have been working on establishing common standards and specifications in the eLearning space. The main players mentioned in the study were the Alliance for Remote Instructional Authoring & Distribution Networks for Europe (ARIADNE), the Aviation Industry Computer Based Training (CBT) Committee (AICC), the IEEE Learning Technology Standards Committee (LTSC), the IMS Global Learning Consortium Inc. (IMS) and the Advanced Distributed Learning (ADL) Initiative.

In this goal to establish common standards of eLearning, the ADL initiative created the SCORM (Shareable Content Object Reference Model) concept (Ganchev et al., 2007). The SCORM concept will be discussed further in one of the upcoming section. For now, a further discussion on different tool-sets that form part of eLearning follows. These 10 tools fall within 3 categories, which are eLearning metadata application and packaging tools, eLearning authoring/assembling tools, and Learning Content Management Systems (LCMSs). Figure 2.21 portrays the 10 tools that were tested and evaluated to be the most viable for eLearning (Ganchev et al., 2007).

2.3.2.1. Evaluating eLearning Tools

This section uncovers the tools that were evaluated by Ganchev et al. (2007). The researcher also shows how these tools were evaluated. Figure 2.21 shows the evaluation criteria.

Evaluation Criteria	eLearning Metadata Application and Packaging Tools			eLearning Assembling/Authoring Tools					LCMS	
	MetaData Generator Pro v2.0 and Manifest Generator Pro v1.0	Microsoft LRN 3.0	RELOAD Editor v1.3	ToolBox Instructor/Assistant 2004	Macromedia Authorware 7.0	Elicitus Content Publisher v4.6	ReadyGo WCB	TrainerSoft v8.5	Designer' s Edge 3.0 and Quest7	Smart Builder v1.76
	%	%	%	%	%	%	%	%	%	%
General Criteria (Total Grade):	**58**	**69**	**82**	**61**	**81**	**54**	**67**	**56**	**61**	**69**
Cost of ownership and technical support	78	70	82	58	58	62	62	42	52	70
Hardware and Software requirements	84	76	92	44	92	76	88	76	68	92
Product documentation	50	74	84	56	100	56	88	54	70	54
Ease of use and intuitiveness	52	60	90	74	88	78	88	72	88	84
Source and support	58	68	86	76	66	46	70	66	66	66
Openness and potential for integration	24	64	60	60	80	8	8	24	24	48
SCORM-Compliance Criteria (Total Grade):	**24**	**47**	**49**	**32**	**63**	**49**	**60**	**49**	**21**	**66**
Learning content to LMS communication	0	60	0	35	100	60	60	60	45	90
Learning content metadata	100	75	90	50	90	90	75	80	0	100
Learning content packaging	0	73	63	45	63	54	65	65	0	90
Learning content sequencing	0	0	50	0	0	0	42	0	0	0
Compliance to non-eLearning standards and specifications	20	28	40	30	60	40	60	40	60	50
Tool's Final Grade	**41**	**58**	**66**	**47**	**72**	**52**	**64**	**53**	**41**	**68**

Figure 2.21: Performance of ten evaluated eLearning tools (Ganchev et al., 2007)

Figure 2.21 of the evaluated software shows that the eLearning metadata application and packaging tools are MetaData Generation Pro v2.0 and Manifest Generator Pro v1.0, Microsoft LRN 3.0 and Reload Editor v1.3. The eLearning Assembling/Authoring tools are ToolBox

Instructor/Assistant 2004, Macromedia Authorware 7.0, Elicitus Content Publisher v4.6, ReadyGo WCB, and TrainerSoft v8.5. Lastly, the LCMS tools are Designer's Edge 3.0 and Quest 7, and SmartBuilder v1.76.

The eLearning metadata application and packaging tools show that Reload Editor v1.3 is the highest scored application offering an 82% grade among other applications in the general evaluation criteria. This is followed by Microsoft LRN3.0 with 69%, then MetaData Generation Pro v2.0, and Manifest Generator Pro v1.0 with 58%. The general evaluation criteria for all evaluations looked at the cost of ownership and technical support, hardware and software requirements, product documentation, ease of use and intuitiveness, source and support, and openness and potential for integration.

With the SCORM compliance criteria, Reload Editor v1.3 is still the highest scored application offering a 49% grade among other applications in the general evaluation criteria. This is followed by Microsoft LRN3.0 with 47%, then MetaData Generation Pro v2.0, and Manifest Generator Pro v1.0 with 24% which brings all three software applications to a tool final grade of 66%, 58%, and 41%, respectively. The SCORM criteria for all evaluations included learning content to LMS communication, learning content metadata, learning content packaging, learning content sequencing and compliance to non-eLearning standards and specifications.

In the general criteria evaluation of eLearning assembling/authoring tools, Macromedia Authorware 7.0 got the highest rating of 81%, followed by ReadyGo WCB with 67%, then ToolBox Instructor/Assistant 2004 with 61%, TrainerSoft v8.5 with 56% and Elictus Content Publisher v4.6 with 54%. In the SCORM evaluation criteria, Macromedia Authorware 7.0 is still the first with 63%, followed by ReadyGo WCB with 60%, a tie of 49% for Elictus Content Publisher v4.6 and TrainerSoft v8.5, and 32% for ToolBox Instructor/Assistant 2004.

The total grades for eLearning assembling/authoring tools were 72%, 64%, 53%, 52% and 47% for Macromedia Authorware 7.0, ReadyGo WCB, TrainerSoft v8.5, Elictus Content Publisher v4.6 and ToolBox Instructor/Assistant 2004, respectively. This evaluation used the same elements on both general criteria and SCORM compliance criteria as the one used in the eLearning metadata application and packaging tools.

For the LCMS criteria, the general criteria evaluations were 69% for SmartBuilder v1.76, followed by a 61% for Designer's Edge 3.0 and Quest 7. In the SCORM compliance criteria, SmartBuilder v1.76 still led with 66% and Designer's Edge 3.0 and Quest 7 followed with 21%. The overall score or the final grade for both tools were 68% and 41% for SmartBuilder v1.76, and Designer's Edge 3.0 and Quest 7, respectively. The evaluation used the same elements on both general criteria and SCORM compliance criteria as all other tools evaluated by Ganchev et al. (2007). Looking at the evaluation scores obtained it was noted that the values were not normalised to an outcome that can be safely used to indicate a fair conclusion.

- **eLearning metadata application and packaging tools**

Table 2.4: General Evaluation Criteria for eLearning Metadata Application and Packaging Tools

General evaluation criteria	
Tool	**Normalised evaluation**
MetaData Generation Pro v2.0, and Manifest Generator Pro v1.0	$G_{Cj}(NORM) = (58 \times 100) / 82 = 70.731$
Microsoft LRN3.0	$G_{Cj}(NORM) = (69 \times 100) / 82 = 84.146$
Reload Editor v1.3	$G_{Cj}(NORM) = (82 \times 100) / 82 = 100$

(Ganchev et al., 2007)

Table 2.4 shows that Reload Editor v1.3 is better than MetaData Generation Pro v2.0, Manifest Generator Pro v1.0, and Microsoft LRN3.0 in terms of eLearning metadata application and packaging tools general evaluations.

Table 2.5: SCORM Evaluation Criteria for eLearning Metadata Application and Packaging Tools

SCORM evaluation criteria	
Tool	**Normalised evaluation**
MetaData Generation Pro v2.0, and Manifest Generator Pro v1.0	$G_{Cj}(NORM) = (24 \times 100) / 49 = 48.980$
Microsoft LRN3.0	$G_{Cj}(NORM) = (47 \times 100) / 49 = 95.918$
Reload Editor v1.3	$G_{Cj}(NORM) = (49 \times 100) / 49 = 100$

(Ganchev et al., 2007)

Table 2.5 indicates that Reload Editor v1.3 is better than MetaData Generation Pro v2.0, Manifest Generator Pro v1.0, and Microsoft LRN3.0 in terms of eLearning metadata application and packaging tools SCORM evaluations.

- **eLearning assembling/authoring tools**

Table 2.6: General Evaluation Criteria for eLearning Assembling/Authoring Tools

General evaluation criteria	
Tool	**Normalised evaluation**
ToolBox Instructor/Assistant 2004	G_{Cj}(NORM) = (61 × 100) / 81 = 75.309
Macromedia Authorware 7.0	G_{Cj}(NORM) = (81 × 100) / 81 = 100
Elictus Content Publisher v4.6	G_{Cj}(NORM) = (54 × 100) / 81 = 66.667
ReadyGo WCB	G_{Cj}(NORM) = (67 × 100) / 81 = 82.716
TrainerSoft v8.5	G_{Cj}(NORM) = (56 × 100) / 81 = 69.136

(Ganchev et al., 2007)

Table 2.6 shows that Macromedia Authorware 7.0 is better than ToolBox Instructor/Assistant 2004, Elictus Content Publisher v4.6, ReadyGo WCB, and TrainerSoft v8.5 in terms of General Evaluation for eLearning Assembling/Authoring Tools.

Table 2.7: SCORM Evaluation Criteria for eLearning Assembling/Authoring Tools

SCORM evaluation criteria	
Tool	**Normalised evaluation**
ToolBox Instructor/Assistant 2004	G_{Cj}(NORM) = (32 × 100) / 63 = 50.794
Macromedia Authorware 7.0	G_{Cj}(NORM) = (63 × 100) / 63 = 100
Elictus Content Publisher v4.6	G_{Cj}(NORM) = (49 × 100) / 63 = 77.778
ReadyGo WCB	G_{Cj}(NORM) = (60 × 100) / 63 = 95.238
TrainerSoft v8.5	G_{Cj}(NORM) = (49 × 100) / 63 = 77.778

(Ganchev et al., 2007)

Table 2.7 shows that Macromedia Authorware 7.0 is better than ToolBox Instructor/Assistant 2004, Elictus Content Publisher v4.6, ReadyGo WCB, and TrainerSoft v8.5 in terms of SCORM Evaluation for eLearning Assembling/Authoring Tools.

- **LCMS tools**

Table 2.8: General Evaluation Criteria for Learning Content Management Systems Tools

General evaluation criteria	
Tool	**Normalised evaluation**
Designer's Edge 3.0 and Quest 7	G_{Cj}(NORM) = (61 × 100) / 69 = 88.406
SmartBuilder v1.76	G_{Cj}(NORM) = (69 × 100) / 69 = 100

(Ganchev et al., 2007)

Table 2.8 shows that SmartBuilder v1.76 is better than Designer's Edge 3.0 and Quest 7 in terms of General Evaluation for Learning Content Management Systems Tools.

Table 2.9: SCORM Evaluation Criteria for Learning Content Management Systems Tools

SCORM evaluation criteria	
Tool	**Normalised evaluation**
Designer's Edge 3.0 and Quest 7	G_{Cj}(NORM) = (21 × 100) / 66 = 31.818
SmartBuilder v1.76	G_{Cj}(NORM) = (66 × 100) / 66 = 100

(Ganchev et al., 2007)

In Table 2.9 shows that SmartBuilder v1.76 is better than Designer's Edge 3.0 and Quest 7 in terms of SCORM Evaluation for Learning Content Management Systems Tools. Each of the evaluated tools that resulted in a 100% normalised scores are the best tools to consider for use in the different usage categories based on the evaluation of Ganchev et al. (2007).

While the above results occurred from the evaluation of the tools, it is necessary to indicate how the evaluation transpired. Figure 2.22 shows the evaluation criteria of the eLearning tools.

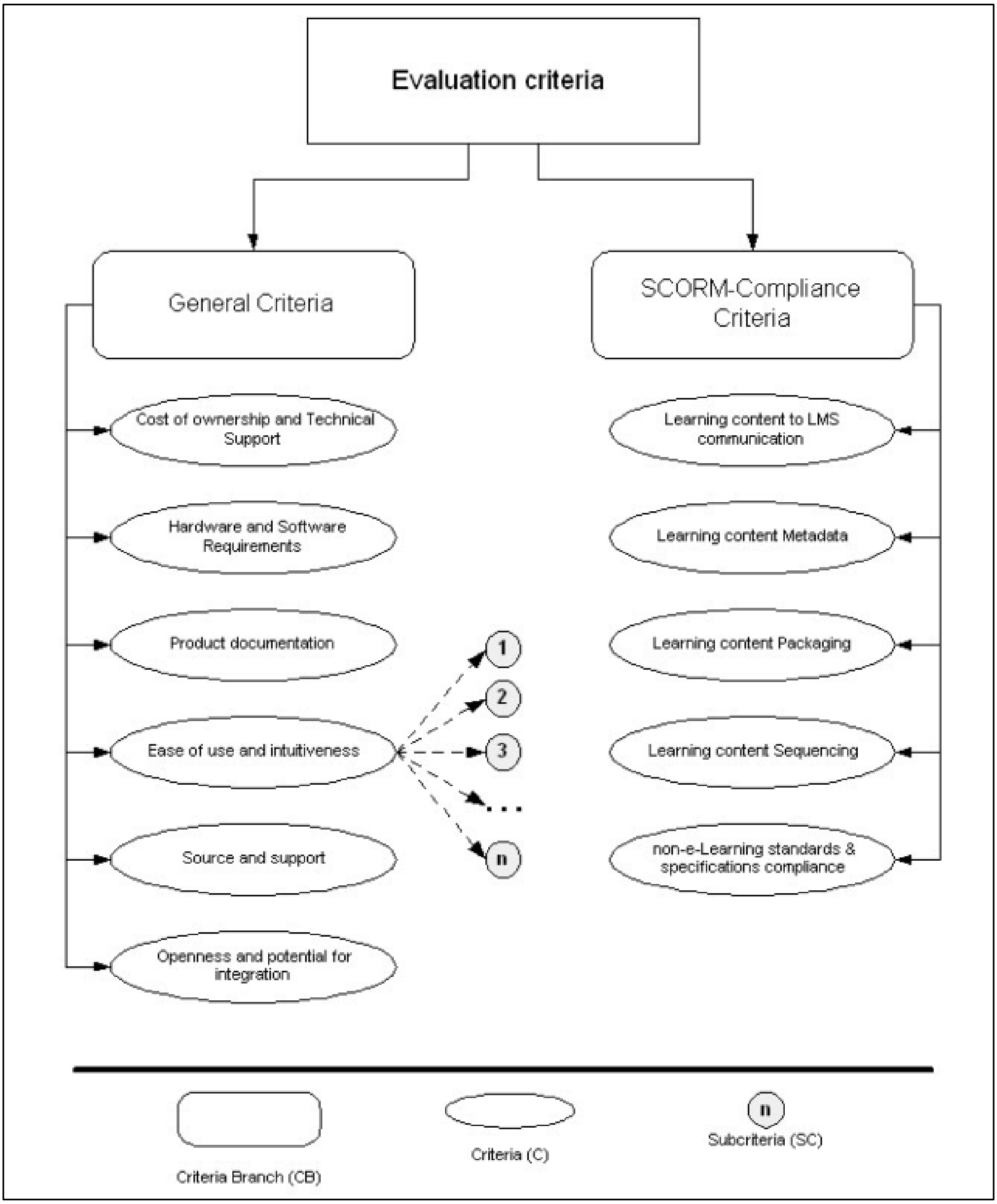

Figure 2.22: Evaluation criteria for eLearning tools (Ganchev et al., 2007)

The evaluation criteria were split into two categories indicating general and SCORM procedures. The general criterion branch had six criteria elements. These were the cost of ownership and technical support, hardware and software requirements, product documentation, ease of use and intuitiveness, source and support, and openness and potential for integration.

The SCORM criteria branch had five criteria elements. These were learning content to LMS communication, learning content metadata, learning content packaging, learning content sequencing, non-eLearning standards and specifications compliance. Figure 2.23 shows the "ease of use and intuitiveness" criterion as divided into five sub-criteria.

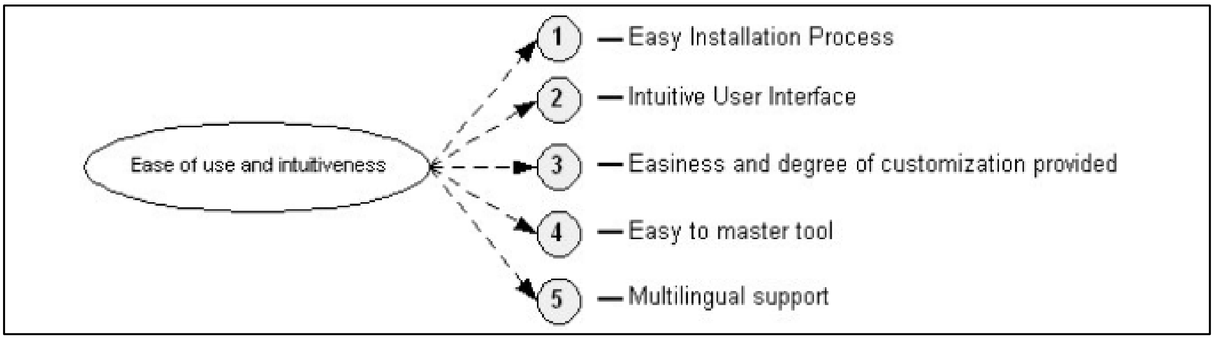

Figure 2.23: Ease of use and intuitiveness criterion and its sub-criteria (Ganchev et al., 2007)

The ease of use and intuitiveness criterion was made-up of five sub-criteria, which are easy installation, intuitive user interface, easiness and degree of customisation provided, easy to master tool and multilingual support. Apart from categorising the evaluation into criteria, the following methodology was also followed.

Ganchev et al. (2007) started by gaining access to trial and demo software through collaboration with the software vendors and downloading or using the software online. They then constructed eLearning content to use for evaluating the different software and then compared the evaluated software functionality based on product documentation, reviews, articles, white papers and user feedback. They then recorded the information and assigned each tool a grade.

LMS tools and other eLearning tools are important to consider when implementing an eLearning project. In this research study the researcher seeks to understand the low usage of eLearning in South African telecommunication companies. Andone & Ternauciuc (2017: 26) shows that the introduction of their Open Education Tools increased the interaction and communication level among learners. Interaction and communication is an element of eLearning usage improvement.

Andone & Ternauciuc mentions blogs, quizes, and wikis as other tools to use for eLearning. These are tools that the researcher can use for improving the usage of eLearning. Wan et al. (2017) indicates that the use of an LMS provides a way to analyse learner behaviour, and Sakai LMS can be used for this and also to evaluate learner performance. This phenomenon has the ability to help improve eLearning usage and is useful in the research study at hand. By analysing the learner behaviour the researcher can understand the reason for the learner not to use eLearning optimally.

Yue (2015) studied Taylor's Integrated Moodle e-Learning System and found that it is a useful tool for supporting collaborative learning. Collaborative learning may be used to improve eLearning usage. The researcher may find collaboration to be an element of understanding the low usage of eLearning. Yue also mentions web-based collaborative tools like wiki spaces, wikis, emails, Skype, MSN, Learning Management System (LMS), blogs, discussion boards, electronic conferences, and chat programs. On the same note Wan et al. (2017) mentions tools like discussion forums, resources, lessons, tests, polls, and quizzes, and assignments. These tools can be used by the research to improve collaboration as mentioned by both Yue and Wan.

Yue says most learners do not use collaborative tools such as discussion board, white board/slides, and rosters, but use emails, and Q & A tools. If this may be a true reflection, then a new tool can be suggested that takes advantage of using emails, and Q& A's to improve the usage of eLearning. Anggrainingsih et al. (2016: 273) found that Moodle source code is easier to maintain and modify compared to the ATutor, and ILIAS. With Moodle being easier to modify the researcher can modify Moodle to attain better collaboration and improve eLearning usage.

eLearning uses learning management systems (LMSs) to systematically improve and manage eLearning (Palova, 2016: 901). Humanante-ramos, García-peñalvo, & Conde-gonzález (2015: 26) indicate that LMSs are massively used globally for teaching practices. Because LMS systems are important for eLearning and need to be addressed, the next section discusses the characteristics of an LMS.

2.3.3. LMS Characteristics

Balogh, Munk, & Turčáni (2013: 38) describe an LMS as special software that provides web-based learning. They say it provides the ability to present, publish and share learning content and information. Nava, Uday, Ankit, Swathi, & Sandesh (2014: 88) describes an LMS as a web based application for centralizing and automating the management, tracking, and reporting of learning and training events. Mtebe & Kondoro (2016: 1) claim that popular LMSs are Moodle, Blackboard and Sakai.

Magdin, Capay, & Halmes (2012: 57) indicate that LMS systems are concerned with presenting the content of instructions, managing these instructions, learner communication, study motivation, and progress evaluation and observation. Sitthisak, Gilbert & Albert (2013: 53) point out that some of the LMSs such as ATutor, eXe, DoKeos, Olat and Moodle are open source software, free of charge, and has various features to support learners and teachers.

Palova (2016: 902) shares the following characteristics of learning management systems:

- LMS systems have an element of content authoring and resource management. Here, users design their content and deliver their courses through the LMS.
- LMS systems offer user activity control mechanisms. Here, tools and rules are used to set access permissions and activities.
- LMSs contain testing and reporting functionality used to test learner knowledge and analytics to identify learning gaps.
- LMSs simplify and organise learning administration, content distribution, user information management and enrolment of courses.
- LMSs have the functionality for blogs, wikis, forums, and a course and personal library for training courses.
- LMSs have the functionality to manage compliance and certificate provisioning for organizations that might need employee certification.
- LMSs provide functionality that replicates virtual classrooms through technologies like video conferencing.
- LMSs can act as extended enterprises by giving organizations the power to train external learners.

(Palova, 2016: 902)

While discussing the LMS characteristics, the researcher also saw an opportunity to introduce Moodle as one of the most widely used eLearning tools and also as an eLearning tool used by ComTek. Next the researcher explains Moodle as a tool for eLearning.

2.3.4. Moodle as a Tool for eLearning

Moodle is claimed to be one of the most known and used learning management systems (Magdin, Capay, & Halmes, 2012: 58). Humanante-ramos et al. (2015: 26) claimed in 2015 that, Moodle registered 53,562 sites and 68,852,768 users across 231 countries. Conde, García-peñalvo, & Therón (2015: 245) also claim that Moodle is one of the most popular LMSs in the world and is supported by an international community of more than 57,000,000 members. The acronym Moodle stands for Modular Object-Oriented Developmental Learning Environment (Sitthisak, Gilbert & Albert, 2013: 53; He, Qiu, & Zhai, 2015: 369). Moodle is an eLearning tool used to provide educators, administrators and learners with a single robust, secure and integrated system for personalised learning (Susanto, Irdoni, & Rasyid, 2017: 153).

Susanto, Irdoni, & Rasyid (2017) refer to Moodle as a free open-source PHP web application that produces internet-based courses that are built based on modules and are meant to support modern social constructionist pedagogy. Abedmouleh (2015: 325) defines Moodle as a socio-constructivist pedagogy attained from a distance learning platform. Mosharraf and Taghiyareh (2018: 8) describe Moodle using words like learning management system, learning platform, virtual learning environment, open source, open educational resources, learner-centric and teacher-centric.

Jin (2012: 1710) points out that Moodle platform chooses Apache as a web server because it is free and open source. Organizations enjoy taking advantage of open source software as it saves them costs. For the database, Moodle uses MySQL because it is a fast and stable database server even when used by numerous users. On the same note, Moodle uses PHP and derives a good combination with MySQL as a default database, and Apache, as they perform well together. PHP is a highly efficient web server that is designed to run in all the mainstream operating systems and web servers (Jin, 2012: 1710).

Moodle uses plugins for additional functionality. Examples of these plugins are activity modules, reports administration, other administration tools, reports, authentication plugins, themes, and others not mentioned here (Susanto, Irdoni, & Rasyid, 2017). Jin (2012: 1710) indicates that Moodle has features like site management, user management, course management, task modules, a chatroom module, selecting module, forum module, logging module, test module, resource module and other modules not mentioned here, which can be used to design courses.

Moodle uses web services for user access and provides a more secure and convenient platform where administrators do not need to configure user passwords for each lecturer when creating course content (Kautsar, Musashi, Kubota, & Sugitani, 2014: 748). The same literature indicates that Moodle web services are accessed using REST (representational state transfer protocol) Function Calls to create course content. While this is the case, it is also indicated in the same literature that not all Moodle REST Function Calls are yet available for creating complete learning content.

If there is a better way to access eLearning systems securely to create course content, organizations are advised to try these options. This research does not restrict organizations to stick to REST as advised here. Organizations can also use other third-party applications to create learning content. Instead of using passwords to access the Moodle database functions like CRUD (create, read, update and delete), the REST protocol can cater for this (Kautsar et al., 2014). According to Kautsar et al. (2014), Moodle learning content is made up of learning sections and learning formats. In this research study, the researcher acknowledges that every learning section must have different learning formats to cater for different learning styles (Kautsar et al., 2014: 784).

2.3.4.1. Moodle Architecture

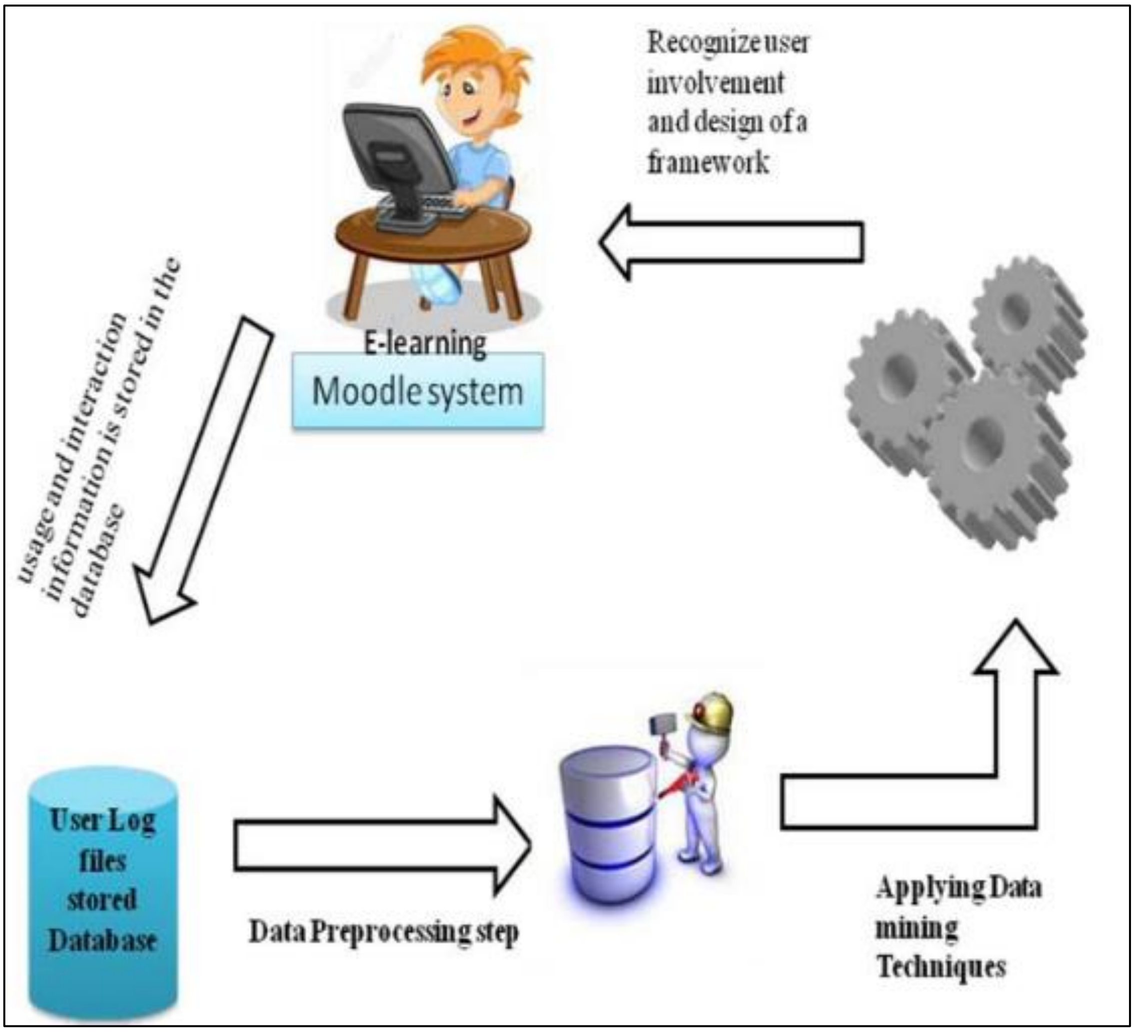

Figure 2.24: Mining Moodle Data for predicting interesting knowledge (Sheshasaayee & Bee, 2017: 736)

Sheshasaayee & Bee (2017: 736) indicates that eLearning produces dynamic and contingent content. They elaborate that eLearning promotes active collaboration. In Figure 2.24 above, when the user starts to interact with Moodle, the usage and interaction data gets stored in a database in a form of logs. Moodle caters for data processing and data mining. Figure 2.24 shows a step by step iterative cycle of the eLearning data mining process.

Moodle records learner or participant data, then pre-processes the data by cleaning and transforming the data to be mined. Data mining techniques are applied to create the model that is used to define the learner's interest and present content to the learner. The learner/user is given a chance to be involved in designing a framework for bettering eLearning. A summary of this framework is then used to design a better eLearning environment using the data injected by the learner.

After storing the usage data, the log files are cleaned and transformed into an appropriate format for mining. Logs can show the administrator information about active and inactive participants, what they did, and when they did it. The below points need to be considered when doing data mining:

- Data cleaning – detecting inconsistent data in datasets
- Data Integration – Combining data from multiple sources into a single source of data
- Data Selection – Only use relevant data for analysis
- Data transformation – Transforming consolidated data into an appropriate format for mining

(Sheshasaayee & Bee, 2017: 737)

"Data mining is the process of efficient discovery of valuable patterns from a huge collection of log data files" (ibid). Sheshasaayee & Bee indicates that Moodle allows integration across a number of different range of resources. Next, Figure 2.25 shows a structural layout of Moodle.

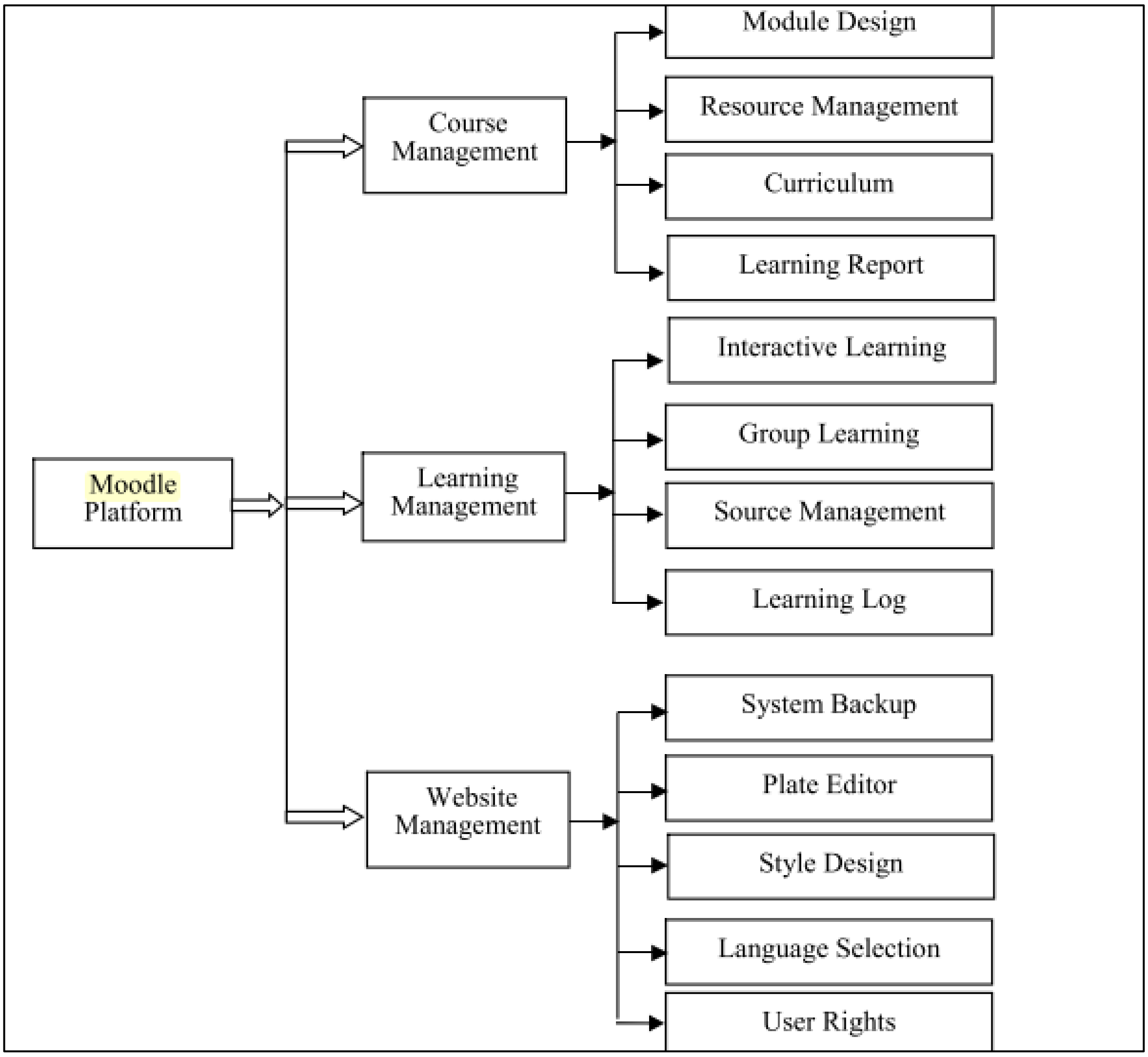

Figure 2.25: Structural diagram of Moodle (Jiugen, Ruonan, & Rongrong, 2018: 748)

Jiugen et al. (2018) indicate that the Moodle platform consists of course management, learning management and a website management module, and each of these modules is made up of sub-modules. They point out that the course management module has functionalities such as the module design, resource management, curriculum, and learning-reports functionality. They then say the learning management module has functionalities like the interactive learning, group learning, source management, and learning log functionality. The website management module has sub-functionalities like system backup, plate editor, style design, language selection, and user rights functionality. Atallah, Barhoom, & Elejla (2017: 116) elaborate on similar Moodle modules like the ones from Jiugen et al. and these modules are the user interface, course interface, grouping modules and activity modules.

2.3.4.2. Benefits of Moodle

Liqin & Chunhui (2014: 894) indicate that Moodle is easy to use, costs less and has a dynamic modular design. (Khamaruddin, Sauki, Othman, & Kadri, 2018: 238) point out that Moodle has a discussion forum that allows participants to exchange ideas and state their viewpoints freely. They further say that Moodle allows coordinators to prepare a rubric for assessors to use. Brkovic, Damnjanovic, Krneta, Milosevic, & Milosevic (2014: 391) indicate that Moodle courses use theoretical lectures for learning.

Moodle allows users the capability to host assignments, online tests and manage academic courses (Gadhave & Kore, 2017: 2043). Songbin & Fanqi (2015: 1367) and He et al. (2015: 369) describe Moodle to have a wealth of modules like user, curriculum and resource management, while also having modules like chat, voting, log, test, forum, calendar, notification, as well as has good compatibility as it is written in PHP. Fakhrusy & Widyani (2018) point out that Moodle contains essays, multiple choice questions, matching, true-false and short answer as question types.

Moodle uses plugins that allow authors to integrate with web-based labs and extend the Moodle file system for their own particular purpose (De La Torre, Heradio, & Sanchez, 2016: 209). While Moodle has a range of plugins, it also has analytics tools such as MOCLog for analysis and presentation, GISMO for visualisation, Excel Pivot Tables for statistics, and Analytics and Recommendations for use by both learners and teachers (Filvà, Guerrero, & Forment, 2014). Mothukuri et al. (2017) point out that learning analytics can be used to predict learners' learning styles, and this is also what this study aims to achieve.

Hu, Huang, & Deng (2018: 549) state that Moodle allows for content updates anytime and anywhere, and is flexible for interaction between learners and teachers or experts in the learning environment with an on-time feedback mechanism. Ueda & Nakamura (2017: 49) claim that Moodle is a global-standard LMS that is useful for both administrators and educators for online course deployment.

One of the major benefits of Moodle is the ability to do data mining (Sheshasaayee & Bee, 2017: 736). Data mining according to Sheshasaayee & Bee, involves acquiring knowledge about the learners' activities as they interact with the system. The goal is to realise the learners' involvement with the eLearning system, which will tell whether the system is useful and effective or not.

2.3.4.3. Challenges of Moodle

Sitthisak et al. (2013: 53) argue that one of the challenges of Moodle is to establish standards to use for adaptivity, usability and interpretability. Course mapping is another challenge of Moodle (Yassine, Kadry, & Sicilia, 2016: 265). Course interoperability between different LMSs is another challenge (Abedmouleh 2015: 323). Information is stored as raw data, which makes it difficult to readily supply educators with useful data for decision-making (Conde, García-peñalvo, Gómez-Aguilar, & Therón, 2015). Mikki (2013: 9) points out that Moodle course creation and the enrolment of learners is a manual process if plugins are not used.

2.3.4.4. Institutions that use Moodle

Moodle has been used for network and online teaching in elementary and secondary schools (Jin, 2012: 1710). While literature indicates the Moodle is used mostly in the academic environment, in this study, the researcher feels strongly that it also can be embraced in organizations which similarly want to achieve learning objectives. Borromeo (2013) points out that the Open University of the Philippines is one of the universities that use Moodle as their main LMS system, and even if they do not host all their exams on Moodle, it still serves to prove that Moodle is trusted by universities worldwide. Mikki (2013: 8) points out that most eLearning centres have implemented Moodle as their eLearning system.

2.3.5. Educational Metadata Standards and Profiles

Metadata is an important aspect of eLearning. Solomou, Pierrakeas, & Kameas (2015: 246) describe metadata as “machine-readable information about electronic resources or other things”. They indicate that learning management systems will behave like tutors/teachers to the learners once deployed and must thus know the learners’ requirements for learning. These requirements can be obtained through sets of information about learners, called metadata (Solomou et al., 2015).

While a single metadata standard can accommodate reusability and interoperability, there currently exists no single metadata schema that can span the needs of multiple applications (Solomou et al., 2015: 246). In some instances, where specialised metadata needs are necessary, the suggestion is to use an application profile. This is an aggregation of metadata elements, from a single schema or multiple schemas, and combined into one schema called a compound schema.

In educational metadata, the schemas should be able to accommodate educational and pedagogical aspects like the learning type, intended users and instructional design instead of only common fields like author, title and type. This can be made possible through a set of information about the learning object (LO) and the learning objective (learning outcome) (Solomou et al., 2015). The next section describes learning objects.

2.3.5.1. Learning Objects

Learning objects are described as pieces of educational material that convey knowledge and in turn, correlates this knowledge to specific objectives, known as learning outcomes (Solomou et al., 2015). Learning objects (LO) are also known as chunks of instructional pieces (Ganchev et al., 2007). While learning objects have been useful to organising learning material and have been used in many modern eLearning systems, there exists no metadata schema that can capture all their characteristics (Solomou et al., 2015). Next, the researcher shows an example of an LO and its class hierarchy.

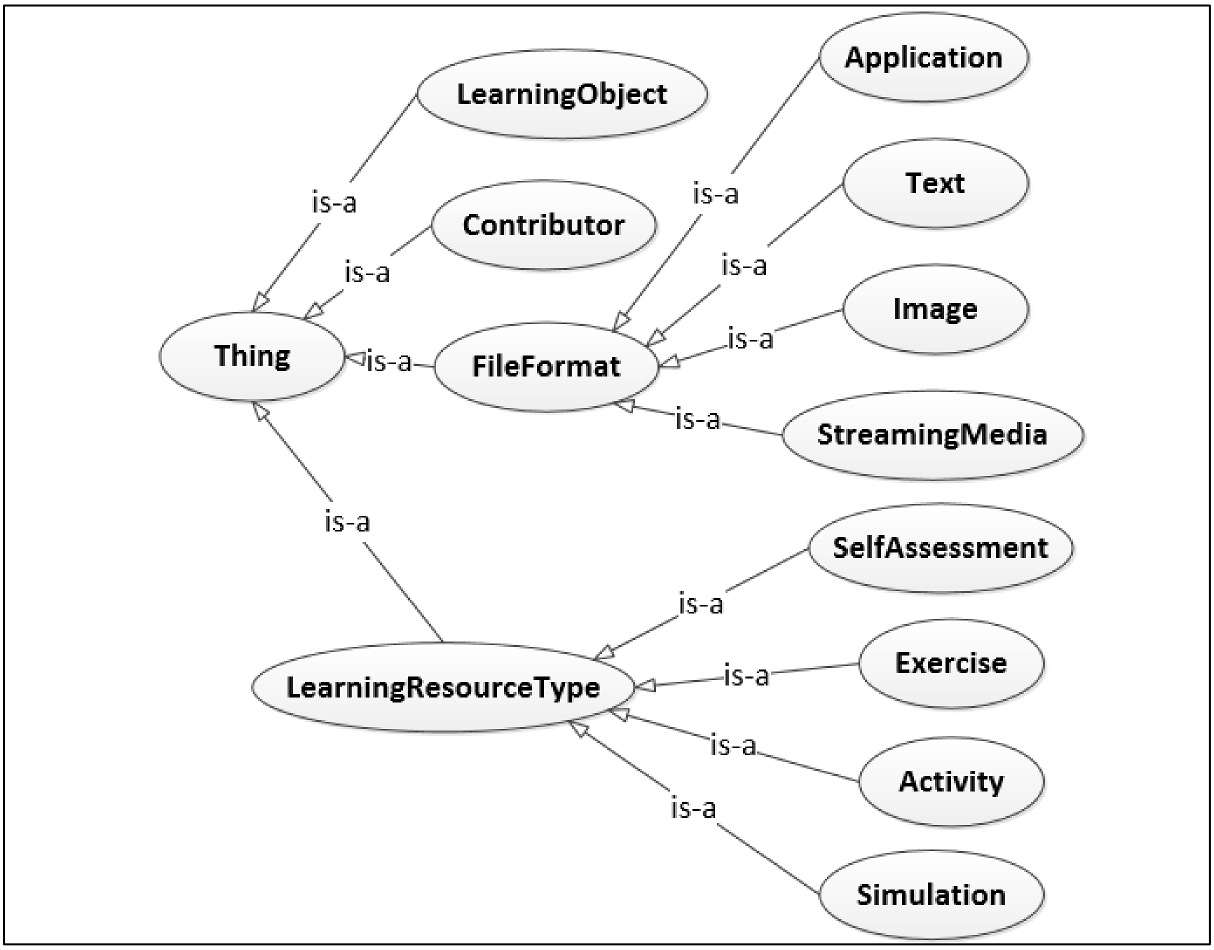

Figure 2.26: The class hierarchy in the LO ontology (Solomou et al., 2015: 254)

Solomou et al. (2015: 247) argue that the handling and dissemination of learning objects are crucial, as no human tutor/teacher will physically track the progress of a learner; instead, the eLearning system has to manage that by itself. They say a popular Learning Object Metadata (LOM) standard suggested for educational and pedagogical metadata is the IEEE Learning Object Metadata (IEEE LOM) standard. Solomou et al. articulate that the IEEE LOM has more than 60 elements grouped into nine types and are general, life cycle, meta-metadata, technical, educational, rights, relation, annotation and classification. They say each one of the groupings contains metadata for different aspects of an LO (learning object), which include the technical characteristics and rights, coupled with the educational and instructional features.

According to Solomou et al. (2015), examples of IEEE LOM profiles are ARIADNE and IMS Learning Resource Metadata (IMS LRM).

- **ARIADNE**

Solomou et al. describe ARIADNE as a “not-for-profit” foundation that does basic and applied research on improving the creation, sharing and reuse of knowledge through the aid of technology. They develop software and methodologies to provide access to large-scale knowledge bases. They use research results to develop and help preserve multi-cultural knowledge assets and collections. The organization also looks at ways to make the research results adoptable and sustainable, and they also support educational and research communities. ARIADNE forms part of the global learning objects brokering exchange (GLOBE) alliance (Solomou et al., 2015).

ARIADNE is used to describe the learning material in secondary and post-secondary education and was designed to solve the problem of indexing educational resources and their metadata, and to make it easy and efficient to exploit this metadata to look for relevant pedagogical material (Solomou et al., 2015).

- **IMS Learning Resource Metadata (IMS LRM)**

IMS LRM is made up of a set of specifications for learning resources that address issues like content packaging, question and test interoperability, learning design and simple sequencing (Solomou et al., 2015: 247). Other examples of LOM applications are CanCore and UK LOM Core. CanCore is short for Canadian Core and is used to describe local resources, simplify the LOM, and maximise interoperability between different projects. UK LOM Core is designed for the United Kingdom educational system and is used to provide guidelines for creating, using and applying metadata (Solomou et al., 2015). Another important standard to consider is the SCORM reference model.

- **SCORM**

SCORM is short for Shareable Content Object Reference Model. It is a reference model used to control how learning content is described, organised and linked with a Learning Management System (LMS) system (Solomou et al., 2015). SCORM has a capability that allows adding LOM extensions, which then enable organizations to add more learning elements and enhance the existing vocabulary.

Solomou et al. (2015) share the DCMI (Dublin Core Metadata Initiative) standard that provides the ability to share any generic web resources. The DCMI standard started with 15 elements, then a Dublin Core Metadata Element Set (DCMES) called the DC (Dublin Core) and later, seven additional elements were added, and a new name was coined as QDC (Qualified Dublin Core) (Solomou et al., 2015: 248). These learning objects have rich schemas, but even with the enriched Dublin Core schemas, the Qualified Dublin Core was unable to capture pedagogical aspects of educational resources (ibid).

While Solomou et al. (2015) elaborate on various LOM standards, it is still a concern in their work that even well-defined LOMs that manage to capture most important pedagogical characteristics of educational resources, also tend to be weak when it comes to dealing with distance learning. The reason for this is, the educational material designed for distance learning must apply to certain standards of content, layout, structure and technical properties for it to be effective. Since the educational material mimics the presence and role of a tutor, it has to directly correlate to the learning outcomes, educational material and the different styles of learning in online and distance learning; however, most LOMs fail to uphold these standards (Solomou et al., 2015).

2.3.5.2. Binding of Metadata

Metadata schemas are handled as SQL tables, text files, HTML meta-tags, RDF, RDF Schema, OWL and XML (Solomou et al., 2015: 248). These are referred to as bindings. Solomou et al. indicate that XML bindings provide a surface syntax for structured documents and do not provide any semantics for describing these documents, but give some structure and provides datatypes. They indicate that the Resource Description Framework (RDF) can be used for describing objects, how they relate, and it provides simple semantics through XML representation. RDF is intended for representing knowledge but lacks reasoning ability and is designed not to support inferences and deductions. In this regard, the metadata cannot be meaningfully encoded (Solomou et al., 2015: 248).

OWL, on the other hand, provides the ability for better semantics and represents any domain of interest with better structure. OWL provides a vocabulary that describes classes, relations between the classes, cardinality, equality, richer typing of properties, characteristics of properties and enumerated classes, and identifies constraints about declarations a user can make (Solomou et al., 2015: 248). Next the researcher shows guidelines for eLearning.

2.3.6. Guidelines to eLearning

Ibarra-Florencio et al. (2014) indicate that, when planning an eLearning environment, some of the important aspects to consider are among the below, as derived from Horton's methodology:

- Identify the organization's eLearning goal;
- Analyse learners' needs;
- Identify what is to be taught;
- Set learning objectives;
- Write down such objectives;
- Identify prerequisites to learning;
- Choose an approach to meet each of the objective;
- Decide the teaching sequence of all objectives;
- Create a learning object (LO) per objective, for all objectives;
- Specify a structured sequence of LOs for more specific objectives;
- Assign low-level LOs to activities that accomplish the objective of that LO;
- Create tests to measure learning achievement;
- Choose learning activities per objective for all objectives;
- Choose the appropriate media for each of the learning activities; and lastly,
- Redesign periodically aspects.

(Ibarra-Florencio et al., 2014)

2.3.7. Stakeholders in eLearning

Developing a robust eLearning environment is a complex task and thus, requires a specialist in all eLearning areas. The following experts form a major role in developing eLearning (Ibarra-Florencio et al., 2014):

- Subject matter experts (SMEs) – The SMEs are responsible for writing suitable content for the target learning units like topics and lessons, which are directed to the specific target audiences.
- Instructional design experts (IDEs) – The role of the IDEs is to design instructional experiences like the sequence of activities for learners to do in order to learn the content.

- Technical design experts (TDEs) – The role of TDEs is to design the activities above into digital resources like graphs, plots, sound, videos, digital images and games.
- Production personnel (PPs) – These experts are in the categories of graphics designers and programmers who develop digital resources. To do this, they use tools like Flash, Photoshop and PowerPoint. The job in this category also entails organising the eLearning content into web pages using Hypertext Mark-up Language (HTML) within learning management systems (LMS) such as Moodle and others not mentioned.

(Ibarra-Florencio et al., 2014)

For better presentation and understanding, Figure 2.27 summarises the above eLearning stakeholder functions using a diagram. Figure 2.27 shows SME functions, like content creation, IDE functions like instructional design, TDE functions like digital resource design, and PP functions like digital resource development.

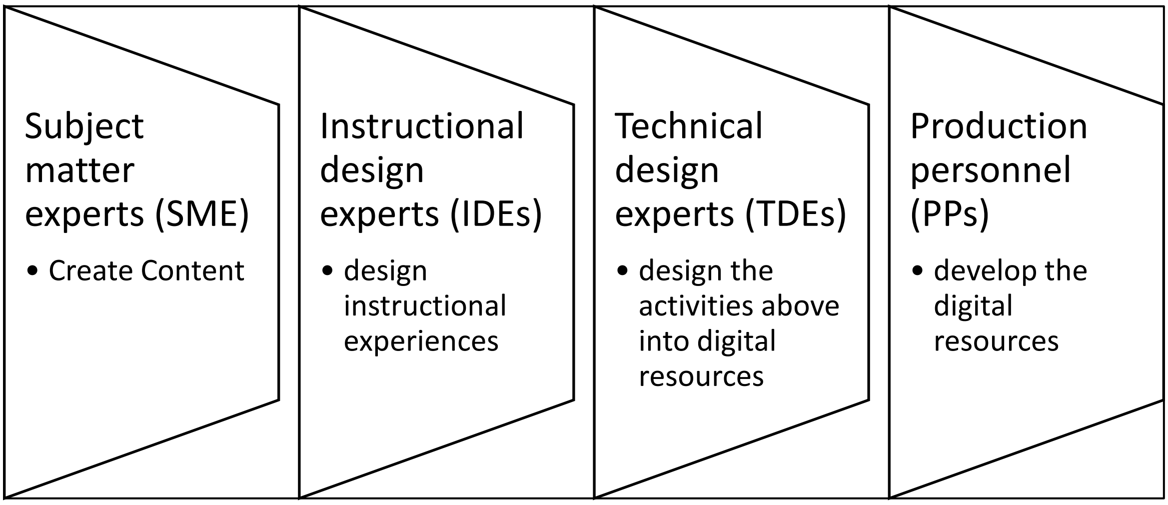

Figure 2.27: eLearning Stakeholder list as derived from Ibarra-Florencio et al. (2014)

In the next section the researcher briefly discusses course content preparation.

2.3.8. Course Preparation

When planning a course, the teacher or facilitator must make sure that the learners know and understand how to use the eLearning tools provided, and all media and content is well organised and fully functional (Sepic, Pogarcic, & Raspor, 2010). The following key points below will help the teacher or facilitator not to be biased to his/her way of teaching when preparing the course content:

- *Learner motivation* – Learners might want to know why it is necessary to study a certain course, what they will gain from studying the course, and where to start to study the course.
- *Course development motivation* – The teacher may want to motivate by giving reasons for developing a course. They may also want to embark on methods on how to create the best learning course content and learning experience for learners.
- *Time* – A good and significant commitment to time for creating all courses content and course material in advance is a necessity to deliver the coursework just in time.
- *Pedagogical considerations* – The teacher must incorporate proper pedagogical models and learning theories in place to have good teaching material.
- *Orientation* – The teacher must create the course content and course material such that it has a preview, objectives, overviews, summaries, prerequisites and a schedule. These will help the learner to adjust to the course environment and the course content being taught.
- *Information* – The teacher must make sure there is enough information on the outcomes of the study and what the learner needs to master. There must be a set of facts, definitions, examples, evidence, cases, control events, explanations, recall data, tasks to perform, concepts to identify and outcomes inferences.
- *Application* – The course should demonstrate how the learner will learn. Will the learner practice, use prompting, give feedback or use remediation?
- *Evaluation* – An evaluation is key to show understanding of the content. So, the teacher must plan on what he/she will assess the learner, whether the content was relevant and whether the instructional method was appropriate.
- *Technical competency* – The teacher must be computer comfortable with course delivery technology to deliver the course. Training and support must also be in place.

(Sepic et al., 2010)

Figure 2.28 shows a schematic overview of a course content preparation model by Sepic et al.

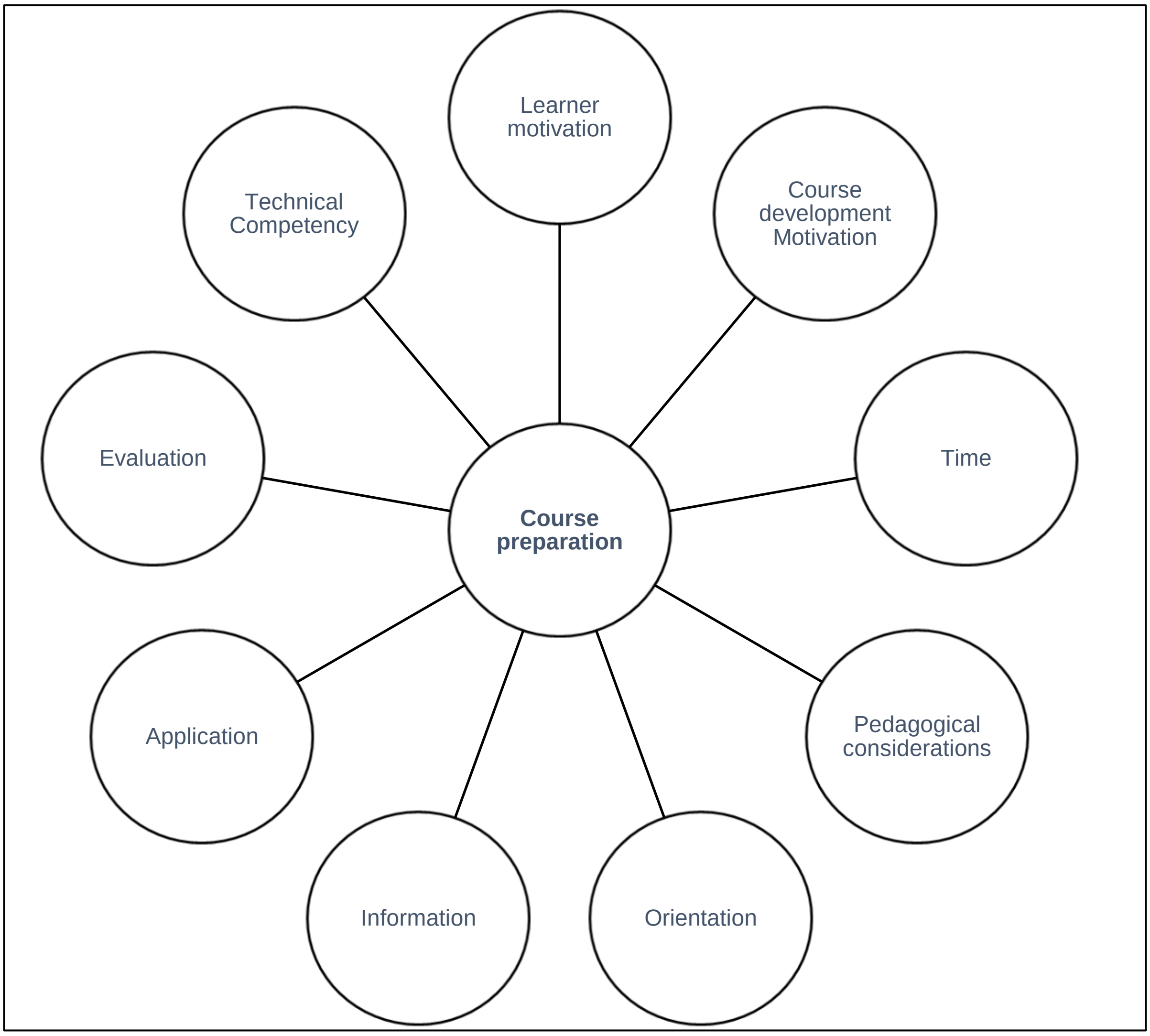

Figure 2.28: Schematic layout of a course preparation model as derived from Sepic et al. (2010)

In the next section the researcher briefly discusses course design.

2.3.9. Course Design

Course design is one of the crucial elements of the process of eLearning design. Course content must be well presented in order to influence better learning and understanding.

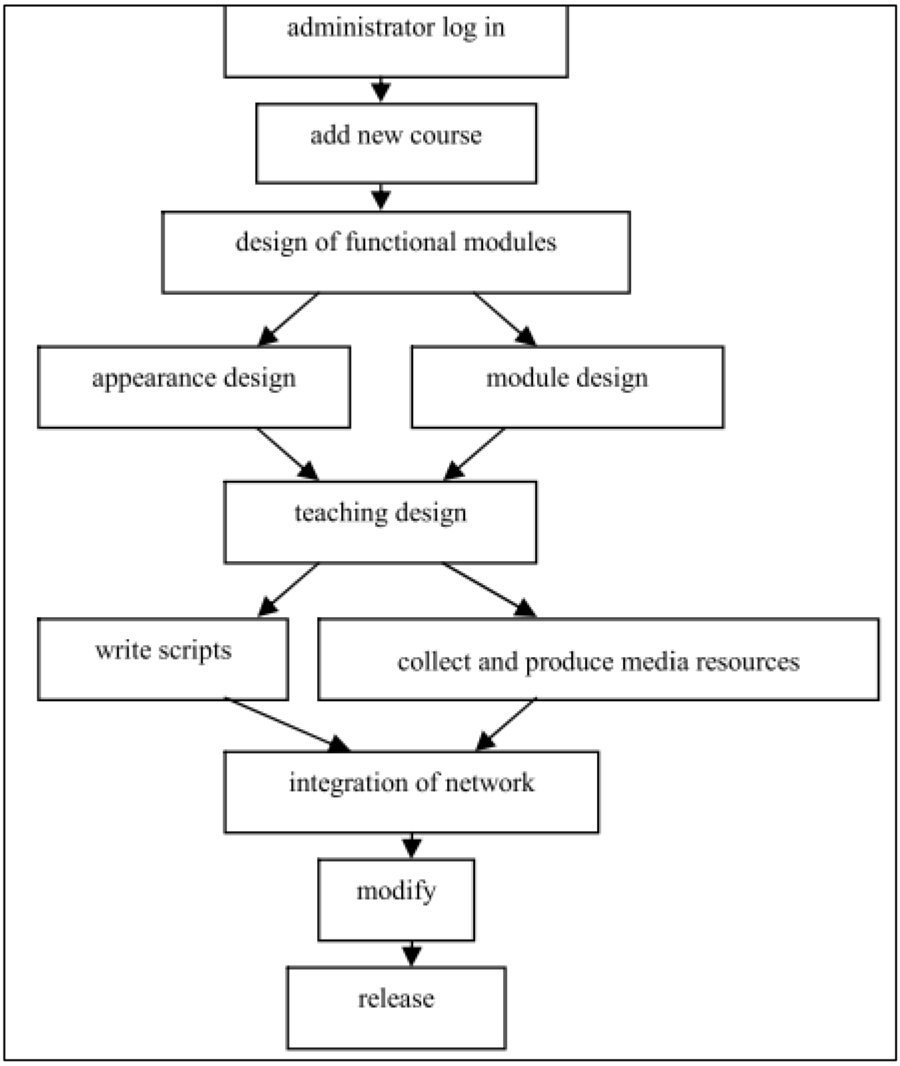

Figure 2.29: Course Design Flowchart (Jin, 2012: 1711)

Jin (2012: 1711) illustrates the flow of a course design in Figure 2.29. Jin indicates that, it all starts with doing a preliminary needs analysis and a participant analysis, then a course design. To design the course, an administrator logs into the system and adds new courses and design functional modules. The functional modules comprises of the appearance design of the module and the design of the module itself. After designing the functional modules, the administrator will then design the teaching module.

The teaching module includes scripts and media resources. After adding a new course, designing functional modules and teaching modules, the course is then deployed on the network, tested, modified and released. So on a high level the steps involved in designing a course are preliminary analysis, course design, teaching design, and network integration (Jin, 2012). When designing a course one needs to take into account the learners styles of learning. Next, the researcher explains learning styles.

2.3.10. Considering Learning Styles

Just like any other learning and teaching methodology, eLearning also consists of different styles of learning and teaching. To create a better understanding, the researcher starts by defining the word “style” in the context of this study. Sepic, Pogarcic, & Raspor (2010) define style in the context of eLearning as the way a person expresses himself/herself characterised by all features differentiating him/her from others. An individual’s learning style is mostly influenced by his/her personality, way of thinking and preferences of pictures, sounds or actions (Sepic et al., 2010).

McNutt & Brennan (2005: 27) embarked on a research to design an eLearning system that differentiates between learning styles and categorise them as visual, auditory and kinaesthetic. Other learning styles can also be verbal. Verbal means the variant is made up of structured text and visual means the variant has images, graphs and animations. The word *auditory* means the variant contains spoken words, sound and videos, and kinaesthetic means the variant adapts to different interactive educational programmes (Kostolanyova & Nedbalova, 2017: 6). The video aspect in auditory learning may mean live streaming or video-on-demand (Michalko, Kesterová, Fogaš, & Halaszová, 2014: 331). Live streaming occurs on a real-time basis, while the video-on-demand is stored on a storage system and is retrieved on user request (ibid).

McNutt & Brennan (2005: 30) used WebCT as their eLearning tool. Their system used a questionnaire that evaluates learners on their individualised learning styles prior to accessing eLearning content. The questionnaire was delivered using JavaScript and MySQL database to capture and store data. JSP pages were used to navigate through the website. McNutt & Brennan used pre-tests and post-tests to realise the impact of learning using individualised learning styles. This study aimed to investigate whether learners would perform better if the learning content was presented according to their preferred learning styles.

Poulova & Simonova (2012) introduced approaches for implementing the learning style theory in the field of engineering education at a Czech university. Their research aimed to run experiments to prove the difference of learning outcomes when using different learning styles and based on pre-tests and post-tests, evaluate the process of course-offering using eLearning tools for learning, and lastly, to design an appropriate learning model based on individualised learning. They used Blackboard as an LMS for the study.

Gaikwad & Potey (2013: 149) elaborate on three factors of learning in their study. They talk about learning style preference, motivation to learning and the knowledgeability of a learner. Style preferences are attained by recording the time spent by learners on learning objects based on a given period and then calculate the ratio of the learning styles. The motivation for learning is estimated through using discussion forums, assignments, quizzes, feedbacks, bonus points and multimedia learning materials. The number of learning activities the learner is involved in indicates a high or low motivation. Finally, knowledgeability of a learner is estimated by calculating the number of correct answers to decide the class of knowledgeability, whether poor (0-50), average (50-74) or good (75-100) (ibid).

There are numerous tools in the market to help unlock the will to learn. One of these tools is the learning combination inventory (LCI) (Poulova & Simonova, 2012). The LCI focuses on the process to learn and not on the product used to learn. The process to learn is more focused on unlocking the learner's motivation and ability to learn. Poulova & Simonova (2012) used the LCI as a questionnaire that learners had to fill in to discover their learning styles before writing the actual course on the eLearning system.

In line with using the LCI questionnaire, Poulova & Simonova (2012) used books, professional literature, electronic study material, presentations, video recordings, animations, self-assessments, hands-on activities and examples, and other material like dictionaries to present content. They discovered that even if the material and technical instruction requirements are satisfactory, a strong focus must be on the didactic aspects of instruction. Further findings of their study were the importance of the learner to know their learning style, strength and weaknesses. Rodriguez-Ascaso, Boticario, Finat, & Petrie (2017: 3) also used a needs assessment form to determine the learners' preferred accessibility adaptations, which were textual, visual, or auditory. Rodriguez-Ascaso et al. (2017) wanted to determine user experience as part of a content personalization system they were examining.

When looking for ways to enhance learning styles, the focus must also be on learning objects. The different types of learning objects are active, reflective, sensing, intuitive, visual, verbal, sequential and some are global (Gaikwad & Potey, 2013: 147). Gaikwad & Potey describe active learning objects as self-assessment exercises and multiple-question guessing exercises.

They describe reflective learning objects as those that include examples, outlines, summaries and result pages. They further describe sensing learning objects as those that include examples, explanations, facts and practical material. They then describe intuitive learning objects as those that include definitions and algorithms.

Visual learning objects are made-up of graphics, images, charts, videos and animations (Gaikwad & Potey, 2013: 148). Verbal learning objects, on the other hand, are comprised of text and audio. Sequential learning objects comprise step-by-step exercises and constrict link pages. Lastly, global learning objects are made up of outlines, summaries and all-link pages (Gaikwad & Potey, 2013: 149).

McNutt & Brennan (2005) indicate the following learning styles as reading, listening, seeing, speaking and doing. They say reading learners are those who are comfortable with reading text using a visual learning mechanism. Learners see text and build pictures in their minds as they read the text. The listening-type learners respond better to audio and other auditory mechanisms of learning and like to learn by listening to stories (ibid).

Among the different types of learners, there are also those who prefer to see content and make sense out of it (McNutt & Brennan, 2005). These are the visual kind of learners. They prefer to see images, videos and other visual types of content. Other learners are those who learn better from speaking, preferring speech. Speech is an auditory type of learning. The last set of learning styles from McNutt & Brennan' s research study are those learners who learn by doing, referred to as kinaesthetic learners.

From the variety of learning styles from different researchers, a few more are mentioned next. Bousbia, Balla & Rebai (2009: 100) elaborate on a learning style model. This model is made up of three layers, an educational preferences layer, a learning process layer and a cognitive abilities layer.

- The educational preferences layer refers to attributes like preferred learning time, environmental preference, information representation and encoding methods. Preferred learning time involves individual or group learning, learning by project or simulation, while information representation includes verbal or image learning, and encoding includes verbal, visual and auditory learning.

- The learning process layer refers to attributes like learning strategy, information processing, comprehension, and progression approach.
- The cognitive abilities layer refers to attributes like motivation and concentration capacity.

(Bousbia et al., 2009: 100)

Figure 2.30 below shows a learning style design model by McNutt & Brennan.

Media / Learning Style	Text	Audio	Graphics	2D/3D	Video	Simulation/ Games
Visual	✓		✓	✓	✓	
Auditory	✓	✓	✓			
Kinaesthetic	✓		✓			✓

Figure 2.30: Learning styles design structure (McNutt & Brennan, 2005)

In the learning styles design structure, visual learners can be supplied with text content, graphics content, 2D/3D content, as well as video content during the presentation of a course (McNutt & Brennan, 2005). For auditory learners, the presentation must include text, audio and graphics (ibid). For kinaesthetic learners, the content must be presented using text, graphics and simulation games, as kinaesthetic learners carry out physical tasks and experiments (McNutt & Brennan, 2005). Bacon, Mackinnon, & Kananda (2017: 54) point out that games and simulations have always been beneficial for computer training. Trilaksono & Santoso (2017: 603) share seven key points of addressing kinaesthetic learners, which are the creation of tactile activities, immersion and interactivity, focus on emotions, create various kinaesthetic learning styles, create branching scenarios, create collaborative group projects and allow experimentation.

2.3.11. Multimedia Content in eLearning

The principles below will ensure that the learners are not overloaded and feel more comfortable with taking the assessments. Ibarra-Florencio et al. (2014) specify that when preparing multimedia for presentation the PPs, the following needs to be considered:

- All graphics must have in parallel and in the same screen the printing words that correspond to them. Scrolling to read text relating to a graphic must be avoided.
- Words can be presented in audio narration rather than on-screen text to capture the learners' attention. There must be at least two separate cognitive channels, which are words presented in the audio channel and pictures in the visual channel.
- Visuals must be explained with audio or text, not both because learners might try to compare and reconcile the text with the audio narration, which might require them to look for answers outside the eLearning content, causing a delay in learning.

(Ibarra-Florencio et al., 2014)

2.3.12. Benefits of eLearning

Melicheríková & Busikova (2012) claim that eLearning has less limitation to space and time. They point out that eLearning is a more efficient way of learning, as it allows for flexibility of time and space with a reduced cost in travelling. They further indicate that learners with a busy schedule can adjust their learning time per their schedule. Melicheríková & Busikova say eLearning also offers education without any discrimination against age and race. The measuring of learning, record keeping, and tracking are much easier resulting in minimal discipline issues (ibid). ELearning tends to be more affordable than traditional learning.

2.3.13. Challenges of eLearning

Melicheríková & Busikova (2012) point out that with less or no personal contact, eLearning could pose a challenge of low motivation of learners while this is a benefit to stronger, independent learners. They indicate that some learners might not be punctual and consistent with tasks due to the perceived lack of control in the eLearning space. It is also perceived that learners might use unreliable sources when searching for answers on the internet in eLearning assignments. Xiang-Feng (2014: 543) indicates the online learning challenges to be the disconnection between teachers and the development process, paying less attention to the design of the learning environment, inadequate teaching activities and less ideal teaching effects.

Melicheríková & Busikova (2012) argue that if an eLearning environment lacks resources, technologies and infrastructure for communication, eLearning might not produce better learning results than traditional learning. They further argue that in some cases, teachers, trainers or facilitators who are less skilled in ICT or computers might affect the learning outcome of the learners negatively. They are of the view that eLearning might encourage laziness among learners by making it easier for them to access learning resources than in a traditional setup.

Laura, Bogdan, Aurelia, & Serban (2018) argue that it is a difficult routine to maintain software updates and support, and ensuring that hardware is always relevant. Lack of security could be another challenge for eLearning if the infrastructure is not hardened for security and privacy. For learners who mostly prefer face-to-face explanation of tough computations and certain problems perceived, if the video conferencing tools are not set up, the eLearning process could suffer and have a negative outcome. This will occur mostly with learners who find it hard to do self-studies and understand printed documents like books, newspapers and magazines.

Byungura, Hansson, Mazimpaka, & Thashmee (2016: 2) argues that teachers may develop different attitudes towards new technology systems due to aspects like lack of confidence, lack of technical support, and inadequate training. They also say that the degree of using eLearning technology is dependent on the intention to the use the technology.

2.3.14. Massive Open Online Courses (MOOCs)

While the researcher is not focusing on MOOCs as a major subject of this research study, it is important to mention MOOCs as one of the evolutions of eLearning. Taking eLearning to the next level is the birth of massive open online courses (MOOCs) enabling more than 10 million learners from all over the world to enrol for more than 1000 courses (Qu & Chen, 2015: 69). MOOCs allow multiple learners to coexist simultaneously, openly access the courses on a network (Linna, Mäkinen, & Keto, 2016: 861). Fu, Zhao, Cui, & Qu (2017: 201) claim that the idea of MOOCs has been embraced in industries, in scholarly publications, and in the mind of the public. They claim that over a million learners from leading universities have registered for at least one or more courses.

Brinton et al. (2014: 346) claim that MOOCs were introduced to make higher education available to a broader base. Ingolfsdottir (2014: 1642) argues that MOOCS have brought about the need to revise the standard teaching practice. Lynda, El Amine, Farida, & Tassadit (2017: 235) indicate that the first MOOC by George Siemens and Stephen Downes at the University of Manitoba (Canada) in 2008 was called the Connectivism and Connective Knowledge (CCK08).

MOOCs forums are usually large with thousands of users and over hundred thousand posts (Fu et al., 2017: 201). Brinton et al. (2014: 348) claims that MOOCs forums are other forums in that they allow both technical and social discussions, each forum has one course, and each course has one forum where only enrolled learners can participate in the forum. Sanchez-gordon & Luján-mora (2015: 123) claims that MOOCs are a relatively new type of online learning approach.

Alario-hoyos et al. (2014: 260) describe the type of participants using the MOOCs forums. They indicate that there are inactive, passive, reacting, acting, and supervising/supporting participants. The inactive participants do not visit the forum at all, passive participants just assumes information, reacting participants tend to want to answer existing questions, acting participants are those who post questions and tend to lead discussions, and supervising/supporting participants lead, summarizes, and gains insights. Next the researcher elaborates on eLearning models for MOOCs.

2.3.14.1. MOOCs eLearning Models

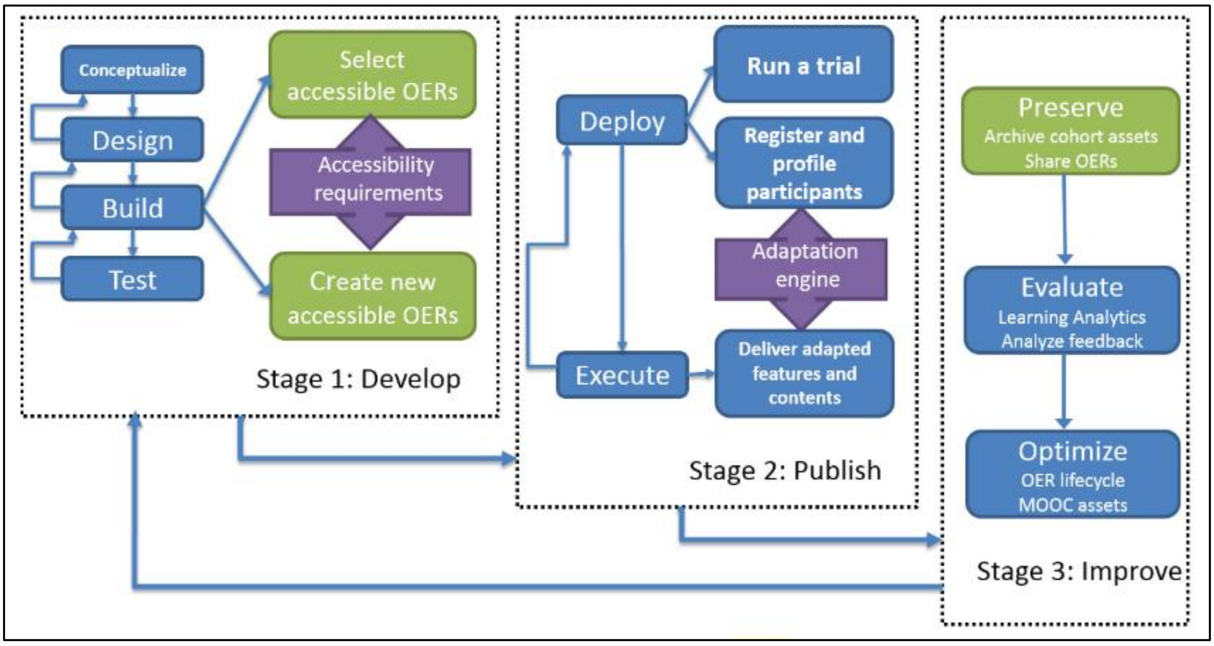

Figure 2.31: Ecosystem for corporate training with accessible MOOCs and OERs

(Sanchez-gordon & Luján-mora, 2015: 125)

Sanchez-gordon & Luján-mora (2015: 125) shows an ecosystem for corporate training which is made up of three stages, a development stage, a publishing stage, and an improvement stage. The development stage entails the conceptualizing, the designing, the building and the testing phases of the development. After testing accessible OER's are selected and created through the use of accessibility requirements. OERs are Open Educational Resource which offers free access to digital learning materials (ibid).

In the publishing stage, during the deployment, a trial is run, participants are then registered and profiled, and during the execution phase, adapted features and content gets delivered through the adaptation engine. In the improvement stage, the units/cohorts are preserved and archived, then learning analytics and feedback is evaluated, then the OER lifecycle and MOOCs assets are optimized.

The conceptualization phase in the development stage includes:

- Characterizing corporate culture
- Alignment of training goals to corporate goals
- Identifying target participants

- Describing the target corporate context
- Outlining levels as entry, medium, advanced
- Identifying pedagogical approaches
- Locating team and infrastructure resources
- Defining a timeline

(Sanchez-gordon & Luján-mora, 2015: 126)

The design phase in the development stage involves:

- Define a learning objectives hierarchy
- State the units and sub-units of the hierarchy
- State the learning content and the learning activities
- State the assessment activities and enriched rubrics
- Outline complementary channels
- Give the corporate MOOC a name
- Indicate course duration and weekly minimum hours
- Quantify content and activities to week schedules
- Describe the accreditation strategy

(Sanchez-gordon & Luján-mora, 2015: 126)

The deployment phase in the development stage involves:

- Unit version naming
- Deciding on start and end dates for these units
- Assigning instructors and teaching assistants
- Including an activity calendar
- Exposing the course units to target audience
- Including a trial version for quality assurance
- Ensuring that instructors and assistants have access
- Accessing and opening the course unit
- Ensuring that participants are registered and profiled accordingly

(Sanchez-gordon & Luján-mora, 2015: 126)

The execution in the development stage involves:

- The welcoming of participants

- The delivering of features and content
- The motivation of participants
- The promotion and scaffolding of learning
- The moderation of complementary channels
- The monitoring and documenting progress
- The collection of learning data and participant feedback
- The assessment of learning objectives, whether achieved or not
- The assessment of overall learning experience

(Sanchez-gordon & Luján-mora, 2015: 126)

2.3.14.2. Steps for Course building in MOOCs

According to Linna et al. (2016: 862), the steps of course building in MOOCs include course development and course implementation.

- Course development – In developing a MOOCs course, the first step is to prepare readings. This includes reviewing texts and technologies, selecting topics and relevant technologies, studying the selected technologies and topics, and ultimately writing the course readings. The second step is to develop exercises. This step includes writing the exercise specifications, developing example solutions, preparing program templates, and developing test cases.
- Course implementation – Course implementation includes supporting learners. Supporting learners include code reviews, assessing study attainments, and verifying submissions.

(Linna et al., 2016: 862)

2.3.14.3. Benefits of MOOCs

Qu & Chen (2015), claim that MOOCs will benefit course instructors, education researchers, learners, university administrators, and MOOC providers. Linna et al. (2016: 863) indicates that MOOCs possess the same potential as degree programs. They indicate that MOOCs can accommodate special courses which could be expensive and have a great financial risk. Sanchez-gordon & Luján-mora (2015: 124) also argue that MOOCs are inexpensive, and also effective to use for training purposes. They indicate that MOOCs eliminate printed learning materials, and travel expenses of instructors and employees. MOOCs offer flexibility in terms of space and time, and also accommodate different capabilities and skill levels, such that learners can focus on only new knowledge that they need to immediately apply. Ingolfsdottir (2014: 1641) indicates that MOOCs and other online learning methods can be used for improving understanding, problem solving, encouraging creativity, unlocking innovation, and training learners.

2.3.14.4. Challenges of MOOCs

MOOCs also have challenges. Fu et al. (2017) indicates that MOOC instructors face several huge challenges like having to analyse complex, complicated and heterogeneous data. Some organizations complain about security issues, lack of budget, and lack of technical skills to design MOOCs (Sanchez-gordon & Luján-mora, 2015: 124). Ingolfsdottir (2014: 1641) indicate that while there are advantages in eLearning and MOOCs, there is a believe from some university leaders and academics in Europe, the United States, Canada, China, and the University of Iceland that MOOCs teaching will not fulfil the pedagogical and quality assurance requirements of university teaching.

While we are mentioning university teaching, we also relate university teaching very close to organizational learning and training. Ingolfsdottir (2014: 1642) further indicates that MOOCs are expensive to implement because of the technological infrastructure necessary to service thousands of learners, and also staff time to develop, execute and interact with learners.

Now that a better understanding of eLearning has been created, next the researcher discusses cloud computing.

2.4. Cloud Computing

While cloud computing is one of the top ten IT trends that businesses follow (Rivera, 2015), learning remains part of the most integral needs of an organization. Moving computing, control and data storage to the cloud has been a growing trend since the past decade (Chiang & Zhang, 2016: 854). Zrakić et al. (2013: 302) define cloud computing as "*an abstract, scalable and controlled computer infrastructure that hosts applications for the end-users*". Bernal (2016: 64) defines cloud computing as a new way to decentralise data centres, virtualise infrastructure and platform and provide access to services through the Internet, unlike the traditional corporate LAN.

The National Institute of Standards and Technology (NIST) defines a cloud as "*a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable resources (e.g., servers, storage, networks, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction*" (Kehoe, Patil, Abbeel, & Goldberg, 2015: 398; Zhu, Leung, Shu, & Ngai, 2015: 2154; Mijumbi et al., 2016: 242).

Cloud computing offers highly scalable IT capabilities where data and services coexist in a shared and dynamically scaled set of resources (Zrakić et al., 2013: 302). Cloud computing reduces the management of physical, technical and maintenance resources (Bernal et al., 2016: 64). Servers, laptops, tablets, apps, smartphones, emails and stored information are all a subset of the cloud paradigm and are managed and supported remotely by cloud service providers like Google Apps, Microsoft Azure, Heroku and Amazon Web Services (Bernal et al., 2016: 64; (Moaiad, Bakar, & Al-sammarraie, 2016). Many cities are starting to take advantage of cloud computing, high-speed networks and data analytics for their citizens (Sun, SONG, JARA, & BIE, 2016: 766). Cloud computing also enables mobile devices to consume unlimited dynamic resources useful for computation, storage and service provisioning (Chen, Hao, Li, Lai, & Wu, 2015: 18).

Companies like Google and Apple use cloud computing for emails and data storage. IBM, Dell and Sun are also taking advantage of cloud computing (Mahmood, 2011: 121). Amazon has taken advantage of the e-cloud business and has become the most profitable sector with Dropbox being a consumer of its cloud service (Mao, You, Zhang, Huang, & Letaief, 2017: 2322). Cloud computing and big data are trending topics that play a vital role in other industries like the healthcare industries (Zhang, Qiu, & Tsai, 2017: 89). Remote platforms, services and tools can be accessed from millions of terminals. In every cloud computing infrastructure, virtualisation is a key element.

Cloud computing can be classified into the following categories of deployment models: private cloud, public cloud, hybrid cloud and community cloud, of which all models share infrastructure characteristics such as management, ownership and location (Zrakić et al., 2013: 302). The specified characteristics in the specified deployment models determine the access rights of users to shared cloud resources. Figure 2.32 shows a diagrammatic representation of the cloud deployment models.

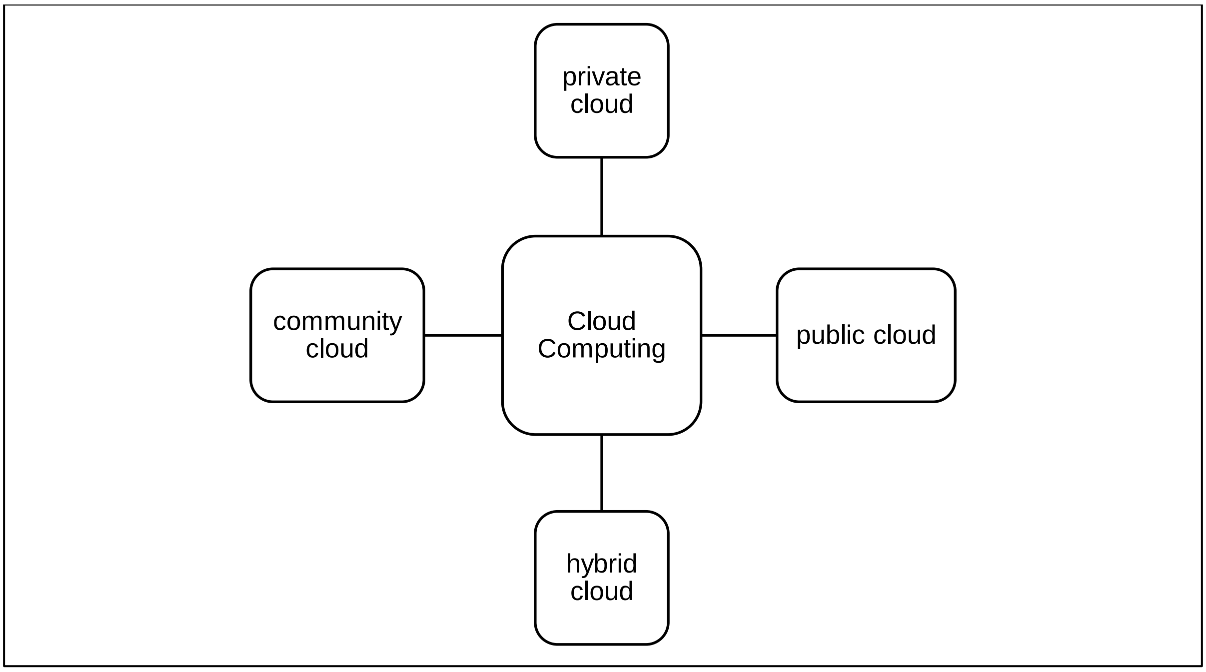

Figure 2.32: Types of clouds in cloud computing as derived from Despotović-Zrakić et al. (2013)

- Public Cloud – User in public access cloud services via a web interface and pay only for the duration they had used the service. This reduces the operational ICT costs. This type of cloud is not secured and is prone to malicious attacks.
- Private Cloud – This type of cloud operates within an organization's data centre. It offers more control over deployment, and it is easier to manage security, maintenance and upgrades. A private cloud is more like an intranet. Services are pooled and made available at an organizational level. The organization manages the resources itself.
- Hybrid Cloud – A hybrid cloud is partly public and partly private where some of the private services are linked to external cloud services. Here, information can be accessed on the Internet, and it offers a more secure way to control data and applications.
- Community Cloud – A community cloud could be hosted at one of the community's organizations or at a third party's premises. Here, many organizations share a cloud infrastructure with shared requirements and policies.

(Jadeja & Modi, 2012: 879)

2.4.1. Cloud Computing Characteristics

Cloud computing is described here to be a cloud service model that uses virtualisation technology, is highly scalable and reliable, and is also highly secured (Lei, Zhe, Shaowu, & Xiongyan, 2009: 865). These characteristics are expanded as follows:

- Cloud Services Model
    - computing and storage resources reside on the cloud;
    - clouds can execute complex calculations;
    - there are a variety of cloud computing services that allows users to enjoy the present power of personal computers anytime and anywhere;
    - the cloud service model separates consumers and producers of IT services;
    - the cloud service model reduces the cost and complexity of using IT services; and
    - the cloud service model offers opportunities and a market for producers.
- Virtualisation Technology
    - Virtualisation is the key to cloud computing and is the foundation for building cloud services.
    - Virtualisation technology provides virtualisation of all of the hardware, storage, network resources and establishes a resource pool.
    - User requests for resources are done via the cloud rather than on fixed physical entities.
    - Applications run on the cloud.
    - Cloud computing provides users with all the resources they need, including supercomputing power, even when the resource location is not known.
- High scalability and reliability
    - Cloud computing offers good scalability, reliability and flexibility that meets the needs of users in line with the scale of growth.
- High security
    - Cloud computing allows for the effective management, control and usage of data that is centralised and stored in the cloud.

- Data in the cloud can receive unified management, load balancing, resource allocation, deployment of software, control security and the security of reliable real-time testing so that the user's data security is guaranteed greatly.
- Data in the cloud is automatically replicated.
- Data is retained in the cloud, even when a user's personal computer might crash.

(Lei et al., 2009: 865)

Among the above characteristics, others are:

- On-demand self-service – Consumers of cloud computing can individually acquire computing capabilities like server time and network storage anytime when needed.
- Broad network access – Capabilities such as compute resources storage capacity are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops and workstations).
- Resource pooling – The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.
- Rapid elasticity – Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand.
- Measured service – Cloud systems automatically control and optimise resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth and active user accounts).

(Mijumbi et al., 2016: 242)

2.4.2. Cloud Computing Services

Cloud computing consists of services like software as a service, platform as a service, infrastructure as a service, network as a service, storage as a service, database as a service, security as a service, integration as a service, management as a service, testing as a service, information as a service, communication as a service, monitoring as a service (Pantelić, Pajić, & Nikolić, 2016: 137). Despotović-Zrakić et al. (2013) also acknowledges IaaS, PaaS and SaaS as cloud computing services in Figure 2.33.

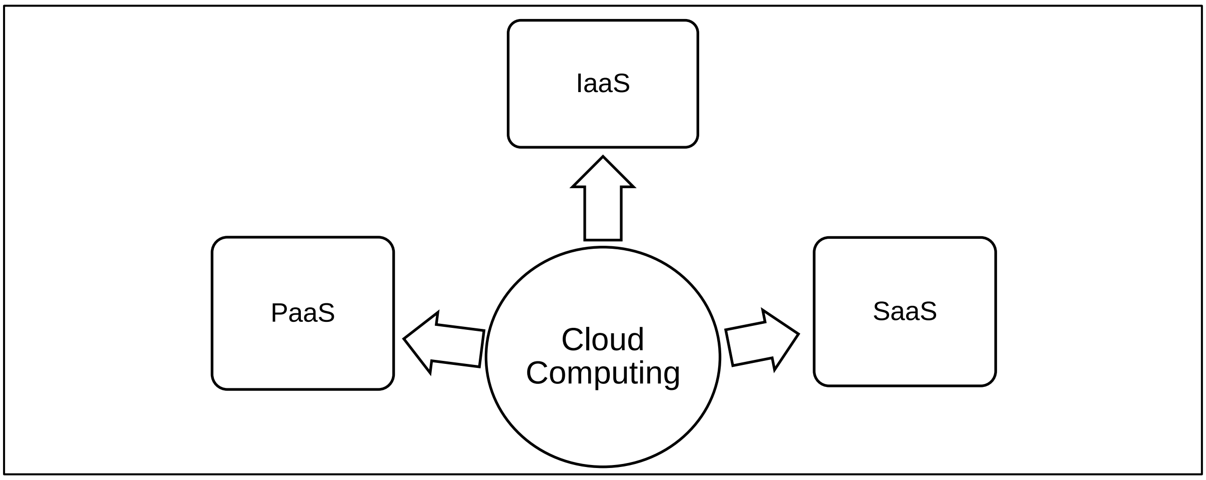

Figure 2.33: Cloud computing services as derived from Despotović-Zrakić et al. (2013)

This study only focuses on basic services, which are software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS). IaaS offers storage, hardware, servers and networking services, PaaS offers an environment to do development and SaaS offers software such as word processors hosted by a service (Liao, Wang, Ran, & Yang, 2014: 341). PaaS can be used for deploying applications, designing applications, pushing applications to deployment environments, consuming services, database migration, domain mapping, IDE plugins or as a build integration tool (Pahl, 2015: 28).

Nava et al. (2014: 89) indicates that SaaS is driven by critical factors like speed of implementation, immediate business impact, direct cost, resource saving, outsourcing of systems, and technical expertise. They say when compared to traditional client-server installations, organizations rip benefits like a lower total cost of ownership, and a substantially higher ROI.

2.4.3. Cloud Computing Aspects to Consider

In this research study, the researcher used eLearning and cloud computing to model a concept to understand and improve eLearning usage. When deploying cloud computing as an eLearning strategy, the organization becomes partially cloud compliant and could face the same challenges, as well as have the same gains as other organizations using cloud computing. The following challenges and gains below are to be considered, and these are the demands on the suppliers of cloud computing services, the impacts on user companies and organizations and the support of business processes using an appropriate selection of ICT services (Tvrdíková, 2016: 1130). The next section outlines other cloud computing aspects to consider.

2.4.4. Demands on the Suppliers of Cloud Computing Services

Since applications can run from anywhere on the cloud, their mutual integration demands certain standard interfaces as set by the suppliers of cloud computing services (Tvrdíková, 2016: 1130). Tvrdíková argues that some of the standard interfaces will have to adhere to certain frameworks and methodologies like agile and extreme programming. Analytical tools for big data are a critical demand for their real-time analysis (ibid).

Tvrdíková (2016: 1130) recommends that the organization's managers must be involved throughout the implementation and transformation of the cloud environment, as they are the key to the organization's strategy. Tvrdíková specifies that the drive to a cloud computing environment forms part of the organization's information strategy. It, therefore, becomes critical to do this through the coordination of the organization's managers who form part of the ownership of data and documents. Data and documents in a cloud space can be updated by these owners (Xia, Wang, Sun, & Wang, 2016).

2.4.5. Impacts on User Companies and Organizations

Companies and organizations using cloud computing might soon have to reduce employees with technical skills. Skills such as IT administration, programming and support, and other related skills will no longer be necessary for the organization, but will now be the responsibility of the service provider (Tvrdíková, 2016). Employees will have to be given new responsibilities with functions that ensure a link between business and ICT services. Tvrdíková & Tuo (2016: 1130) indicate that qualification structures will have to change where employees will have to be skilled more about business in the following aspects:

- Using ICT to gain a competitive advantage;
- How to create new products or services;
- How to find new customers;
- How to speed up response time to external organization events; and
- How to reduce the costs of business processes.

(Tvrdíková, 2016: 1131)

2.4.6. Support of Business Processes Using an Appropriate Selection of ICT Services

Tvrdíková (2016: 1130) argues that organizations must upskill their employees with the skills to determine the content, volume, quality and price of ICT services. Tvrdíková says the organization must also offer training on how to design an overall architecture of ICT services. The organization must also preserve skills on how to select an ideal supplier to offer and implement proper ICT services. Training on how to systematically monitor the delivery of ICT services must also be acquired (ibid). Lastly, Tvrdíková indicates that there need to be rules for controlling the services and measuring the impact of these services on business/organization processes. Training is imperative and helps in improving and developing employee skills looking at their knowledge, skills, capabilities, behaviours and attitudes (Bangura, 2017: 33).

2.4.7. Getting the Best out of Cloud Computing Services

The researcher wanted to get the best out of cloud computing services to portray a ubiquitous learning environment for access anytime anywhere in the conceptual framework. New technologies like web 2.0, internet of things (IoT) and cloud computing (CC) have caused educators to become more interested in using cloud computing in education (Ding, Xiong and Liu, 2015: 1368). Tvrdíková & Tuo (2016: 1131) suggest the below pointers as a drive towards maximising the output of cloud computing services:

- Prepare a strategic schedule for transforming the entire IT architecture gradually.
- Draft a requirements specification document considering necessities like delivery time, costs, functionality, performance and complexity of the information system, which will help in selecting an appropriate supplier.
- Indicate whether the information system will be progressive or not, is real-time analysis and management of computer networks required or not, and if required, then specify the possible requirements for allowing this.
- Adapt to the qualification structure of employees as needed to ensure that the right employees with the right skill set address a proper link between business needs and ICT services.
- Prepare a budget that aligns to the changes in cost structure as some investments will be eliminated and a linear cost structure will be adopted. Prepare the employees to

measure the services they consume against the budget. Fees for shared services make it easier to obtain an overview of operating costs and to identify agendas per cost spent, which improves the manageability of the cloud services and their cost.

- Prepare a document stipulating the contract between the business/organization and the service provider. This document will contain the requirements, responsibilities, guarantees and sanctions in case of non-compliance. The documentation will also specify the provision of services, subject, functionality, objectives, expectations, service scaling, and ensured connectivity. Service scaling must include the change in scope, quality, and time of provision. Ensured connectivity must include provider downtime, protection of data, responsibilities and legalities, tools for service provision, software licensing, system migration conditions, and customisation requirements.

(Tvrdíková & Tuo, 2016: 1131)

If all the above aspects are embraced in a cloud computing project, then the business can concentrate on its core functions, thereby improving productivity, efficiency and sustainability while focusing less on operational and other secondary functions. Figure 2.34 shows other key factors to embrace when embarking on a cloud services model for an organization.

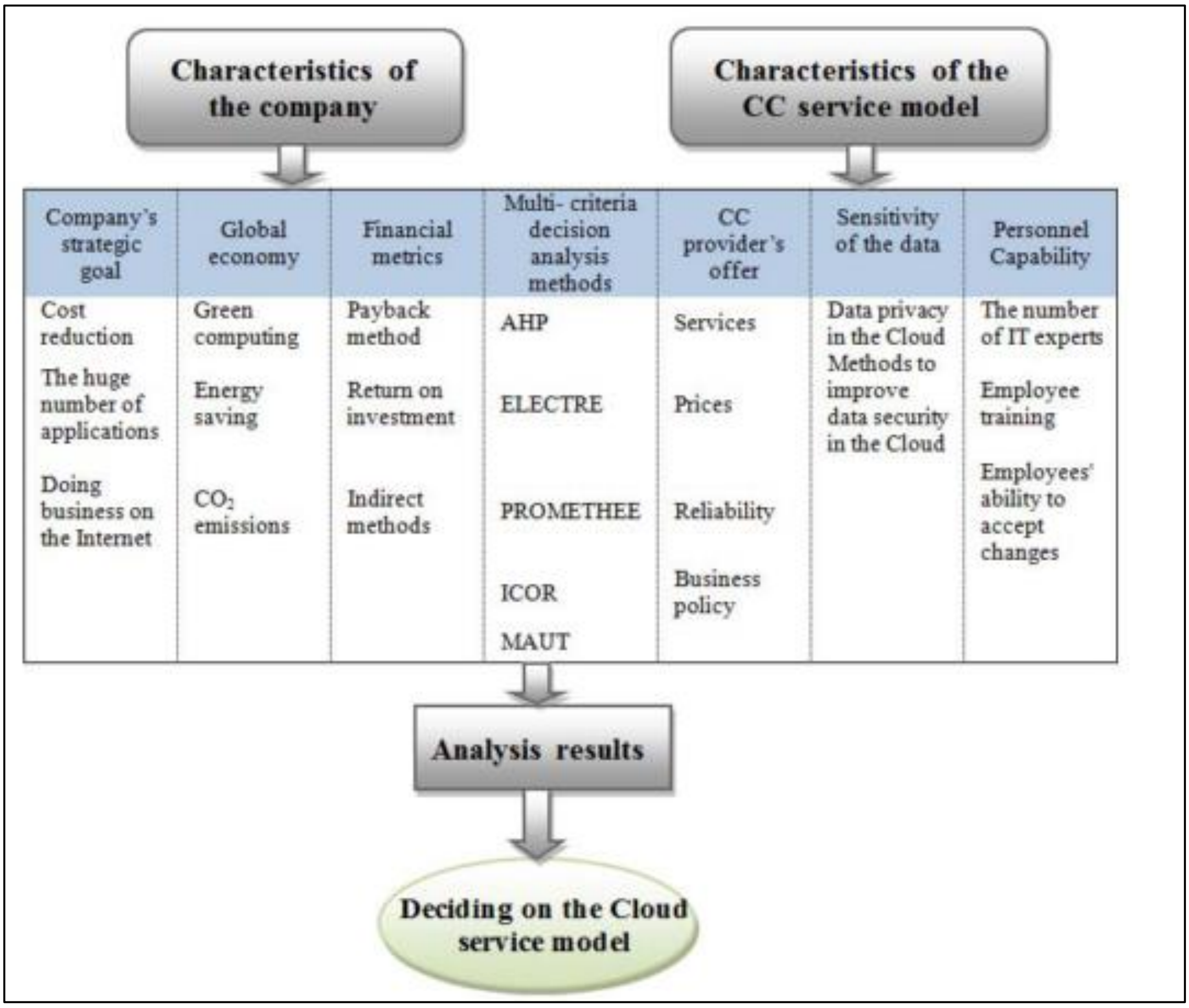

Figure 2.34: Key factors of general model for Cloud adoption (Pantelić et al., 2016: 136)

Pantelić et al. (2016: 136) describe key factors for cloud adoption and organizational benefit from cloud computing. They claim that decision-makers use these key factors for evaluating benefits, risks and costs of using cloud computing. They argue that decision-makers select the most appropriate cloud solution based on these evaluations because no single cloud model can fit all businesses. The seven key factors which the organizations could use to make decisions are the organization's strategic goal, the global economy, financial metrics, multi-criteria decision analysis methods, cloud computing provider's offer, the sensitivity of the data and personnel capability (ibid).

Pantelić et al. argue that organizations must first evaluate their objectives towards using cloud services. The organizations must then re-evaluate themselves based on financial metrics. While this is necessary but not sufficient, the evaluation needs to be based on a multi-criteria decision analysis method to determine the value of cloud services as intangible assets (ibid). It is also important to compare the cost of different cloud providers, deployment options and usage scenarios. While there are different strategies and technologies towards security and privacy issues, service agreements signed with service providers remain the only guarantee, and it, therefore, is important to assess security risks of embedding resources within the cloud computing environment. It then remains an ultimate goal for the users of the cloud services to embrace and accept the cloud technology (Pantelić et al., 2016: 136).

Multi-criteria decision-making methods as mention above by Pantelić et al. include analytic hierarchy process (AHP), iterative compromise ranking (ICOR) and multi-attribute utility theory (MAUT). Some examples of the results of the MAUT, ICOR and AHP decision-making methods are shown next (Pantelić et al., 2016: 137).

Alternative	Grade
1. Software as a Service	8.105
2. Platform as a Service	6.393
3. Infrastructure as a Service	6.662
4. Network as a Service	6.424
5. Storage as a Service	8.447
6. Database as a Service	7.328
7. Security as a Service	6.982
8. Integration as a Service	7.648
9. Management as a Service	6.994
10. Testing as a Service	8.152
11. Information as a Service	7.351
12. Communication as a Service	7.129
13. Monitoring as a Service	7.204

Figure 2.35: Example of an overall score using the multi-attribute utility theory (MAUT) method (Pantelić et al., 2016: 137)

Alternative	Grade
Software as a service	1
Storage as a service	2
Integration as a service	3
Testing as a service	4
Monitoring as a service	5
Database as a service	6
Management as a service	7
Information as a service	8
Security as a service	9
Infrastructure as a service	10
Platform as a service	11
Communication as a service	12
Network as a service	13

Figure 2.36: Example of alternative ranking list using the iterative compromise ranking (ICOR) method (Pantelić et al., 2016: 138)

Alternative	Grade
Software as a Service	0.11036
Storage as a Service	0.105934
Monitoring as a Service	0.09246
Testing as a Service	0.08768
Integration as a Service	0.081947
Information as a Service	0.071484
Network as a Service	0.071146
Communication as a Service	0.068752
Database as a Service	0.065457
Infrastructure as a Service	0.06239
Management as a Service	0.058437
Security as a Service	0.057504
Platform as a Service	0.05698

Figure 2.37: Example of an overall relative score for each alternative using analytic hierarchy process (AHP) method (Pantelić et al., 2016: 138)

In all three example figures above, PaaS is given a low rating because developers have to work within the constraints of the platform. It, therefore, can be concluded that cost, ease of use and disclosed scope of controls between provider and consumer are the main determinants of prioritisation in the cloud service models (Pantelić et al., 2016: 139). Data security and privacy protection issues did not play a key role in selecting the right Cloud service model as was expected.

2.4.8. Cloud Computing Architecture

Lohmosavi, Nejad, & Hosseini (2013) indicate that cloud computing architecture requirements are derived from the cloud provider's requirements and the consuming organizations' requirements. Thus, from a service provider's perspective, there is a need for a highly efficient service architecture to support infrastructure and services to provide dynamic virtualised services (Lohmosavi, Nejad, & Hosseini, 2013: 25). A well organised and secured data management and storage mechanism is also necessary. An attractive cost model, a QoS-enabled, secure and scalable system is necessary on an enterprise level. QoS involves the reliability, the price factor, the range constraint, the service response time and the packet loss probability (Lin et al., 2017: 1865).

Lohmosavi, Nejad, & Hosseini (2013: 25) articulate that the enterprise must provide business management services with an internal/external interoperable mechanism for deploying different cloud models. They further indicate that the service interfaces must be simple to address pricing, metering and service level agreements. Next follows three main types of architectures based on Lohmosavi et al.'s research.

- Service-oriented cloud computing architecture – In this type of architecture, services facilitate the access of applications to resources. Since there is no direct access to physical resources, the services must have access to a large number of multiple physical resources that can be dynamically allocated on demand (Lohmosavi et al., 2013: 25-26).
- Mandi service-oriented architecture – This type of architecture is based on market and pricing options. It interfaces with other services to determine the best pricing options by bidding for the best prices from multiple service providers. According to Lohmosavi et al., the resource providers first provide pricing options, and then the consumers send

proposals to show interest in renting the resource advertised. Next, a winning bid is calculated, and then the Mandi meta-broker selects the winners and sends reservation requests to the Mandi reservation service for user resource reservation. Mandi gives users flexibility in negotiating and is well scalable when deployed in most business models. Mandi uses Aneka to support its reservations and adverts. Aneka is a service-oriented middleware for building an organizational cloud (Lohmosavi et al., 2013: 25-26).

- Aneka platform for operative cloud computing applications platform – Aneka provides a platform that enriches applications with scalability in elastic public and private cloud environments (Lohmosavi et al., 2013: 25-26). Aneka is .Net-based and used as a platform for development and building web applications in the cloud. According to Lohmosavi et al., Aneka has excelled in scalability and performance issues and allows for the easy and rapid development of applications for both private, public and hybrid clouds. The integration of services can allow the development of a whole business solution on the cloud using Aneka. Advantages of Aneka are that it provides scalability on demand, and therefore, allows users to optimise the use of allocated funds while providing quality service. Aneka also supports IaaS deployments to main providers to supply resources dynamically when QoS cannot be guaranteed.

(Lohmosavi et al., 2013: 25-26)

Next, Figure 2.38 shows a contrast between traditional computing and cloud computing focusing on characteristics of both computing paradigms.

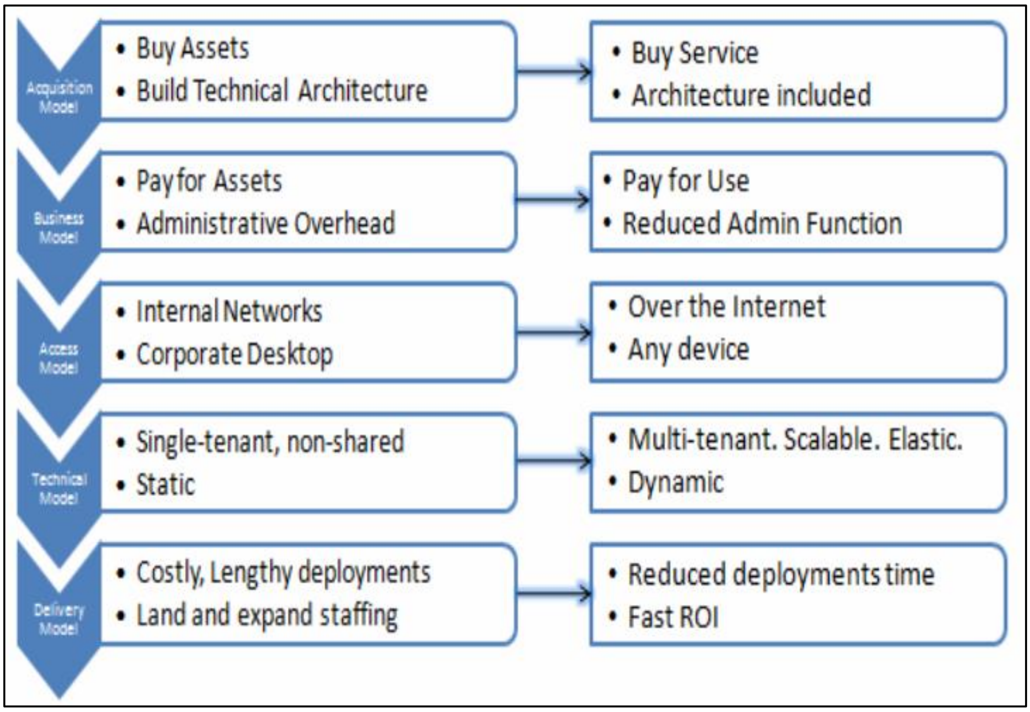

Figure 2.38: Traditional computing and cloud computing (Lohmosavi et al., 2013: 26)

According to Lohmosavi et al. (2013: 26), traditional computing and cloud computing compare with at least five levels of models, which are an acquisition model, a business model, an access model, a technical model and a delivery model. In the traditional acquisition model, organizations used to buy assets and build technical architectures, while in the cloud acquisition model, they buy services with the architecture included. Lohmosavi et al. indicate that in the traditional business model, organizations used to pay for assets, while in the cloud business model, they pay for using resources via services and reduce administrative functions.

The access model traditionally is made up of an internal network and a corporate desktop, while in the cloud model, access is over the Internet and can be accessed using any device (Lohmosavi et al., 2013). Traditionally, the technical model is a single-tenant and is static, while the technical cloud model is a multi-tenant model that is scalable, elastic and dynamic. Lastly, Lohmosavi et al. argue that the delivery model is traditionally costly with lengthy deployments, requires physical working space and an increase in human resources, while with the cloud delivery model deployment, time is reduced, and ROI time is improved.

Next Figure 2.39 shows a cloud learning system by Ibarra-Florencio et al. (2014).

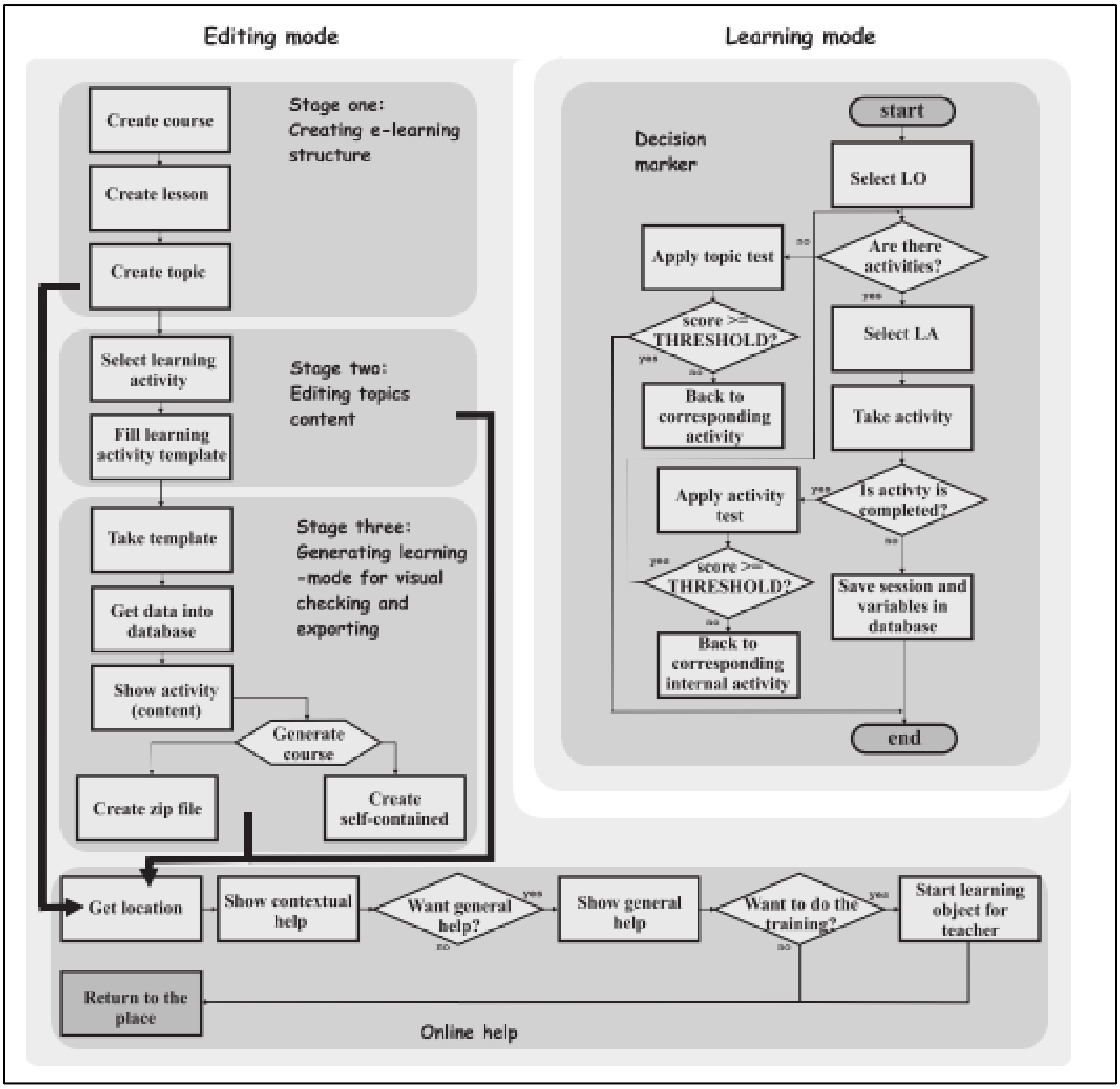

Figure 2.39: BP4ED (Best Practices for eLearning Content Development) engine operating modes (Ibarra-Florencio et al., 2014)

The BP4ED system is a cloud-based web solution that uses best practices to develop eLearning content (Ibarra-Florencio et al., 2014). It has an editing mode, a learning mode and an online help feature. The solution uses learning object (LO) templates for organising eLearning units and displaying content (ibid). These templates are managed using the editing mode for developers and learning mode for learners. The LOs are build using HTML web pages and a MySQL database (Ibarra-Florencio et al., 2014). According to Ibarra-Florencio et al., the database contains tables for curricula, courses, lessons, topics as base LOs, learning activities and media resources. Individual content elements like graphics, videos and sound are not developed as part of the BP4ED solution but are custom developed by production personnel (PP) (Ibarra-Florencio et al., 2014).

The editing mode consists of three stages:

- Stage 1 – Creating a learning structure, which includes creating a course, lessons and topics.
- Stage 2 – Editing topic content, this includes selecting a learning activity and filling in the learning activity template.
- Stage 3 – Generating a learning mode for visual checking and exporting, which involves storing the template data into a database, showing the activity to generate a course using zip files and self-contained content.

(Ibarra-Florencio et al., 2014)

Ibarra-Florencio et al. describe the learning mode in the BP4ED system to contain a decision-maker that will make decisions based on activities. This decision-maker will select a learning object and check if there are any activities. If there are no activities, it will apply a learning topic test. After the test, if the score is greater than the threshold, the process completes, and if the score is less than the threshold, then the corresponding or succeeding activities will carry on (Ibarra-Florencio et al., 2014). If there are activities that have not been completed, their session will be saved. The learner will otherwise take the existing activity and apply an activity test and carry on with the next corresponding activities similarly until the score is greater than the threshold and the process is ended. The help function includes contextual help and general help (Ibarra-Florencio et al., 2014).

2.4.8.1. Cloud Computing Models for Learning

In this section the researcher discusses cloud computing models that may be used for eLearning. Figure 2.40 below shows the cloud computing framework for IAAS.

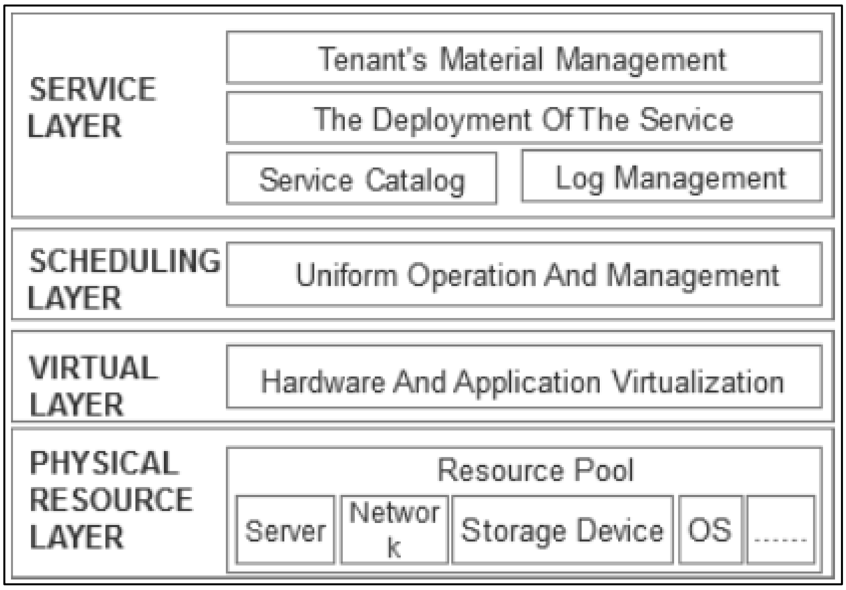

Figure 2.40: Computing Framework of IAAS (Jingzhao, 2017:2)

Jingzhao (2017: 2) refers to Infrastructure as a service as service made-up of IT facilities, computers, storage, networks and other software and hardware facilities. Jingzhao indicates that IaaS is expanded to depict a physical resource layer, virtual layer, scheduling layer and service layer. The resource layer is a large resource tool that stores resources in a logical way. The virtual layer accounts for virtual deployments, virtual storage of resources, and the virtual network environments.

The scheduling layer is responsible for maintenance and management of resources in the resource pool. This layer calculates resource performance, the status of resources, and strategizes on resources allocation. The service layer is responsible for managing the purchasing of services in a resource pool (Jingzhao, 2017: 3)

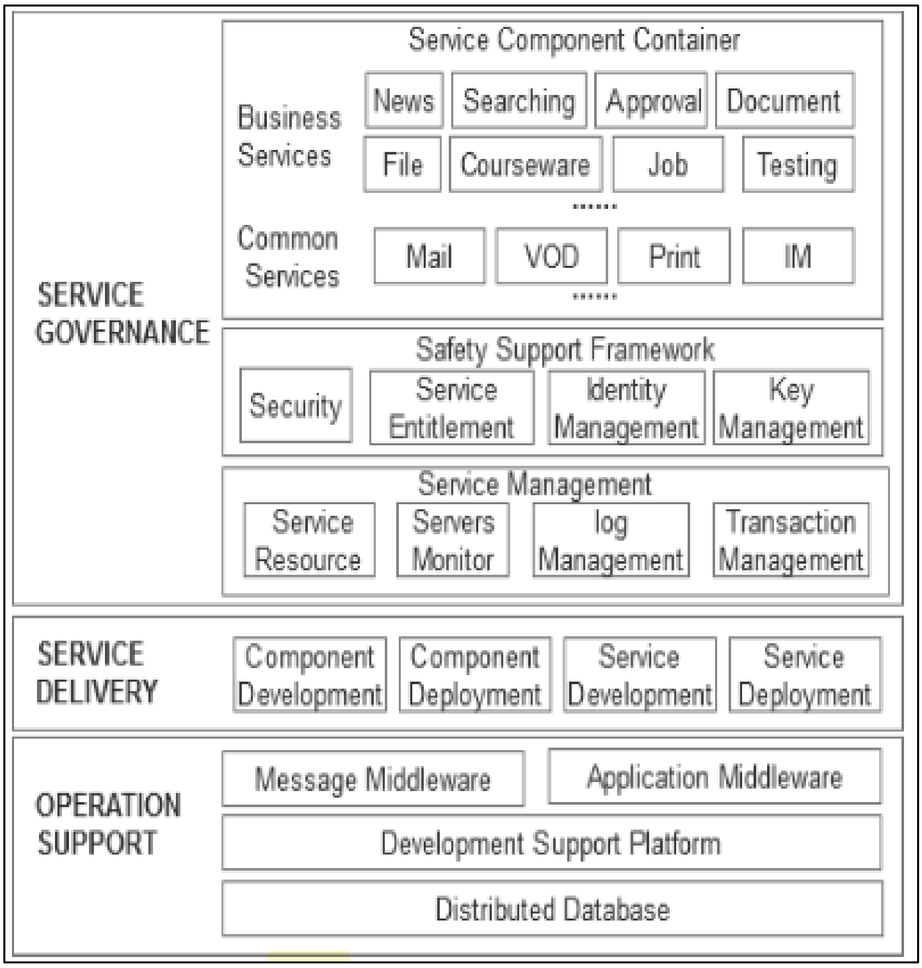

Figure 2.41: Cloud Computing Framework of PAAS (Jingzhao, 2017: 3)

PaaS offers a platform to develop, design, combine and manage functional units of the cloud learning platform (Jingzhao, 2017: 3). PaaS platform is made up of service governance, service delivery, and an operation support layer. The service governance layer is made up of a service component container, a safety support framework, and a service management component. In the model of Jingzhao, the component service container is made up of business services and common services. Business services have a news, search functionality, approval functionality, documents, files, courseware, jobs, testing functionality, mail services, print services, instant messaging etc.

The safety support framework has a security component, service entitlement component, identity management component, and a key management component. The service management element has a service resource component, a server monitor component, a log management component, and a transaction management component. The service manager manages service resources. The service delivery layer is made up of a component development, component deployment, service development, and service deployment. The operation support layer is made up of components like, a message middleware, application middleware, development support platform, and a distributed database.

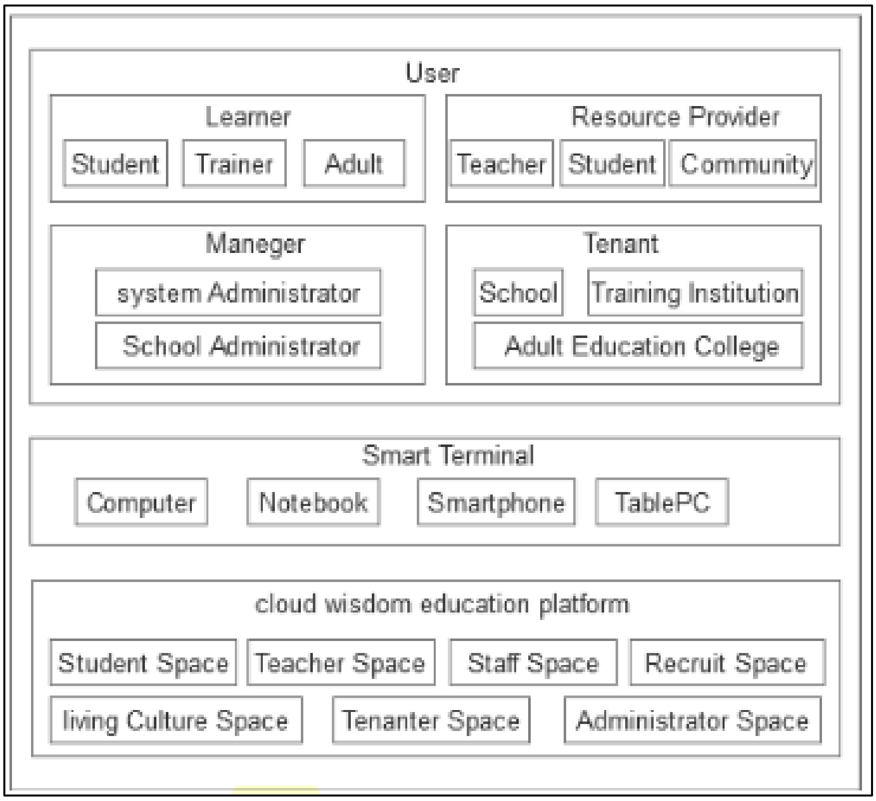

Figure 2.42: Cloud Computing Framework of SAAS (Jingzhao, 2017: 3)

Jingzhao (2017: 3) indicates that SaaS provides educational web application services for elementary schools, middle and high schools, and training and adult education organizations, via the internet. Jingzhao's SaaS framework includes a user, a smart terminal, and a cloud wisdom education platform. The user element is made up of a learner, resource provider, a manager, and a tenant. The smart terminal element is made up of a computer, a notebook, a smartphone, and a tablePC. The cloud wisdom education platform is made up of a learner space, teacher space, staff space, recruit space, living culture space, tenanter space, and an administrator space. Jingzhao's model indicates that a learner may be a learner, a trainer, or an adult. A resource provider may be a teacher, a learner, or a community. A manager may be a system or school adminnistartor, while a tenant may be a school, training institution, or an adult education college.

2.4.8.2. Cloud Architecture using Partitioned Tenant Services

In the work of Luo & Lin (2013: 157), a partitioned tenant service was deployed across multiple infrastructure service providers on a federated cloud where each partition spanned a set of requirements for the tenant service. Firstly, the tenant service had to discover available physical resources such as servers, storage and databases via a mechanism and such resources needed to be made available on demand.

To support resource pooling and service on-demand, virtualisation technologies were deployed at the server, storage and database. After creation and instantiation of virtual resources for the tenant service, a network virtualisation mechanism was also required to dynamically set up a virtual link for topology creation, network isolation in joint-tenant environments and virtual resource mobility across subnets. Figure 2.43 illustrates the architectural design followed by a description of the process taking place.

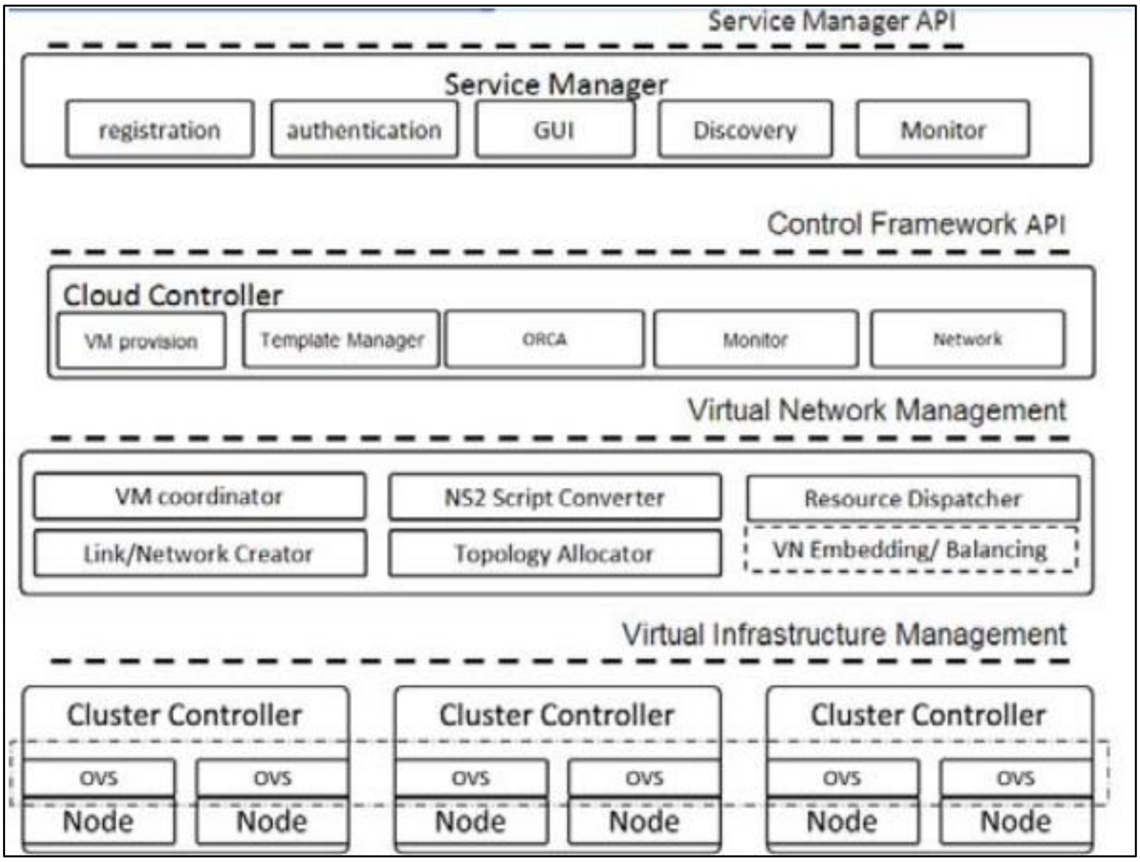

Figure 2.43: System architectural design for eLearning on the cloud (Luo & Lin, 2013: 58)

The service management layer in the system architectural design model was used to enable service providers to put forward requests for system resources using a GUI. This GUI allows service providers to request and register resources, authenticate users and do monitoring. The service management layer is then integrated with the control framework API to assist in discovering, managing and allocating available resources on physical infrastructure (Luo & Lin, 2013: 158).

In the control framework, virtualisation takes place using a virtual machine that also is responsible for instantiating various service components. Virtual machines' (VMs) images are stored as VM templates in the virtual environment and could be retrieved on an on-demand basis on the physical nodes.

2.4.8.3. Cloud Architecture using the virtual computing lab

In most organizations, only 10% of computer resources are utilised while 90% are wasted (Melhem, Daradkeh, Agarwal, & Goel, 2015: 600). While Melhem et al.'s argument could be true, the researcher based the conceptual framework on cloud computing so as to curb the waste in resource usage. Cloud computing helps to attain optimum usage of resources, such as CPU, RAM, storage, power and network (Youn, Yoon, & Kim, 2017: 4021). While there is still focus on resource optimisation, there is a growing demand for large storage systems to store unstructured data, and cloud computing offers object storage systems to resolve storage scalability issues (Youn, Yoon, & Kim, 2017: 4021).

Melhem et al. (2015) indicate that the virtual computing lab (VCL) is one convenient solution to use for cloud computing. They say VCL is an open-source cloud computing solution that is cost effective and built for ubiquitous on-demand network access through a shared pool of configurable computing resources, like hardware (processing, network connectivity, memory, servers, storage), software (platforms, operating system, applications), and services (virtualisation, automation, provisioning, and management) (Melhem et al., 2015). Reflecting the use of open-source software in the conceptual framework could help to boost the acceptance and usage of the researcher's concept by organizations who might want to implement cloud-learning.

In 2006, the North Carolina State University in cooperation with IBM introduced the VCL system with the goal of creating a multi-institutional, shared-computing services community, which includes universities, colleges, schools and business partners (Melhem et al., 2015: 601). The system was developed using Apache in 2008 to 2012 providing an open cloud environment for educational purposes. The system had a high throughput architecture regarding computational power that could keep track of all computation nodes and could redistribute virtual machines (VM) from heavy loaded nodes to least utilised physical computation nodes. This gave an advantage of the availability of resources anytime and anywhere (Melhem et al., 2015). The researcher's conceptual framework as a result of the study at hand, advocates the use of ubiquitous access to enhance learning. Melhem et al. saw some benefits in using VCL and these benefits are distinguished as:

- Increase in computing resource availability and accessibility;
- Improved data integrity, better applications and better research materials;
- End-users can move from node to node as resources are accessible anywhere and anytime;
- Less need for client applications;
- Improved computing performance and application utilisation;
- Provides convenient web access and a self-service portal;
- Widely used for research purposes;
- Documentation is clear and has a support community;
- Architecture is flexible, and components are modularised;
- Supports different types of hypervisors;
- Allows for modest hardware installation;
- VCL delivers a dedicated computing environment to users;
- VCL is has a self-service portal;
- Services can be requested anytime and from anywhere;
- Manual resource requesting processes are eliminated;
- Offers a single repository for all cloud services;
- No need for end-users to be experts in IT to use the IT services; and
- Delivery of business services is improved.

(Melhem et al., 2015)

VCL complies with cloud computing standards by providing infrastructure (computing power – CPU, RAM, Network, and Storage), platform (platform power – operating system choice, windows or Linux) and software (MATLAB, CAD and DB) as services (Melhem et al., 2015: 601). The conceptual framework that the researcher created in this study reflects IaaS, PaaS and SaaS services, which are used for eLearning. Despite the different software types that may be acquired and used via the cloud for other uses, this study reflected specifically on the use of learning software either as a platform where the software can be developed, or the infrastructure the organization might need, or the using vendor eLearning software as a service. To understand VCL further, Figure 2.44 shows a graphical representation of its architecture as shown in Melhem et al.'s study.

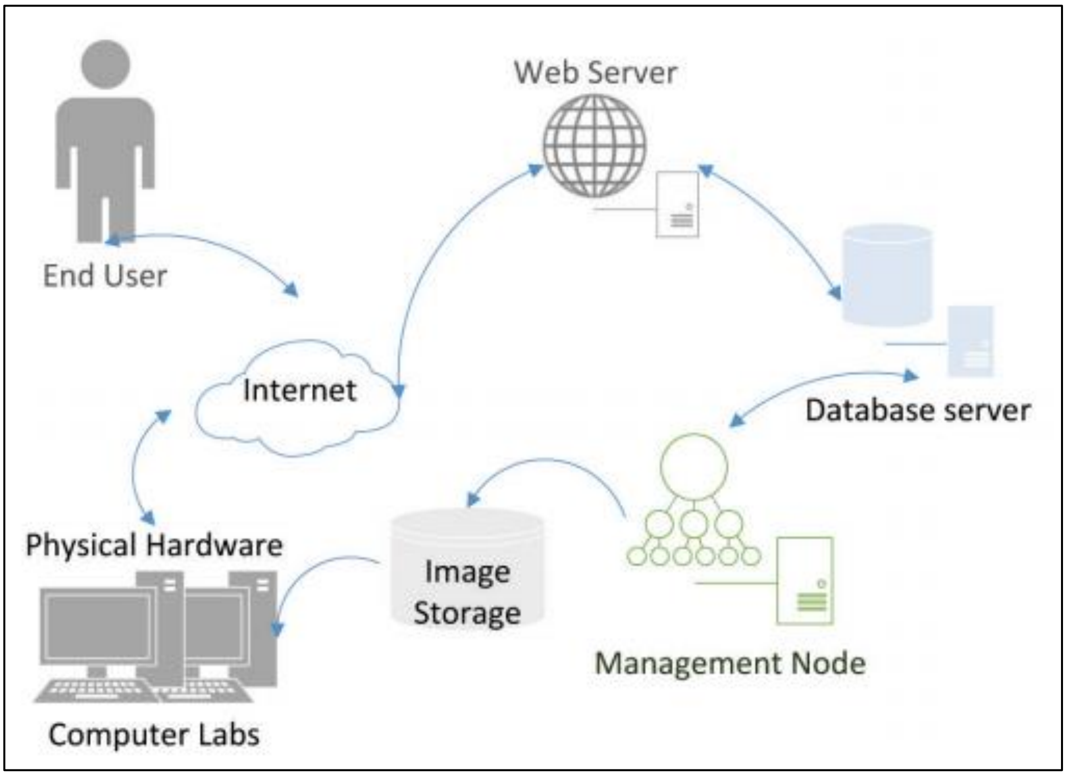

Figure 2.44: VCL(Virtual Computing Lab) architecture (Melhem et al., 2015: 602)

Melhem et al. (2015: 601-602) describe the VCL architecture as composed of four main components, namely a web server, a management node server, a database server and compute nodes.

- The web server comprises a web portal, a scheduler and a schedule database. The web portal provides a management interface for environment administration and resource reservation. The VCL manager software maps the request from the users onto available resources and software application images. The VCL manager then schedules the resource for either immediate on-demand use or later use. The work of the scheduler is to check whether the hardware server has the image requested by the user and orders the management node server to load the virtual environment requested. The database, on the other hand, is responsible for storing system data like user, requests, server and image information.

- The management node server runs the VCLD (VCL demon engine). It controls both real and virtual resources and loads images on the servers based on instructions from the scheduler. The VCL Demon (VCLD) middleware processes the reservations that the VCL web portal has assigned. VCLD also ensures that the images are loaded and are available based on the requested environment type.
- The database server stores up-to-date information about the image repository and user requests time schedules. The database is responsible for storage of authentication data, resource availability data, image storage, reservation request data, resource inventory data, users' privileges and resource mapping data. VCL uses a MySQL database that allows it to track each server's state, maintain image information and implement a privilege tree.
- The compute nodes are physical servers, virtual machines, traditional computing lab machines and cloud compute resources where VM images are stored.

(Melhem et al., 2015: 601-602)

2.4.8.4. Cloud Architecture using Micro-services

Cloud computing micro-services are regarded as packages of smaller services where each service is independently deployable on a different platform and technological stack (Balalaie, Heydarnoori and Jamshidi, 2016: 42). Mechanisms such as RESTful (Representational State Transfer) or RPC-based APIs can be used for a micro-service communication (ibid). Certain algorithms in cloud computing are used to make virtual machines available to users. The list below shows examples of such algorithms.

2.4.9. Cloud Computing Algorithms

The algorithms below by Pandey, Sumit, & Joshi (2016) are known in cloud computing as resource scheduling algorithms. Algorithms can be used to improve performance in the execution time and block viruses and Trojans in real time (Chang & Ramachandran, 2016: 150). Pandey et al. (2016) indicate no single strategy is perfect on its own for resource allocation, as performance is an issue in cloud computing according to them.

- Replication-Based Resource Allocation – The strategy is that multiple sub clouds process a single job. This algorithm takes one cloud, divides it into multiple sub-clouds and replicates the job to accommodate all sub-clouds. The replicated job remains in a queue for the available VMs in the sub-clouds to process it. When the processing completes, the consuming VM will inform other VMs on the sub-clouds that the replicated job is now available.
- Multi-Queue Scheduling Algorithm – Resources can be scheduled on demand using their reservation categories. This algorithm divides jobs into clusters of burst time where jobs of equal priority are allocated to three queues based on the jobs' burst time. This algorithm performs better when compared to the traditional first come first serve (FCFS), shortest job first (SJF) and combinational backfill algorithm (CBA).
- Skewness Algorithm – The strategy here is to prevent overload by predicting future load. This algorithm adds different workloads and optimises server resource to avoid overload. It measures the unevenness of resource utilisation, calculates the conditions such that it finds skew values of the VMs and uses this information to predict the future load.
- Simulated Annealing – Here, bins are used for resource allocation. A bin is a collection of parameterised computing resources (e.g. system bus speed, storage and number of units used for processing, architecture, processing speed of the unit and main memory). This algorithm performs better than FCFS in resource utilisation.
- Load-Balancing Algorithm – This algorithm dynamically checks for the least loaded VM that was not used in the previous iteration and assigns the job to it.
- Priority-Based VM – Here, a VM gets assigned based on the priority that is calculated based on memory availability and processing speed. A load balancer is used to assign a job to the highest priority VM. The load balancer maintains a unique table with a

unique VM ID that is updated during allocation and deallocation of the VM. Low priority VMs remain idle when higher priority VMs are busy.

- Heuristic-Based Scheduling Algorithm – This algorithm maximises the exploitation of resources through heuristics and minimises the total execution time of task scheduling.
- Non-pre-emptive Nephele Scheduling – The critical time for every task is computed, and when it reaches a critical point, the highest efficiency task is executed, and the active task is discarded. The task with the smaller efficiency than the set threshold also is discarded.
- Optimal Cloud Cost Resource Provisioning (OCRP) – This algorithm uses a reservation and demand method to provision resources. The reservation is used to reserve resources earlier before they are demanded, and the demand is used to release the resources on request or demand. This algorithm ensures that there is no strain on VMs during user demand.
- Improved Priority-Based Job Scheduling Algorithm – The focus here is the priority to schedule jobs in a pipeline. The priorities are divided into three, namely the scheduling level, the resource level and the job level. This algorithm performs better than the traditional priority-based scheduling algorithms using the analytical hierarchy process (AHP). AHP evaluates the priority of a process using the multi-criteria decision-making model and multi-attribute decision-making model. Job scheduling here is improved using FCFS, SJF and RR algorithms.

(Pandey et al., 2016: 215)

2.4.10. Cloud Computing Quality of Service

Quality of service (QoS) is one of the main concerns of cloud computing. While the quality of systems deployed in a traditional way, solely depends on the IT department of the organization deploying them, the systems consumed as a service from service providers, are reliant on a service level agreement(SLA) for quality realisation. This SLA represents a contract of negotiation between the user and the service provider, where the service provider is charged a certain fee of penalty if the agreed upon service level is not satisfactory (Ghahramani, Zhou, Hon, & Member, 2017:6). Cloud SLAs are plain text contract documents which may be published online at times.

A contract defines a legal agreement between two parties, creating a mutual relationship or legal obligation. It contains a definition of business partners, specification of functional obligations, quality, price, and penalties. Examples of contracts are Amazon S3 SLA, and Amazon EC2 SLA (Ghahramani et al., 2017:7).

Aspects to be considered when implementing SLAs are, a clear SLA structure based on cloud ontology, a linkage to the QoS metrics and the cost model, and reliable monitoring tools to test the metrics. Frameworks for SLA management include web service level agreement (WSLA), web services agreement (WSagreement), and service level agreement language (SLAng) (ibid). The SLA agreement templates comprise of parameters like physical and main memory, processing speed, availability, and response time.

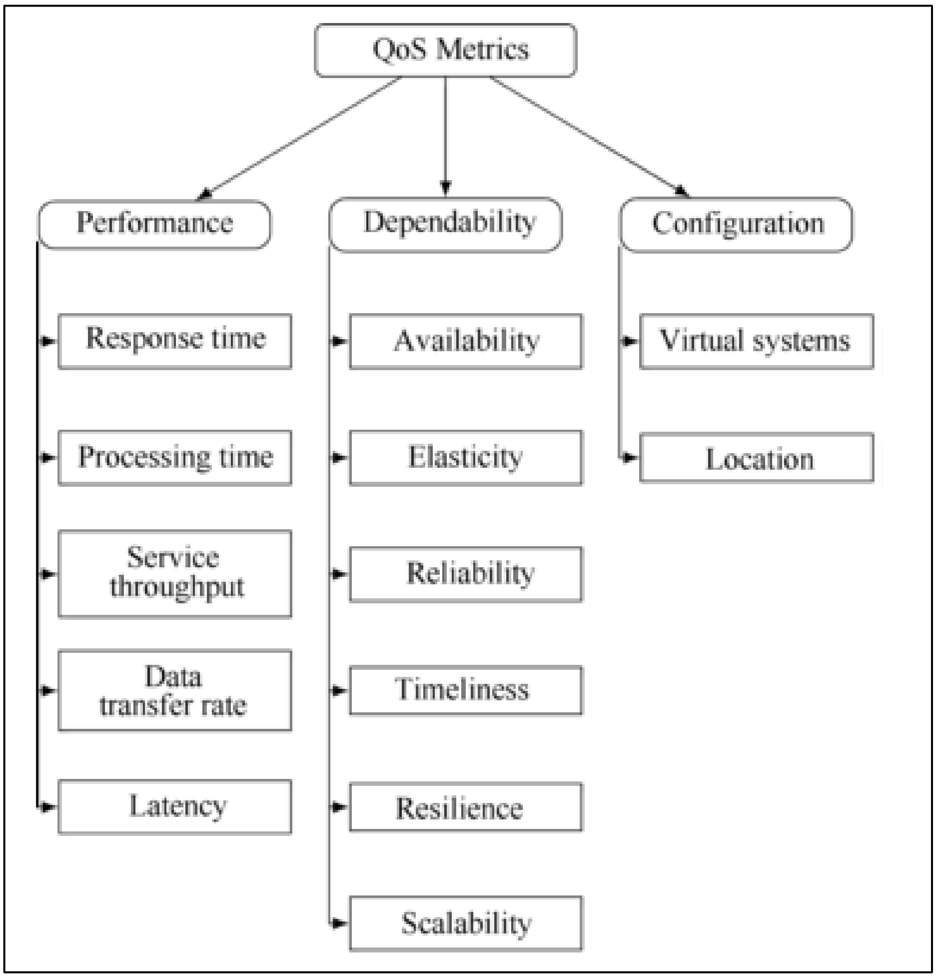

Figure 2.45: Classification of QoS metrics (Ghahramani et al., 2017: 8)

The QoS metrics depicts three important aspects which are performance, dependability, and configuration (Ghahramani et al., 2017:8). Performance denotes how well the service performs, and has sub-categories, metrics time, ratio, and latency. Ghahramani et al. argue that dependability denotes availability, reliability, elasticity, timeliness, resilience, scalability, and security.

2.4.11. Cloud Monitoring

Ghahramani et al. (2017) argue that QoS is a vital aspect of delivering cloud services, and it is thus important to deploy cloud monitoring tools to ensure service up-time. This is achieved by ascertaining resource availability at all times and providing feedback to schedulers (Ghahramani et al., 2017: 12). Monitoring is important for resource planning, resource management and performance management. Monitoring can be classified into two categories, which are high-level and low-level monitoring. Ghahramani et al. indicate that high-level monitoring monitors virtual platform status, while low-level monitoring monitors physical infrastructure.

Monitoring tools should ensure availability, elasticity, timeliness, resilience and reliability (Ghahramani et al., 2017: 14). Below are common properties of monitoring tools. To test for the above aspects and ensure availability and reliability, the following two tests must be done: computation-based test and network-based test. The computation-based tests include CPU utilisation test, CPU speed test, disk throughput test, VM acquisition test and system up-time test (ibid). The network-based test includes a bandwidth test, jitter test, round-trip test, throughput test, traffic volume test and service response time test (Ghahramani et al., 2017).

Table 2.10 below describes the properties of selected cloud monitoring tools.

Table 2.10: Properties of Cloud Monitoring Tools

Tools	**Scalability**	**Elasticity**	**Timeliness**	**Interoperability**	**Resilience**	**Availability**	**Portability**
CloudWatch	√	√	√				
AzureWatch	√		√				
CloudStatus			√			√	
Realize Hyperic				√		√	
Nimsoft	√			√	√		√
Monitis				√			√
Aneka	√	√					
CloudKick		√					√
Up.time			√		√		

(Ghahramani et al., 2017: 14)

Table 2.10 illustrates the properties of cloud monitoring tools. The properties range as follows: scalability, elasticity, timelines, interoperability, resilience, availability, and portability. These properties are measured on the tools: cloud Watch, Azure Watch, Cloud Status, Realize Hyperic, Nimsoft, Monitis, Aneka, CloudKick, Up time. The above tools could be any other tools used by different cloud providers. The main point drawn from this section is that cloud computing services must be monitored for quality of service.

2.4.12. Cloud Resource Management

Resource management is the process of requirements gathering, resource matching, resources allocation, and scheduling and monitoring resources over time to run applications efficiently (Ghahramani et al., 2017). Resources include processors, data, scientific instruments, networks and other services that are contended for by users, resource owners and administrators of the system. According to Ghahramani et al., to meet these demands, the service providers must quantify the capacity and resources and determine the workload of users. Examples of system-centric resource management tools are Condor, Globus toolkit, load sharing facility (LSF) and portable batch system (PBS) (ibid).

Ghahramani et al. (2017: 15) claim that resource management includes aspects like load balancing and resource allocation. They advise implementing virtualisation as a server strategy to attain dynamic load balancing. They further indicate that a dynamic load balancing system is the key to improving the functionality of clouds; thus, VM migration is vital in supporting load balancing. To simulate load balancing, algorithms like first come first serve and round robin are key algorithms. These algorithms can be classified as static or dynamic. Dynamic load balancing translates to better performance in dynamic and distributed environments, and static load balancing is a more stable algorithm (Ghahramani et al., 2017).

According to Ghahramani et al. (2017), in a dynamic environment, tasks can move dynamically from an overloaded environment to an underloaded one, thereby improving performance through scalability and result in efficient resource utilisation. While static approaches are stable, costs less and are easier to implement, these approaches are not well suited for heterogeneous environments (Ghahramani et al., 2017). As load balancing brings an advantage of ensuring efficiency of physical infrastructure usage through workload dependency modelling among VMs and workload distribution, revenue can be improved by minimising rejected tasks and attaining an improved QoS (ibid).

A suitable algorithm should choose nearby, lightly loaded servers that are reachable for requests from users (Rashidi & Sharifian, 2017: 3797). Table 2.11 below compares selected load balancing algorithms indicating their advantages and disadvantages.

Table 2.11: Comparison of Load Balancing Algorithms

Algorithm	Advantages	Disadvantages	Environment
First come first serve	Simple implementation	Non-pre-emptive	Static
Random allocation	Simple implementation	Overloading	Static

Algorithm	Advantages	Disadvantages	Environment
Round robin	Equal workload distribution	Job processing time not considered	Static
Throttled	Distributes load among VMs easily with easy access and has high fault tolerance	Processing time not considered individual requests	Static
Genetic algorithm	Improved response time and used in heterogeneous environments	Overly complex and bad computational time	Dynamic
Heuristic-based load balanced scheduling	Improved response time and fault tolerant	Inherits first come first serve strategy	Dynamic
VM-assign load balancing	Efficient allocation of incoming requests to available VMs	Not fault tolerant and not fit for heterogeneous cloud environments	Static
Particle swarm optimisation	Improved response time and suitable for heterogeneous environments	Overly complex with communication overhead	Dynamic
Min-min	Reduces the makespan	Existing resource load not considered and could lead to	Static

Algorithm	Advantages	Disadvantages	Environment
		starvation of resources	
Max-min	Reduces the makespan	Smaller jobs might have to wait long in the resource queue	Static
Opportunistic load balancing	Keeps each node in the cloud busy	Does not consider the current VM workload	Static
Load balance min-min	Effective in assigning tasks to different nodes and avoids unnecessary duplication	Low response time and does not consider job priorities	Dynamic

(Ghahramani et al., 2017: 11)

While cloud computing aims at ubiquitous access, resources allocation is still a major challenge and it, therefore, is desirable that resource allocation in a cloud environment should be performed dynamically and automatically at a fair price and on the client's high-level requirements (Ghahramani et al., 2017: 11). To achieve the latter, it becomes vital for the service provider to understand the client's computational resources and their quantity. To manage performance effectively, it is important to define the dimensions of resource scaling and to determine what cloud resource configurations will affect the client's applications. It is therefore the key to trying different configurations to test performance (ibid).

The above translates into an effort of elasticity, where clouds can automatically add and remove VM instances with any change in the workload. To do better resource allocation, it is important to maximise resource utilisation and have a reduced cost of runtime configuration. A strategy for aggressive resource provisioning is to increase resources in each adaptation cycle with any increase in the workload and to balance SLA violations and the cost of resources (Ghahramani et al., 2017: 11). To reduce cost, the created VMs can be reused but still considering security risks, which will improve the QoS and response time.

Table 2.12: Strength and Weaknesses Perceived in Resource Allocation

Strengths	Weakness
Ability to handling different VM configurations	Uncontrolled elasticity
SLA and load balance satisfaction among the servers	Lack of implementation detail in IaaS, PaaS and SaaS
Improved profits for platform providers	Parameters that negatively affect the maximising of resource utilisation are not considered
SLA violations are minimised	SLA negotiation process not clear
Maximisation of computing as a utility from service providers	Payment management absent
Identification of cloud availability to maximise incoming-request satisfaction	Confidence level of the prediction model is not investigated
Resource utilisation is increased with increments in workload	Multiple interactions and interoperability parameters are not investigated

(Ghahramani et al., 2017: 12)

2.4.13. Cloud Security

Cloud computing comes with exposure to more security threats and expands the trust boundary resulting in stakeholders adopting traditional security techniques (Bera, Misra and Rodrigues, 2015: 1487). However conventional, pure IP-based security mechanisms give more security capabilities (ibid).

Singh, Pasquier, Bacon, Ko, & Eyers (2016) studied cloud computing security for IoT (Internet of Things). Similarly when using cloud computing for eLearning, the same security evaluation applies, hence it is safe to use this study as contribution to eLearning literature. They elaborate on cloud tenants, end-users, and cloud providers. Their contribution was to analyse the current state of IoT in terms of cloud security. The outcome of their study was that data security is the main concern over the public cloud and constrains the adoption of cloud computing. They also highlighted legal and regulatory concerns about the location of data and the jurisdiction under which this falls. They named a couple of security considerations which are:

- Concerns about data transport to/from cloud services
- Concerns about data management
- Concerns about identity management, certification, trust, and compliance with regulations and contractual obligations
- Concerns about decentralization into multiple clouds, fog services, etc.

(Singh et al., 2016: 281)

Singh et al. says it is crucial that the security, privacy, and personal safety risks coming from the open access of data across systems in the cloud must be addressed. They say using a Hybrid cloud may cater for better security as the one part of the cloud platform is inhouse and gives greater control and an increased sense of security. Potentially sensitive data can be processed in the private cloud, while non-sensitive data can be processed in the public cloud. With known improved security learners might be inclined to use cloud based learning more than before. It could be possible that the root cause of low eLearning usage at telecommunication organizations in South Africa emerges as a result of fear of exposing personal data when accessing eLearning outside the organizations premises. This may be the case as some of the employee learners access eLearning at remote access point outside the organizations firewall.

While Singh et al. is concerned about security threats on user data, Lei et al. (2009: 865) says cloud computing has high security features. They say with a centralised data model, cloud computing offers security for real-time testing, and users' data security is also guaranteed.

Bouchaala, Ghazel, Saidane, & Kamoun (2017: 304) did a study to derive a new end-to-end architecture focusing on classification of security issues in a cloud computing environment. They mention the following security requirements:

- Confidentiality and privacy – This requirement can be addressed based on priviledges access and encryption. Only the data owner or an authorised user must be able to access cloud data.
- Integrity – Only authorized users must be able to modify or delete cloud data, software and hardware.
- Authentication – User identity must be confirmed when users attempt to access cloud resources.
- Identity management – Users must appear as anonymous to the cloud provider.

- Trust – There must be a trust relationship between the service provider (trustor) and the cloud consumer (trustee).
- Auditing – Operations pertaining to authorization and authentication must be captured in a log and examined to cater for access control policy compliance.

(Bouchaala et al., 2017)

Bouchaala et al. indicates that it is very difficult to ensure cloud security as the cloud provider needs to secure dependency between layers, and this requires a huge number of heterogenous security controls. They say cloud computing security also requires a unified security control management module.

Almorsy, Grundy, & Ibrahim (2011: 364) mentions that security is considered one of the top ranked open issues in the adoption of cloud computing. They say concerns include loss of control over cloud hosted IT assets, lack of SLA security guarantees between cloud providers and cloud customers, and sharing of resources with competitors and malicious users. Almorsy et al. (2011: 364-365) identifies the following important concerns to bear in mind when implementing a cloud computing solution:

- Security requirements to protect cloud hosted services given that they are used by different tenants at the same time.
- Appropriate security controls to mitigate service adoption risks and who must have the authority to select such controls.
- Must the selected controls be available on the cloud platform or hosted by a third party.
- Security metrics used to measuring security status of cloud-hosted services.

(Almorsy et al., 2011)

Bernal (2016) indicates that one of the benefits of cloud computing is security parsing (HTTP) and continuity. Bokhari, Shallal, & Tamandani (2016: 890-891) says the SaaS model uses secure socket layers (SSL) thus improving the security concern cloud users have about implementing cloud computing. While Bernal and Almorsy et al. mentions the security benefit of cloud computing, Luo & Lin (2013: 156) says data privacy and security are of the main challenges of cloud computing. A good solution to this could be to use a federated model (ibid). With a federated model, part of the infrastructure resides on a private cloud internal to the organization. This model allows integration, management and using third-party resources. By using this model, an organization can take control of its system and secure its data since part of the infrastructure is under the organization's control (ibid).

2.4.14. Benefits of Cloud Computing

Cloud computing allows for efficient use of resources, as multiple virtual machines can run on one physical machine. With cloud computing, services are delivered in a more reliable and efficient manner (Zrakić et al., 2013: 302). Other benefits of cloud computing are improved reliability, virtualisation, centralised storage and cost-effectiveness. The cloud computing industry is embracing centralised cloud services to take advantage of the easier management of the services (Want, Schilit, & Jenson, 2015: 32). Cloud storage enables universal data access with independent geographical locations (Wang, 2015: 329).

Bernal (2016) suggests the following benefits: technology cost reduction, improved response times, improved scalability, extensive storage, high availability, security parsing (HTTP) and continuity. Among these benefits, cloud computing can interact with different protocols (Al-Fuqaha, Guizani, Mohammadi, Aledhari, & Ayyash, 2015). More benefits are given in the next section.

2.4.14.1. Benefits of SaaS

The benefits of SaaS include:

- reducing the cost of licensing when acquiring application software;
- multiple applications can be consumed by clients at the same time;
- the responsibility to limit and control application usage is with the application provider;
- no need for infrastructure to deploy software;
- there is an API provided for configurations even if customisation is limited; and
- the SaaS model uses secure socket layers (SSL).

(Bokhari, Shallal, & Tamandani, 2016: 890-891)

2.4.14.2. Benefits of PaaS

The benefits of PaaS include:

- the development process is flexible

- server storage is decreased
- streamlined deployment versions
- provides data security, recovery and backup capabilities
- cost reduction with reduced need for expert management and maintenance of infrastructure
- caters for adaptability with changes and alterations of the platform
- developers can work on the same application
- there are tools provided for customers to control and customise the environment to suit their needs.

(Bokhari et al., 2016: 892)

2.4.14.3. Benefits of IaaS

The benefits of IaaS include:

- The capacity of infrastructure can be increased or decreased on demand;
- Clients are given the capability to start virtual machines;
- Offers a network as a service and caters for load balancing;
- Reduces human resource and hardware costs;
- Offers an improved return on investment; and
- Scaling and streamlining are automated.

(Bokhari et al., 2016: 893)

2.4.15. Challenges of Cloud Computing

Data privacy and security are of the main challenges of cloud computing (Luo & Lin, 2013: 156). A good solution to this could be to use a federated model (ibid). With a federated model, part of the infrastructure resides on a private cloud internal to the organization. This model allows integration, management and using third-party resources. By using this model, an organization can take control of its system and secure its data since part of the infrastructure is under the organization's control (ibid).

Another challenge is virtualisation, which comes with challenges of VM creation, allocation of physical resources, managing users' competing resource demands and VM termination (Luo & Lin, 2013: 158). Among other challenges, cloud computing could attract high cumulative data from incoming media like videos from many cameras (Satyanarayanan et al., 2015). Moving data to the cloud might use excessively high network bandwidth (Chiang & Zhang, 2016: 855).

The internet of things (IoT) is a trending topic these recent years and though it is not part of the research study, it may be mentioned how it will impact cloud computing if an organization may also want to go IoT route with their cloud learning. Cloud computing is in some instances not efficient enough for some of the IoT applications that could involve private data and could require a short response time (Shi, Cao, Zhang, Li, & Xu, 2016: 637). It could also be a burden for large quantities of data that might be heavy loads for the network (ibid).

2.5.Other Research Studies

In this section, similar research works by other researchers are studied to see if some similarities can be drawn associated with this research study and whether the perceived problems thereof were common to other research work. The researcher outlines the work of the other researchers showing their research setting, the core of the research work, the objective and in other instances and the proposed solutions. Both eLearning and cloud computing are addressed as components that lead to addressing the study's research questions the researcher puts more emphasis on SaaS as a main service to focus on in this study. IaaS and PaaS are less relevant due to no intended implementation and intervention. IaaS and PaaS are still as good to discuss though, as they are also cloud services that may be looked at when an organization wants to use cloud network and hardware infrastructure.

Note that not all research literature in this study is based on telecommunication organizations, but could be based on academic institutions and other types of institutions due to a lack of literature about cloud learning in telecommunication organizations. Even so, the focal point was not missed. The literature is based on people and eLearning technology and cloud computing as an enabler of learning, and these aspects form the major components of this study. Next, follows a discussion of a study in Thailand where the technology acceptance model (TAM) was used as a theory to observe the behaviour of people interacting with eLearning technology.

2.5.1. Evaluating Users' Intentions to Use eLearning

Premchaiswadi, Porouhan, & Premchaiswadi (2012) did a study using the technology acceptance model (TAM) to evaluate Thailand's users' intentions to use e-learning. Their study was based on different factors like Internet experience, perceived usefulness, perceived ease of use, subjective norms and system interactivity. The literature from their study helped this research study by sharing an experience of user interaction with an eLearning system. Even though the study was in Thailand, the researcher expresses similar experiences as in the current research study. This study also articulates that the learners' intentions to use eLearning are subject to the perceived usefulness of the system, and the technology experience or technology skills of the learner. Such experience is necessary to mould this conceptual framework for improving eLearning usage. During Premchaiswadi et al.'s study, they focused on the assumptions below:

- Internet Experience has a significant and positive effect on Thai learners' intention to use eLearning.
- Perceived Usefulness has a significant and positive effect on Thai learners' intention to use eLearning.
- Perceived Ease of Use has a significant and positive effect on Thai learners' intention to use eLearning.
- Subjective Norms has a significant and positive effect on Thai learners' intention to use eLearning.
- System Interactivity has a significant and positive effect on Thai learners' intention to use eLearning.

(Premchaiswadi et al., 2012: 336)

Premchaiswadi et al. concluded with findings that showed that system interactivity is the most important determinant of intention to use eLearning. To interact with an eLearning system, one needs the necessary skills to use the eLearning system, operate the computer used to access the eLearning system and to navigate to the internet. In the literature, strong evidence was also discovered that subjective norms and perceived usefulness do play a role in influencing learners' intentions to use eLearning systems (Premchaiswadi et al., 2012).

Another research was done to identify factors for adopting eLearning in SMEs (Raymond, 2012). The research found that the implementation and adoption of technology in firms are influenced by technological, organizational, and environmental contextual factors. By comparing Raymond's discovery with Premchaiswadi et al.'s discovery, it is clear that the word acceptance relates to the word adoption and depicts a similar relationship or influence of users interacting with systems. The findings applied to various contexts, including SMEs versus large enterprises, services versus the manufacturing sector and the Information Technology (IT) sector. The following are the contextual factors mentioned (ibid).

- **Technology-related factors**

While eLearning is a technology, Raymond (2012) argues that referring to technology as a monolithic reality could limit or jeopardise the chances of an enterprise to adopt IT. While this is one of the perceived technology factors or facts, it is also realised that the standardisation versus customisation factor of technology is another subject, and this resulted in a conclusion that managers must pay attention to the different types of technology and fine-tune their adoption strategies to the needs of their organizations (Raymond, 2012: 595). Raymond continues to give other technological factors to consider such as eLearning equipment, software, connectivity, complexity, compatibility and the cost of an eLearning system. If these factors are not well considered in the planning of an eLearning system, it could result in being barriers to eLearning adoption. The lack of a good IT infrastructure could create another barrier to the adoption of eLearning (Raymond, 2012).

- **Organization-related factors**

Organizational factors that could influence the adoption of eLearning are technological opportunism, technological orientation, organizational innovativeness, technology portfolio and absorptive capacity (Raymond, 2012). Among these factors, top management support remains a necessity, while similarly, the organizational culture and characteristics of IS professionals in the organization create a particular influence. Raymond argues that the size of the organization, the sector the organization is in, the industrial relations system (unions) and whether it is a single or multi-location establishment are all organizational factors that could influence the adoption of eLearning. The education level of employees, the rank of the position they are in, their gender and their competencies like computer literacy, internet self-efficacy and cognitive absorption, all influence the adoption of eLearning (Raymond, 2012: 599).

- **Environment-related factors**

IT adoption is influenced by the following categories of environmental factors: social factors, institutional factors, competitive context and industry characteristics (Raymond, 2012: 599). Social factors include subjective norms on behavioural intention, which means that the behaviour of an individual is subject to a certain perception about a phenomenon. Using the technology acceptance model (TAM), it was found that social factors contribute significantly to user-perceptions and beliefs about eLearning (ibid). The ease of use and the usefulness of an eLearning system is determined by users' social norms. This study agrees with the notion that ease of use and usefulness of an eLearning system will contribute to better usage of eLearning systems, while the opposite will cause a decline conversely. Other social factors include language, qualification, skills and facilitating conditions (Al-lawati, Al-Jumeily, Lunn, & Laws, 2011: 284).

Figure 2.46 illustrates Raymond's factors influencing technology adoption.

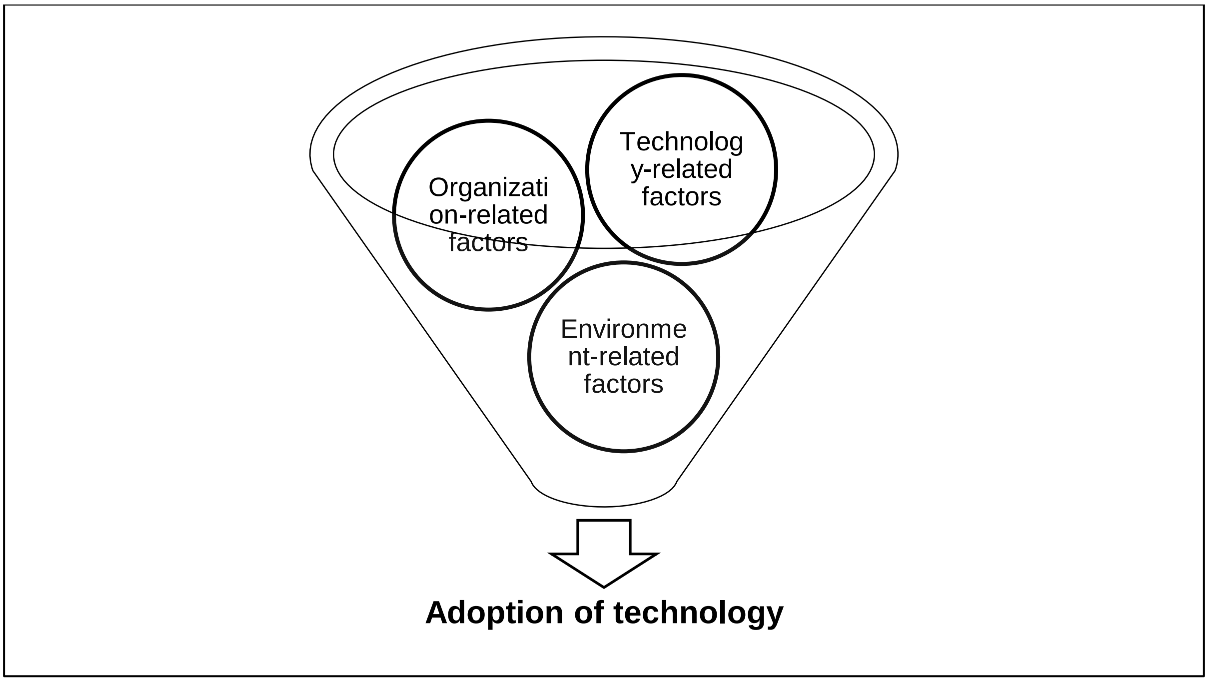

Figure 2.46: Technology adoption factors as derived from Raymond (2012: 606)

The technology adoption influences are seen to be organizational, technological and environmental. Raymond (2012: 606-608) postulates the following propositions:

- If management values eLearning and have a clear vision for it, then the organization is more likely to see the quality of eLearning.
- If there is a perceived quality in eLearning, then the adoption of eLearning will improve.
- If management values eLearning and has a stronger vision for it, then the adoption rates will rise.
- If management’s eLearning vision and eLearning value competencies are greater, then the organization is more likely to adopt an eLearning solution that is more aligned with the organization’s business strategy.
- If management’s IT technical knowledge, IT control and change management competencies are stronger, then the organization will create more facilitating conditions for e-learning assimilation.
- If management’s IT technical knowledge, IT control and change management competencies are stronger, then the organization will influence stronger competencies among employees.
- If the employees’ computer literacy, learning capabilities and business competencies are good, then the eLearning solution’s quality will be positively influenced.
- If the employees of an organization demonstrate stronger computer literacy, learning capabilities and business competencies, then the level of eLearning assimilation will be higher.

(Raymond, 2012: 606-608)

Raymond (2012: 599) indicates that social factors influence the beliefs of learners in eLearning, and in turn, these beliefs influence the usefulness of the eLearning solution, thereby affecting the attitudes and intentions towards using the solution. Al-lawati et al. (2011: 285) explain other cultural dimensions that could influence the adoption of eLearning, which are individualism versus collectivism, uncertainty avoidance and power distance. These dimensions are explained next.

Al-lawati et al. (2011), mention that individualism is concerned with an individual’s role and rights. Here, an individual will represent or act on behalf of himself/herself and his/her own family and affiliations (Al-lawati et al., 2011). Collectivism is concerned with an individual being part of an organization and being a member that represents a group to which they are loyal (ibid). Uncertainty avoidance is concerned with a society that tries to cope with anxiety by avoiding uncertainty. It measures the extent of coping with anxiety. Such a society lives by certain rules and laws that are carefully followed to avoid or minimise unknown and ambiguous circumstances (Al-lawati et al. 2011: 285). Power differences are concerned with the type of relations involved, mostly autocratic. In this society, a hierarchy of superior to subordinates exists. In contrast, a low power society is more democratic, and equality is practised (ibid).

Al-lawati et al. (2011: 282) used two groups of participants in their study, which they referred to as the control group and the experimental group. The control group was tested while studying in a traditional learning setting, while the experimental group was tested studying in an eLearning setting. The outcome of the study after pre-tests and post-tests concluded that eLearning is a better option for learning and the perception of the learner towards eLearning as a technology has an imperative effect on its acceptance.

When Al-lawati et al. (2011) did their study to measure the response of learners in integrating technology into a geographical pedagogy, the following assumptions were proven to be likely:

- There is no significant difference in learning comparing the control and experiment group in pre-tests.
- The learners studying through the aid of eLearning will do better in post-tests.
- There are significant differences in the responses from both the control and experimental group.

(Al-lawati et al. 2011: 283)

All the above factors measure the impact of the adoption and acceptance of technology in organizations. Table 2.13 below illustrates the relationship between the different outcomes of the researchers regarding the TAM model.

Table 2.13: Combined View About eLearning Adoption

Researcher	**eLearning adoption view**
Raymond (2012: 600)	Behaviour influences adoption

Premchaiswadi et al. (2012: 336)	System interactivity influences adoption
Al-lawati et al. (2011)	Perceived Usefulness (PU) and Perceived Ease of use (PEOU) influence adoption

Raymond (2012) shows that the behavioural outcome influences technology adoption significantly and indicates that if the behaviour is positive, then the rate of adoption will increase. Premchaiswadi et al. (2012: 336) indicate that system interactivity influences the adoption of eLearning as a technology. System interactivity, according to Premchaiswadi et al., is the interactive communication between instructor and learners. Al-lawati et al. (2011: 284) postulate that perceived usefulness and perceived ease of use is the major influencing factors toward the adoption of eLearning.

The adoption of cloud learning technology is one of the imperative aspects of this cloud-learning conceptual framework, which is aimed at improving eLearning usage. Without the users accepting cloud learning the problem at hand will be retained. The next study examines an enterprise-oriented architecture using cloud computing.

2.5.2. Enterprise Architecture Using Cloud Services

Bernal (2016) did research on cloud computing, aiming to develop a framework for enterprise service-oriented architecture using cloud computing as a source for services. This literature contributes to the research study at hand by showing that services are widely deployed in different institutions and appear to be the future in the ICT space. Bernal (2016) indicates that applications with service-oriented enterprise architectures in the cloud will form a significant part of technology and communication trends. They looked at integrating cloud computing into enterprise architecture frameworks and methodologies like TOGAF, FEAF (Federal Enterprise Architecture Framework), DODAF (The Department of Défense Architecture Framework), GARTNER, PEA (Enterprise Architecture Planning) and Zachman.

Among the issues that plague cloud computing, QoS is a critical aspect. (Ghahramani et al., 2017) embarked on research with the intent to provide an insight into QoS issues using QoS metrics as a contribution. In their research, they reviewed technical details related to cloud QoS and classified them into different categories. They also produced a list of capabilities relevant to enable efficient cloud resource management. Further on they mention how pivotal the role of QoS monitoring tools is, and discussed challenges researchers and practitioners face. QoS contributes to this study by laying down a foundation to monitor the quality of service of a deployed eLearning system using cloud services. Figure 2.47 shows a cloud-based eLearning system by Despotović-Zrakić et al. (2013).

2.5.3. Cloud Learning Using ELAB Cloud Ecosystem

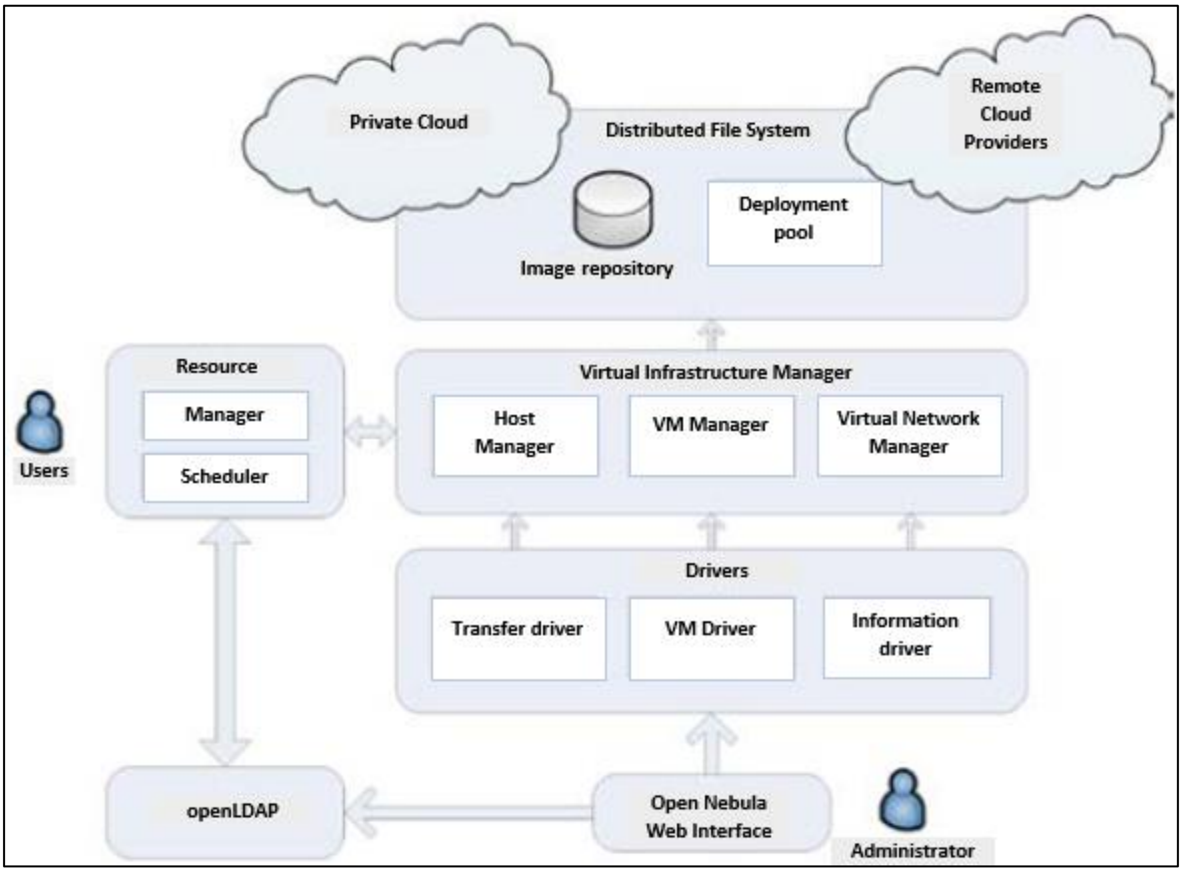

Figure 2.47: Cloud computing infrastructure in e-Business Lab (Despotović-Zrakić et al., 2013: 306)

In the cloud computing infrastructure model in Figure 2.47, an eLearning application was deployed in the private cloud portion of the model and comprised of services for accessing a virtual environment, services for resource management, user account management services, a distributed file management system and a virtual infrastructure management system. The virtual machines (VMs) were stored in the image repository of the model and are available on-demand via requests by users. Next in Figure 2.48 follows another example of a cloud-based eLearning architecture (Despotović-Zrakić et al., 2013).

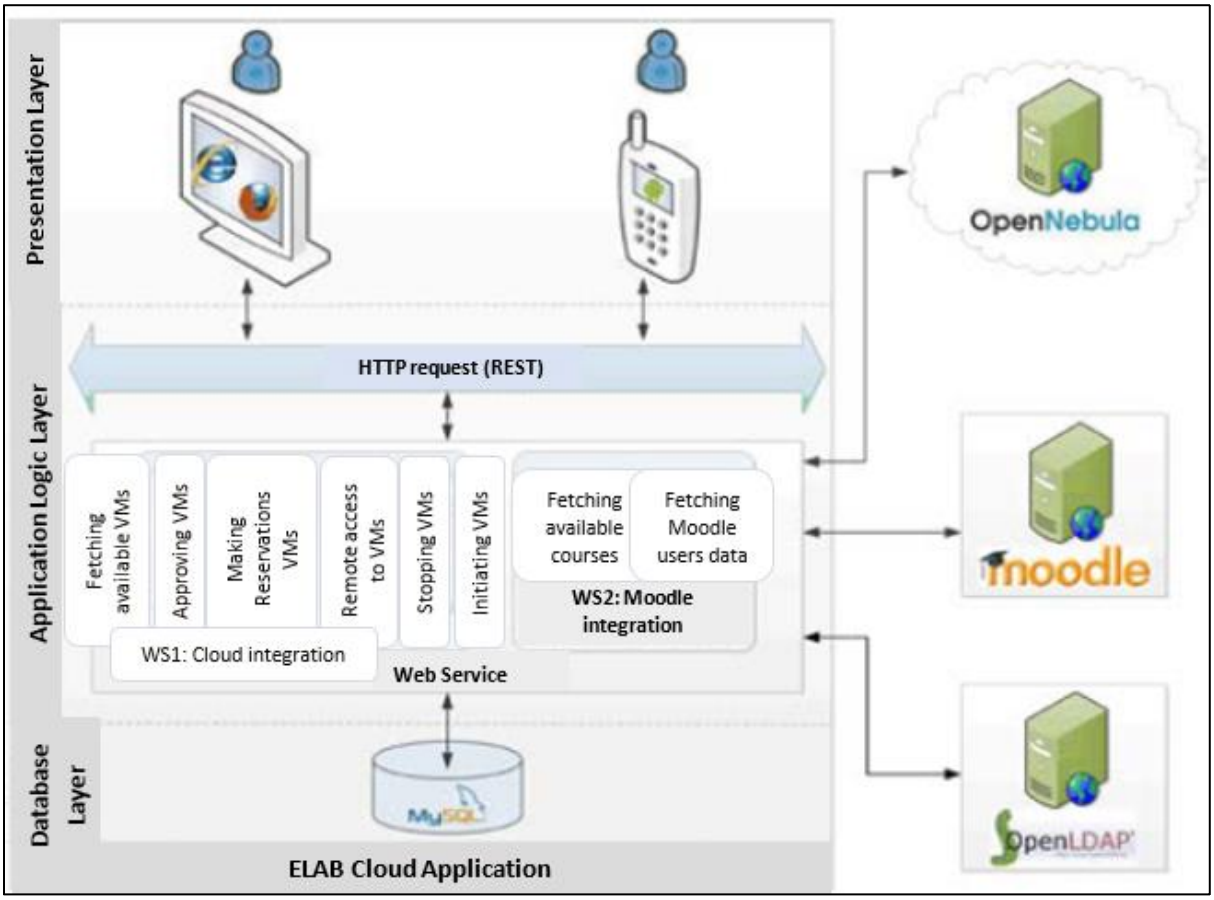

Figure 2.48: Architecture of the ELAB e-learning ecosystem (Despotović-Zrakić et al., 2013: 306)

The ELAB (e-Business Lab) cloud system allows integration between Moodle, Open LDAP, business information systems and cloud computing infrastructure (Despotović-Zrakić et al., 2013: 306). This integration is handled by operations such as fetch VM, approve requests for a VM, reserve the VM, remotely access the VM, initiate the scheduled VM and stop the expired VM (ibid). As articulated by Despotović-Zrakić et al. (2013: 306), the ELAB cloud eLearning system was built on a three-tier architectural approach that includes a set of web services and a web application. Users of the cloud eLearning system would use the web application interface or the presentation layer to review, request, reserve, use and release the virtual machines (VMs).

Zrakić et al. illustrate that the application logic layer in the ELAB ecosystem above contains two cloud integration web services; one for cloud integration and one for Moodle integration. Open LDAP performs the function of integrating digital identities within heterogeneous e-learning environment and facilitates user authentication. Once users are authenticated by Open LDAP, they are automatically authenticated in Moodle (Despotović-Zrakić et al., 2013: 306). Figure 2.49 shows layers of cloud computing service oriented architecture for eLearning.

2.5.4. eLearning Services on Mandi Architecture

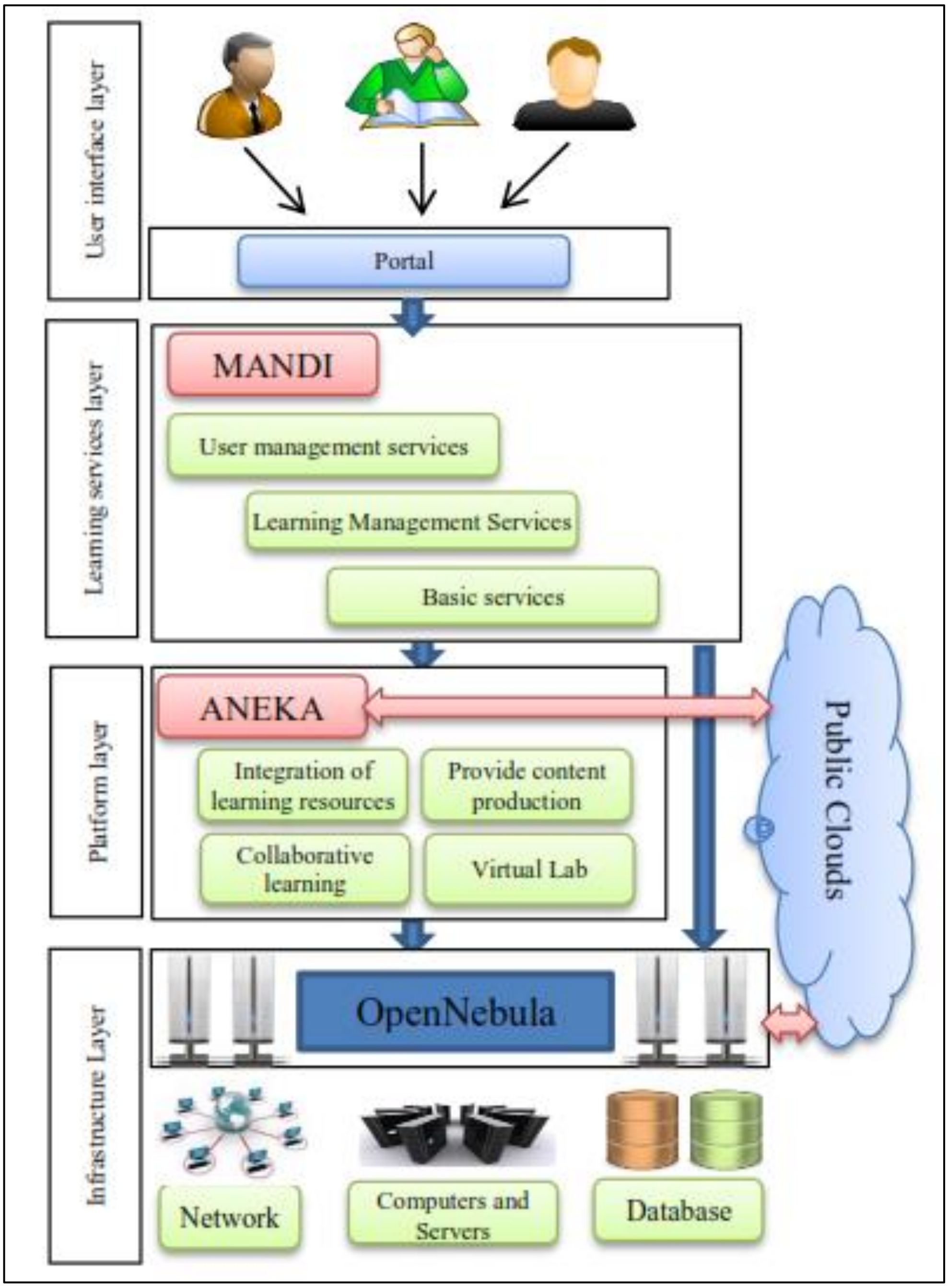

Figure 2.49: Layers of cloud computing services oriented architecture for e-learning environment (Lohmosavi et al., 2013: 27)

The model by Lohmosavi et al.(2013) consists of four layers, namely the user interface layer, the learning services layer, the platform layer and the infrastructure layer. These layers are explained next.

- User Interface Layer: This is an entry point for learners, teachers, administrators and other users. The user interface connects via a portal that provides public access to these users. They log in to the portal and are authenticated through unique identifiers with different assigned roles and privileges.
- Learning Services Layer: This is made up of a market-based architecture called Mandi. This layer facilitates and controls the presentation and application of content from providers based on users' requests to rent eLearning content. Services included here are user management services, learning management services and basic services.
- Platform layer: The platform layer contains an ANEKA public cloud. It is responsible for integration of learning resources, content production, and collaborative learning. This layer also contains a virtual lab.
- Infrastructure Layer: The infrastructure layer consists of an Open Nebula public cloud for infrastructure as a service. This layer offers network, computers and servers, and databases.

Lohmosavi et al.(2013)

Figure 2.50 below shows how eLearning services are outlined in the Mandi architecture.

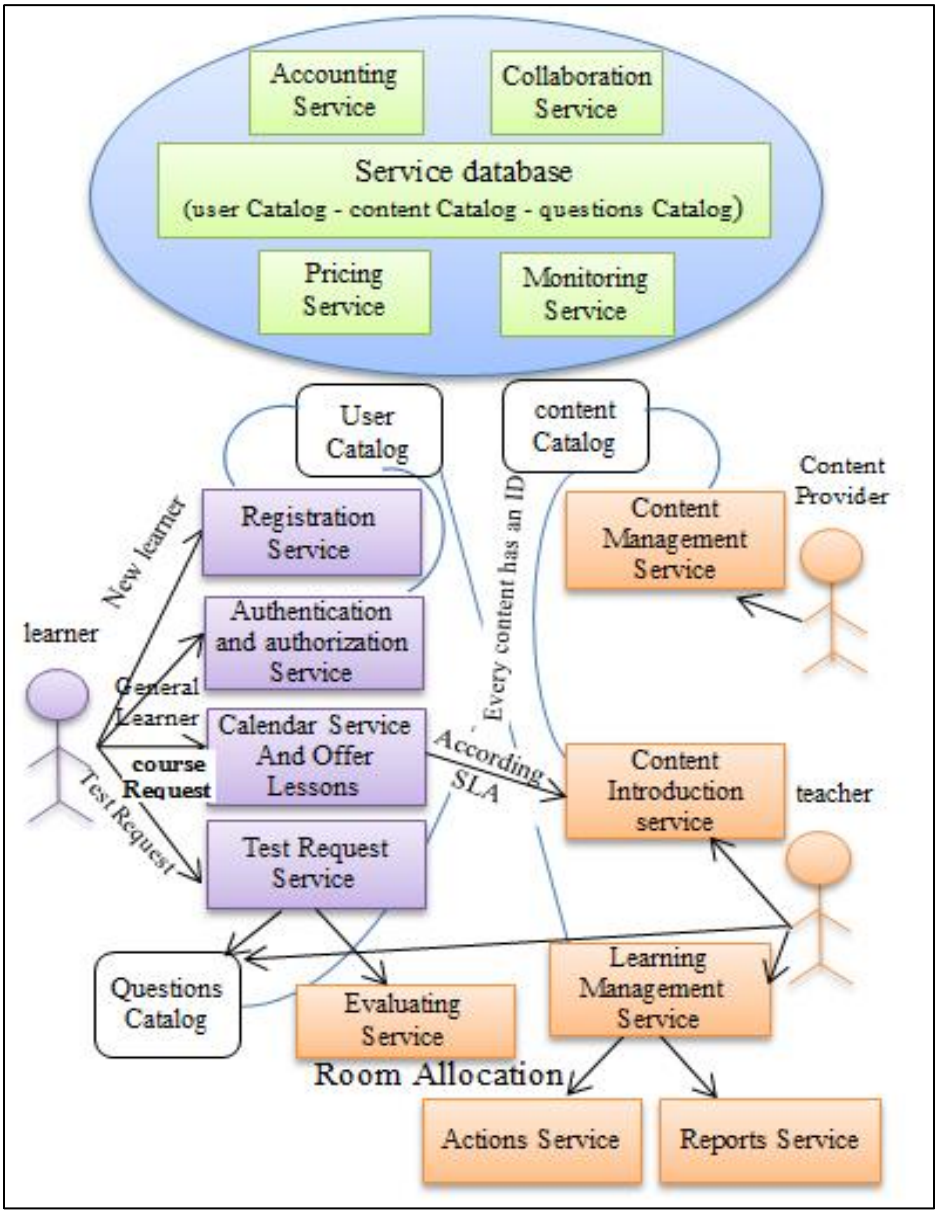

Figure 2.50: eLearning services based on Mandi service-oriented architecture (Lohmosavi et al., 2013: 28)

eLearning services based on Mandi accommodate cloud services including accounting services, collaboration services, a service database with a user, content and question catalogue, a pricing service, and monitoring service (Lohmosavi et al., 2013). The user catalogue service contains the registration, authentication, calendar and test request services, while the content catalogue contains the content introduction and management services. The test-request service draws questions from the question catalogue and uses the evaluating service for course evaluations.

The action service in the learning management services is responsible for room allocation, while the report service is responsible for reports. All these services help to impersonate a traditional classroom environment of learning that the conceptual framework in this study embraces. The conceptual framework reflects on learning content and tests and uses the tests as part of the determinants of low usage. The content introduction service is used in conjunction with the calendar service and offers lessons per course request according to a specific SLA. The actors here are the content provider, the teacher and the learner (Lohmosavi et al., 2013).

eLearning must be based on powerful hardware and software infrastructures to support heterogeneous learning resources and act as a ubiquitous learning environment (Despotović-Zrakić et al., 2013: 301). To reflect this in the proposed conceptual framework, the focus was on exploring cloud computing as a remedy to provide IaaS, SaaS and PaaS as services for a ubiquitous eLearning platform.

Cloud computing has been used in eLearning to support institutions to create their own eLearning services with little or no need at all to invest in infrastructure (Luo & Lin, 2013: 156). Luo & Lin (2013: 157) have built integrated web-based systems as tools that contribute to educational support at different levels, being academic, continuous education and organizational training. These web-based systems were built using a multi-tier architecture where the presentation, processing and data layer were logically separated from one another (ibid).

One of the systems was a course management system (CMS) that incorporated both synchronous and asynchronous communication between learners and instructors. It also allowed instructors to convey information such as curricula, assignments, study material, course content and announcements to learners anytime and anywhere (Luo & Lin, 2013: 157). Tools like quizzes, surveys, and other monitoring tools were included in this package as well. The researcher acknowledges that such features are the key for any learning system, but they will be best embraced if users have relevant devices and network access to download and upload eLearning content remotely. With the introduction of cloud computing services, organizations could receive access devices such as laptops and smartphones included in the service packages from the service provider.

Similar to other learning systems, Luo & Lin's system contained an e-portfolio feature that allowed learners to see their efforts, progress and achievements over time. This e-portfolio feature was formed as an extract of homework, papers, essays, presentations and projects, as well as their results illustrated in text, audio and visual format. The work of (Luo & Lin, 2013) relied on previous technologies and tools that existed on the web before. Their work anticipated integration of the above-mentioned systems and tools to improve the usefulness of their eLearning services.

Luo & Lin (2013) showed an example where quiz results were inevitably loaded on a course management system's (CMS) grade book and thus, eventually appeared in the e-portfolio of each learner. Luo & Lin's systems could be accessed anywhere and at any time via multiple devices like desktops, laptops, cell phones, embedded devices and dedicated thin clients. This complements the goal of having legacy eLearning services that could be dynamically created and dedicated to the different institutions on demand using federated cloud computing services. ELearning functionalities involving computation, database transactions, storage services and networking can be acquired from a cloud system using cloud services (Luo & Lin, 2013).

2.5.5. Implementing Moodle as an Open Source LMS

Wilson, Diao, & Huang (2015) from Macquarie University did a research study on implementing Moodle as an open-source learning management system. They developed a pilot using a built-in peer assessment tool called the Workshop tool. This peer assessment tool is considered an effective learning and teaching tool widely used for improving learning outcomes. It provides opportunities to practise, assess, and provide feedback on learners' development (Wilson, Diao, & Huang, 2015).

In Wilson, Diao, & Huang's research study, the researcher wanted this model to address learner development to see whether eLearning usage could improve. The piloted project aimed to investigate the capacity of the online peer assessment review system. It also aimed to provide participating unit convenors with the practice models for using the Workshop tool to engage learners and promote learning during online assessment tasks (Wilson, Diao, & Huang, 2015: 16).

2.5.6. Using SaaS for eLearning

The term SaaS refers to Software as a Service. SaaS is an application that is located remotely at the service provider's location, and can be accessed using the Internet (Paralic, Červeňák, & Ragan, 2014). When comparing SaaS to traditional software built on the organization's premises, SaaS comes with certain advantages. The customer gets relieved from high implementation costs, as with SaaS, a pay-as-you-use pricing model applies. Organizations may save costs on installing and updating application software, and backing up data. There is also no maintenance cost incurred with a SaaS setup (Tušanová, Tušanová, & Paralic, 2013).

Tušanová, Tušanová, & Paralic mentions that SaaS is offered on environments with a very strong physical and logical security layout. With SaaS, service providers offer software updates without any additional costs. Organizations using eLearning take advantage of the rewards of SaaS, and started implementing their eLearning on SaaS platforms (Jyothi et al., 2014: 89).

With reference to the SaaS cloud service, the research seeks to address the question: "What new understanding can be derived on technology that can be used to improve eLearning usage?". The researcher shows the possibility of hosting eLearning on a SaaS cloud by quoting researchers who have walked the same path, using cloud services for their eLearning.

- **Similar eLearning research studies using SaaS**

Memeti & Çiço (2014) embarked on a research to build a virtual and personal learning environment for a University using existing infrastructure, but migrating services to the cloud seeking to provide better decentralized and just in time learning. Their conclusion was that Cloud Computing services like SaaS can be used in universities for learning. They indicate that a private cloud platform with can be used with existing infrastructure to get benefits like file storages access, educational resources access, research applications access, and access to faculty tools anywhere. The university staff like administrators, learners, and other users can access the cloud services on demand.

Veerabhadram & Conradie (2013) did a study to discuss the influence of cloud computing on learners, teachers, and the educational institutions. The outcome of their study indicated that lecturers and learners agree that mobile-cloud computing will be important for education in the future.

Demchenko, Belloum, Bernstein, & de Laat (2014) did a research study about an integrated approach to develop advanced education and training courses using cloud technology. These courses were developed for full-time university learners, online education programs, and IT professionals. Chiroma et al. (2017: 643) proposed a solution that integrates YouTube, DropBox, Google Drive, and Twitter to deliver course content to learners thereby creating a learner-centred, personalized, and ubiquitous learning environment where classrooms are decongested. The aim of their study was to create a learning environment where resources are stable, balanced and utilized to meet the demand of learners, teachers and learning activities. Chiroma et al. used API's as part of SaaS to integrate and connect to eLearning. They indicate that the outcome of their research study showed imrpovement in learning and research.

- **How does SaaS work for eLearning?**

The SaaS technical architecture is made up of four layers, a user interface, a control, a business logic, and data access layer (Xiaodan, 2014: 134). Xiaodan indicates that SaaS is offered mainly through a network and provided to customers as an application service program where users can use available service on an on-demand basis. The on-demand feature of SaaS allows the processing of large amounts of data, yet saving costs of IT infrastructure investment (Memeti & Çiço, 2014: 145).

When using SaaS, online assessments are exposed using multiple web services like question authoring, quiz authoring, quiz delivery, and result processing services (Jyothi et al., 2014: 91). Jyothi et al. indicate that, question authoring service repositories are created and categorised as topics, units, or course levels by the instructor. These question authoring service repositories are used to create manual and random questions which formulate quizzes and are exposed to the learners via the quiz delivery service. The learners register to participate in the quiz, the quiz has to be ready first to be used as a service, and finally the quiz gets imported as a service to the learner's platform.

SaaS has three critical and advantageous driving factors, which are, speed of implementation, cost and resource savings, outsourced system, and technical expertise (Jyothi et al., 2014: 89). Another advantage is the easy management of resources and multiple on-demand services which allow quick and reliable deployment of services. SaaS caters for flexibility and scalability (Xiaodan, 2014: 134). Centralised remote servers enables much more efficient computing through the effort of centralized storage, memory, processing, and bandwidth (Memeti & Çiço, 2014: 145).

SaaS caters for personalised learning and strongly identifies learning goals for individual learners, and also maps out how they decide to access learning content (Chiroma et al., 2017: 640). This may be a good attribute for using learning styles to deliver content to learners. Learners emotions may also be captured via a SaaS cloud to improve eLearning by learning the needs of learners. Video-capture and facial-recognition technology can be used with SaaS to automatically detect facial expressions of learners to tell whether they are concentrating in the online learning process (H. Chen & Chen, 2015: 456). The learners' facial expressions may help understand whether eLearning low usage is caused by low concentration of learners or not, and necessary improvements can be made.

Memeti & Çiço (2014) indicates that the university staff like administrators, learners, and other users can access the cloud services on demand. This is a great advantage that the researcher may put focus on to understand the origin of low usage of eLearning in South African telecommunication organizations. The background of the literature may be that of an educational institution, but however the concept is still the same. So the low usage may also arise from the fact that the telecommunication organization studies does not have the luxury to access eLearning on demand. So, by introducing cloud computing, we may allow the employee learners to access cloud services anytime anywhere and on demand just when they need them.

Veerabhadram & Conradie (2013) indicated that lecturers and learners agree that mobile-cloud computing will be important for education in the future. The researcher also agrees with this phenomenon. Looking at the intense use of mobile technology in 2019, mobile cloud for eLearning will is definitely the new way of learning. The researcher also perceives the future of eLearning to grow to be on mobile phones accessing cloud services. With the use of mobile phones for eLearning the learners will have an improved chance of accessing their favourite eLearning tools and features anytime anywhere and eLearning usage may improve.

The study of Demchenko et al. (2014) indicates the possibility of using an integrated approach to develop advanced education and training courses using cloud technology. The researcher's aim is to understand the low usage of eLearning. With an advanced education and training approach, perhaps usage of eLearning may be improved. Chiroma et al. (2017: 643) indicate that the outcome of their research study showed an improvement in learning and research when using resources which are stable, balanced and utilized to meet the demand of learners, teachers and learning activities. Telecommunication organizations may make use of this phenomenon to improve their eLearning usage.

The on-demand feature of SaaS allows the processing of large amounts of data, yet saving costs of IT infrastructure investment (Memeti & Çiço, 2014: 145). Telecommunication companies may also make use of the advantage of SaaS to process large amounts of learner data. This data can help in attaining information about the huge number of learners in their organization to help them understand their learning styles, favourite learning content, and other valuable information to help them understand their usage of eLearning.

SaaS offers multiple web services for eLearning like question authoring services, quiz authoring services, quiz delivery services, and result processing services (Jyothi et al., 2014: 91). Jyothi et al. indicate that, question authoring service repositories are created and categorised as topics, units, or course levels by the instructor. Categorizing the question authoring service repositories may create an opportunity for the authors to deliver content that is specific to telecommunication organizations and make more sense to employee learners at such organizations. In turn, this may create interest in the learners to use eLearning more often than they used to.

SaaS caters for flexibility and scalability (Xiaodan, 2014: 134). Flexibility and scalability are both important attributes of eLearning anytime anywhere. Flexibility is the ability for learners to freely choose how, when, where, and what they want to learn. Different learning styles in eLearning delivery are an attribute of learning flexibility. Scalability is the ability for eLearning to handle the growing capacity of learners. In a classroom environment there is not enough scalability as is restricted by physical infrastructure, like class size location and accessibility. Considering flexibility and scalability, eLearning usage can be improved by allowing a big number of learners to connect from anywhere, and also take part in eLearning content they prefer, using their own preferred devices.

2.6.Discussions and Summary

This chapter gave an overview of the theory that addressed this study as well as the literature about similar studies showing that low usage of eLearning is a common problem among organizations using eLearning for their learning interests. The chapter further unpacked the concept of eLearning and its elements, the concept of cloud computing and its elements, the concept of content delivery and ways to go about preparing and presenting eLearning. It also showed models on how cloud computing is used to host eLearning. This section illustrates the researcher's understanding of similar research literature through the use of tables. These tables summarise what other researchers argue or articulate regarding this study's problem and the research process at hand.

The theory used to guide this research study was the activity theory. To understand this theory, the researcher had to tabulate a summarised view showing the literature sources, their opinions and the interpretations of these opinions. This phenomenon is shown next in Table 2.14.

Table 2.14: Understanding the Activity Theory

Summary: Understanding the Activity Theory		
Literature Source	**Source Opinion**	**Interpretation**
Wangsa, Uden, & Mills (2011)	Activity theory is a philosophical theory for understanding the human activities embedded in social practice and mediated by artefacts.	… is used for understanding human activities … involves social practice … is mediated by artefacts
Hashim and Jones (2007)	Activity theory is rich regarding understanding how people interact with each other to do things using sophisticated tools in complex and dynamic environments. The second-generation activity theory extends the four main elements by adding three additional ones, which are the rules, the community and the division of labour.	… is used for understanding people interaction … uses sophisticated tools … has rules, a community and a division of labour

Summary: Understanding the Activity Theory		
Literature Source	**Source Opinion**	**Interpretation**
Kinsella (2018)	The activity theory is meant to explore the relationship between human behaviour within individual members of a group and their mediation using cultural artefacts that form a stimulus between members and the outcome of their mediation.	… is used to explore the behaviour between individual team members …uses cultural artefacts

The activity theory is useful when one wants to understand human activities, how people interact and how people behave when they use tools or artefacts to achieve a social practice. The activity theory further indicates that the process of understanding human behaviour using the activity theory involves a community, rules defined by the community and a division of labour.

The activity theory literature did not remain a silo but had to be tied to the problem this research study was addressing. To achieve this knot, the researcher had to conceptualise the activity theory, showing how its elements were connected to the research objectives of the study. The research objectives as articulated in Chapter 1 are summarised in Table 2.15 as eLearning low usage factors, eLearning requirements, content delivery requirements and technology requirements towards curbing the eLearning low usage problem.

Table 2:15. Conceptualising the Activity Theory

Summary: Conceptualising the Activity Theory	
Research Objective	**Main Activity Theory Elements**
eLearning low usage factors	Subject, Object, Tool/artefact

eLearning requirements	Subject, Object, Tool/artefact
Content delivery requirements	Subject, Object, Tool/artefact
Technology requirements	Subject, Object, Tool/artefact

The conceptual view of the activity theory shows that focus needs to be placed on the subject, the object and the tools or artefacts used to understand the eLearning low usage factors. In the same manner, the eLearning requirements, the content delivery requirements, and the technology requirements need to be addressed when addressing the low usage factors. The phenomenon of understanding the eLearning low usage requirements is shown in Table 2.16.

Table 2.16: Understanding eLearning Low Usage Factors

Summary: Understanding eLearning Low Usage		
Literature Source	**Source Opinion**	**Interpretation**
Dlalisa (2017)	Academics use eLearning systems the least for assessments, but more for course management and communication. There is also a concern about learner readiness to accept and use LMS systems, and these factors include computer experience, confidence, attitude, and ICT experience.	… learners' readiness to use LMS systems could influence low eLearning usage … computer experience, confidence and attitude could influence eLearning low usage
Bagarukayo & Kalema (2015)	Infrastructural constraints, demographic divides, staffing issues, organizational issues,	… infrastructure, demographics, staffing and education could

Summary: Understanding eLearning Low Usage		
Literature Source	**Source Opinion**	**Interpretation**
	learner issues and pedagogical issues also form part of factors that could cause low usage of eLearning.	influence eLearning low usage
Dziuban, Moskal, Johnson and Evans (2017)	Negative emotions including fear of the unknown, alienation, stress, guilt and anxiety could also hinder motivation and persistence of using and accepting eLearning.	… psychological, social and cultural issues could influence low usage of eLearning

Literature from academic research indicates that low usage could be caused by learners who are not ready to eLearning, have low computer experience, low confidence and have a negative attitude towards eLearning technologies. Other influences could be poor infrastructure, demographic divides, lack of skilled staff, inadequate technology education levels, psychological issues, social issues and cultural issues. Table 2.17 shows elements of learning that could be interrogated to curb eLearning low usage.

Table 2.17: Curbing eLearning Low Usage

Summary: Curbing eLearning Low Usage		
Literature Source	**Source Opinion**	**Interpretation**
Dlalisa (2017)	Learners with better computer skills might be at ease to use eLearning systems than less	To curb eLearning low usage, we need: … computer skills

Summary: Curbing eLearning Low Usage		
Literature Source	**Source Opinion**	**Interpretation**
	computer savvy learners. With a variety of benefits like synchronous and asynchronous learner engagement, accessibility, flexibility, self-paced learning, interactivity and increased availability and skill development, the buy-in and usage of eLearning can be improved.	… learner engagement, … accessibility … flexible and self-paced learning
DeRouin et al. (2005)	Self-paced learning allows learners to work on training tasks as quickly or slowly as they prefer.	To curb eLearning low usage, we need: … self-paced learning
Dziuban et al. (2017)	Another study focused on how the cognitive load and learning styles (active, reflective, sensing, intuitive, visual, textual, sequential and global) as a result reduced the cognitive load and influenced a perceived increase in learning gains.	To curb eLearning low usage, we need: … learning styles

To curb eLearning low usage, the literature suggests that learners need computer skills, learner engagement, accessibility, flexibility and self-paced learning. The learning system must also consider learners' learning styles when presenting learning content. This research study was addressing an eLearning problem and thus had to portray an understanding of eLearning, tabulated in Table 2.18.

Table 2:18. Understanding eLearning

Summary: Understanding eLearning		
Literature Source	**Source Opinion**	**Interpretation**
Zrakić, Simić, Labus, Milić, & Jovanić (2013)	ELearning also known to other researchers as ubiquitous learning integrates with wireless, mobile and context awareness technologies to help facilitate seamless learning, thereby improving the traditional learning process.	… eLearning caters for ubiquitous learning and seamless learning … eLearning uses wireless and mobile technology
Bora & Ahmed (2013)	ELearning can also be referred to as a tool that uses computer networks through the aid of electronic media like the internet, intranet, extranet and other networks to deliver learning content to users, using the web as a medium for communication, collaboration, knowledge transfer and training to support ubiquitous learning.	… eLearning is delivered using the internet, intranet, and extranet … eLearning supports ubiquitous learning
Kostolanyova & Nedbalova (2017)	A paradigm where learning is individualised and is dependent on individuals' characteristics, abilities to learn on their own,	… eLearning is personalised and dependent on

	their current knowledge and eventually their learning styles.	individuals' learning styles

The literature describes eLearning as a technology that caters for ubiquitous and seamless learning. It indicates that eLearning is a combination of wireless and mobile technologies used to enable learning. Learning in eLearning takes place using the internet, the intranet or the extranet. ELearning must be personalised and must be dependent on individuals' learning styles. To cater for this study's technology objective, the researcher proposed to use cloud computing as a technology to promote ubiquitous learning. Subsequently, the concept of cloud computing is briefly explained.

Table 2.19: Understanding Cloud Computing

Summary: Understanding Cloud Computing		
Literature Source	**Source Opinion**	**Interpretation**
Zrakić et al. (2013)	Cloud computing is "an abstract, scalable and controlled computer infrastructure that hosts applications for the end-users". Cloud computing offers highly scalable IT capabilities where data and services coexist in a shared and dynamically scaled set of resources.	… cloud computing is abstract, scalable and controlled … cloud computing offers highly scalable capabilities
Bernal (2016)	Cloud computing is a new way to decentralise data centres, virtualise infrastructure and platform, and provide access to services through the Internet,	… cloud computing offers virtualised infrastructure

	unlike the traditional corporate LAN.	… cloud computing offers access to services through the internet
Moaiad, Bakar, & Al-Sammarraie (2016)	Servers, laptops, tablets, apps, smartphones, emails and stored information are all a subset of the cloud paradigm and are managed and supported remotely by a cloud service provider like Google Apps, Microsoft Azure, Heroku and Amazon Web Services.	… access devices and applications are managed remotely by the cloud service provider

In the literature, cloud computing is described as an abstract, scalable and controlled environment for hosting applications. Cloud computing offers highly scalable capabilities on a virtualised infrastructure; it also offers access to cloud services using the Internet. While the consumers of the services do not need to have infrastructure locally on their premises, they also do not need to take responsibility of access devices, as access devices and applications are managed remotely by the cloud service provider. Now that a glance of eLearning and cloud computing has been shared, Table 2.20 summarises content delivery aspects.

Table 2.20: Understanding Content Delivery

Summary: Understanding Content Delivery		
Literature Source	**Source Opinion**	**Interpretation**
Solomou et al. (2015)	It is evident that the learning management system will behave like a tutor/teacher to the learner; thus, the learning management system must know the learners' requirements for learning. This set of information is the metadata about the learner.	… the eLearning system must deliver content according to the learners' learning needs … the eLearning system must collect learner metadata
Sepic et al. (2010)	When planning a course, the teacher or facilitator must make sure that the learners know and understand how to use the eLearning tools provided, and all media and content is well organised and fully functional.	… learners must be given training on using their eLearning system … Content must be well organised
McNutt & Brennan (2005)	Learning style dimensions illustrate that visual learners could be supplied with text content, graphics, 2D/3D content, as well as video content during the presentation of a course. For auditory learners, the presentation must include text, audio and graphics. Then for kinaesthetic learners, the content must be presented using text, graphics and simulation games,	… eLearning must cater for individual learning styles … learning styles can be visual, auditory, or kinaesthetic … learning content must be presented as text, audio, graphics, video, simulation games and

Summary: Understanding Content Delivery		
Literature Source	**Source Opinion**	**Interpretation**
	as kinaesthetic learners carry out physical tasks and experiments.	physical tasks per learning style

When considering learners' needs, the literature suggests that their learning styles should be put into perspective. To achieve this, eLearning technologies should collect metadata about the learners. The learners must also receive proper training on how to interact and use their eLearning systems. The content must be developed in a structured and well-organised way to present the content based on the different learning styles. Learning styles could be visual, auditory or kinaesthetic and can be presented as text, audio, graphics, video, simulation games or physical tasks based on different learning styles. Table 2.21 gives a summary on understanding similar research studies.

Table 2.21: Understanding Similar Research Studies

Summary: Similar Research Studies		
Literature Source	**Source Opinion**	**Interpretation**
Premchaiswadi et al. (2012)	A study was done using the technology acceptance model (TAM) to evaluate Thailand's users' intentions to use e-learning. The study was based on different factors like internet experience, perceived usefulness, perceived ease-of-use, subjective norms, and system interactivity. The findings indicated that system interactivity is the most important determinant of intention to use eLearning. This means that skills	… system interactivity is the most important determinant of intention to use eLearning … subjective norms and perceived usefulness play a …role in influencing learners' to use eLearning …skills to use eLearning tools, operate computers and navigate the internet are all imperative for the success of eLearning

Summary: Similar Research Studies		
Literature Source	**Source Opinion**	**Interpretation**
	to use eLearning tools, operate computers and navigate the internet are all imperative for the success of eLearning. It was found that there is strong evidence that subjective norms and perceived usefulness do play a role in influencing learners' intentions to use eLearning systems.	
Raymond (2012)	Another research was done to identify factors for adopting eLearning. In the research, it was found that the implementation and adoption of technology in firms are influenced by technological, organizational, and environmental contextual factors. The findings applied to various contexts including SMEs versus large enterprises, services versus the manufacturing sector, and the Information Technology sector. Social factors influence the beliefs of learners in eLearning, and in turn, these beliefs influence the usefulness of the eLearning solution, thereby affecting the attitudes and intentions towards using the solution.	…implementation and adoption of technology in firms is influenced by technological, organizational, and environmental contextual factors. … social factors influence the beliefs of learners in eLearning, and in turn, these beliefs influence the usefulness of the eLearning solution
Al-lawati et al. (2011)	A study was done where two groups of participants were used and were referred to as the control group and	… eLearning is a better option for learning, and the perception of the learner

Summary: Similar Research Studies		
Literature Source	**Source Opinion**	**Interpretation**
	the experimental group. The control group was tested while studying in a traditional learning setting, while the experimental group was tested studying in an eLearning setting. The outcome of the study after pre-tests and post-tests concluded that eLearning is a better option for learning and the perception of the learner towards eLearning as a technology has an imperative effect on its acceptance.	towards eLearning as a technology has an imperative effect on its acceptance

When determining learners' intentions to use eLearning, it is imperative to understand how they interact with the eLearning system. The implementation and adoption of technology in organizations are influenced by technological, organizational and environmental contextual factors. Social factors influence the beliefs of learners in eLearning, and in turn, these beliefs influence the usefulness of the eLearning solution. Skills to use eLearning tools, operate computers and navigate the internet are all imperative for the success of eLearning. Subjective norms and perceived usefulness play a major role in influencing learners to use eLearning. While literature from similar research work shows that eLearning is good for hosting learning, the perception of the learners to use this technology has an imperative effect on its acceptance.

CHAPTER THREE
Research design and methodology

3.1. Introduction

Every academic research goes through a scientific process to achieve rigour, trustworthiness and credibility. This chapter elaborates on the process that was followed to design and strategize this research study. The researcher first defines what it means to follow a research process when indulging in a research project, then elaborates on what process was followed to conduct the research. This chapter unfolds with an introduction and ends in a "discussions and summary" section. This chapter defines the research process, methods, design, philosophy, paradigm, approach, strategy, data collection methods, ethical considerations, research sample, and data analysis process followed. It also elaborates on the credibility of the research. The next section describes the research process followed.

3.2. Research Process

Prajapati, Dabhi, & Bhensdadia (2015: 284) describe a research process as a set of tasks or operations that use different research techniques at different stages of a research study. They describe good research to be systematic, logical and empirical. From a research study by Baxter & Jack (2008: 555), the following research process checkpoints have to be ticked to ensure that the process is adequately rolled out:

- Research questions are clearly written and substantiated;
- Propositions are provided;
- The case design is appropriate for the research questions;
- Appropriate purposeful sampling strategies have been used;
- Data are collected and systematically managed; and
- Data are analysed correctly.

(Baxter & Jack, 2008: 555)

Tutunji (2015) defines the research process phases as research problem identification, data gathering and analysis, and validation of the research work. Tutunji also elaborates on research activities like the literature review, research planning, and data analysis and reporting as part of the research process. Tutunji's research aimed to elaborate on successful research methodology guidelines.

Tutunji's research and other similar research studies helped to build a framework on how to approach the study at hand. Baxter & Jack's checkpoints additionally helped to validate this research process by making sure that the questions and propositions were clear and representative of the research study. It helped to ensure that the sampling strategy was purposeful, the data collected were systematic and the analysis process was representative of the research questions. The researcher also followed Prajapati et al.'s view that a research process must be systematic, logical and empirical.

This research study was qualitative in nature. Watts (2014: 3) points out that a theoretical, ontological, epistemological, political or even moral commitment perspective could drive qualitative research. Compared to Watts' view about qualitative research reasoning, the researcher found his reasoning approach to be both epistemological and ontological. Epistemology in this research was driven by the effort to discover the cause of low usage of eLearning, while the ontology in this research was caused by the need to understand how the involved stakeholders interacted with the eLearning environment.

Halverson (2009: 80) claims that historical or cultural study-oriented scholars have a tendency of using qualitative approaches in their investigations, while linguistically-inclined studies use more quantitative approaches. Watts (2014: 2) points out that qualitative research studies demand consistency, reliability and highly methodical approaches; however, consistency and reliability is rarely enough to consider for qualitative research. The researcher used the guidelines from Watts' research study to determine how to go about conducting this research in addition to the earlier points from Prajapati et al. and Baxter & Jack.

This research study used SurveyMonkey, an electronic survey tool to host online open-ended questionnaires as tools for collecting qualitative data. Roberts (2015: 315) claims that qualitative research is increasingly conducted online, but also indicates that ethical considerations must be in place during this process. Roberts discusses online communities in his qualitative research, and the researcher's stance in his research is the social aspect where he mentions online communities and community members who had to take online surveys under an ethical umbrella. A secured online platform was used. SurveyMonkey's web platform had already considers the most ethical issues mentioned by Robert, such as security and privacy. While the researcher has used different guidelines from other researchers to conduct this study, Halverson (2009) illustrates a more rigid process that includes logical elements to consider in a research process.

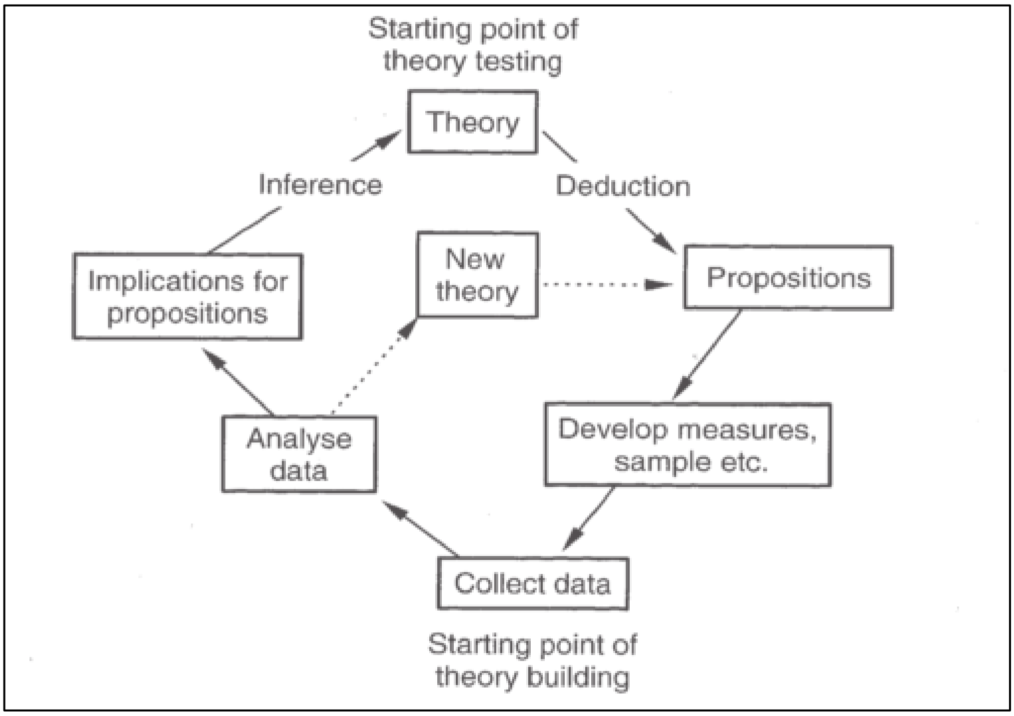

Figure 3.1: The logic of the research process (Halverson, 2009: 86)

Halverson (2009: 86) claims that the logic of the research process has two entry points, either theory building, or theory testing. Halverson (2009: 82) indicates that theory building involves observations and using inductive reasoning to derive theories from these observations, while theory testing attempts to answers the "why" question. Halverson indicates that the process of theory building involves collecting data, analysing this data and interpreting the findings and implications of the theory to support it, threaten it or revise it. Since this research study was qualitative and inductive in nature, it means that the researcher had to follow a theory building approach.

The opposite of theory building is theory testing. While the research did not test any theory, the researcher wanted to contrast between the two concepts to create an understanding of both worlds. Halverson (2009: 82) explains that theory testing, on the other hand, involves using a deductive approach to build an alternative new theory. Halverson claims that theory testing begins with a tentative explanation that emerges from a deductive reasoning approach. Halverson points out that theory testing uses an available theory to guide which observations to make.

To further explain Halverson's model of the research process, theory testing involves testing propositions using a deductive approach, developing measures and samples to collect data from, analysing the data and describing the implications. Then when building a theory, the researcher starts with propositions, develop a sample, collect data, analyse the data, then formulate a new theory based on the propositions, and then interpret the findings and implications of the new theory.

While Halverson's reasoning is to build theory by using propositions derived from scientific evidence, this research study instead builds propositions after collecting scientific evidence and analysing data. This approach is inductive in nature and uses the activity theory as an extant guideline to navigate the study. The end result is a conceptual framework that extends the activity theory with new elements derived from the findings of the study. The next subsection defines the research methods that were used in this research study.

3.3. Research Methods

In this research study, the researcher used qualitative methods to gain qualitative feedback that enabled an in-depth understanding of low eLearning usage. The researcher needed as much feedback as possible to get an in-depth understanding, and needed to interact with informants at any given time during the period of collecting data.

While the researcher has already mentioned that this research study was qualitative, theory building and inductive in nature, the researcher still wanted to give contrast on alternative research methods. This subsection explains the different research methods such as qualitative, quantitative and mix methods. House (2018: 7) points out that quantitative research studies produce reliable and replicable data, while data from qualitative interviews is not reliable but driven by the leading questions. House further argues that combining the two methods produces a mixed method approach that is more useful, improves results and offers triangulation. Mixed methods utilise the strengths of both qualitative and quantitative research methods (Creswell, 2009: 203). Creswell uses words such as integrating, synthesis, multimethod, quantitative and qualitative methods, and mixed methodology to describe mixed methods.

Wiedemann (2013: 338) argues that mixed methods were introduced as a new paradigm to overcome the shortfalls of qualitative and quantitative research paradigms. Wiedemann, however, carries on indicating that many other researchers describe mixed methods to be lacking a fair consideration of current quantitative text analysis approach. In the researcher's view, Wiedemann's argument about mixed methods overcoming shortfalls of qualitative and quantitative research but at the same time lacking a fair consideration of quantitative analysis remains a contradiction. Mayende, Prinz, Isabwe, Muyinda, & Nampijja (2016: 100) claim that mixed methods increase the completeness of a research study, returns higher credibility and increases validity.

As much as Creswell (2009), House (2018), Wiedemann (2013) and Mayende et al. (2016) advocate mixed methods to give improved results, strength, overcome shortfalls of qualitative and quantitative methods, and increase completeness, the researcher still believed that qualitative results were more appropriate and pure for this study because the researcher:

- Wanted to build a theory;
- Was not testing a theory;
- Wanted to understand human behaviour rather than focus on explaining human behaviour;
- Wanted a rich context; and
- Wanted to study repeated patterns of information from the data.

Qualitative research methods are used to understand human behaviour that is rooted in the philosophical strand of hermeneutics, while quantitative research is used to explain human behaviour (House, 2018: 7). Hyett, Kenny, & Dickson-Swift (2014: 2) claim that qualitative research is fundamentally a multimethod type of research. They describe qualitative research to be creative, innovative, reliable and flexible. It remains arguable whether qualitative research is really creative, innovative, reliable and flexible, as different researchers may have different views.

Table 3.1 illustrates the major characteristics of qualitative and quantitative research. By showing the major characteristics of quantitative and qualitative studies, the researcher wanted to create a broad understanding of both research types such as not to be limited to qualitative research without having explored other possibilities.

Table 3.1: Major Characteristics of Quantitative and Qualitative Methods

Quantitative	**Qualitative**
Research object is observed analytically	Research object is observed holistically
Top-down procedure	Bottom-up procedure
Hypothesis testing	Hypothesis formulation
Data measured	Data interpreted
Experiments	Ethnography
Explain	Understand
Objective	Subjective
Search for facts and causes of human behaviour	Comprehends human behaviour
Etic perspective	Emic perspective
Analytic – nomologic	Explorative – interpretive
Deductive	Inductive
Product oriented	Process oriented
Reliable, elicited, replicable data	Valid, natural, in-depth data
Controlled context	Natural context
Representative, generalisable	Single case
One method	Multimethod
Empirical research serves as proof of existing theories, hypotheses	Empirical research serves to formulate theories, hypotheses

(House, 2018: 9)

House (2018: 9) identifies the characteristics of qualitative and quantitative research. House describes quantitative research as hypothesis testing. In qualitative research, the hypothesis is referred to as propositions that are used to build theories. While this is the case, the main drive the author wants to portray is that qualitative studies are interested in building theories rather than testing these theories. The author also highlights ethnography, whereas many other qualitative approaches could be followed such as grounded theory, phenomenology, narratives and case studies. The main point to take from House's work about qualitative research as the subject of interest is that, qualitative studies are taken to create an understanding of phenomena. Qualitative studies are subjective, inductive and involve human behaviour.

Table 3.1 has tabled the major characteristics of qualitative and quantitative research. Table 3.2 outlines values and limitations of quantitative approaches to highlight why the researcher did not opt for this type of a research method.

Table 3.2: Values and Limitations of Quantitative Approaches

Value	**Limitation**
Prove hypotheses	Data can be manipulated
Generalizable	Feedback could be much less
Reliable	Dependent on data triangulation
Replicable	Instruments could be used incorrectly
Manageability of data	Redirection of research questions not possible

(House, 2018: 10)

House (2018) shows the values of quantitative research as worthy of proving a hypothesis, generalisability, reliability, replicability and manageability of data. In this research study, the researcher was not proving any hypothesis and did not anticipate any replicability since this study was subjective to ComTek, and thus not objective and not generalizable. There, however, are still possibilities of using this qualitative research study as evidence to other similar research studies based on the credibility derived. House points out that the limitations of quantitative studies are that data can be manipulated, feedback could be inadequate or less, incorrect instruments could be used, and the redirection of questions is not possible. Clearly, the limitations from quantitative research studies would not allow for the opportunity to achieve these desires.

To achieve a further understanding of research methods, Roberts (2015) explains passive, active and traditional research methods.

- Passive research occurs in an online community using existing data without involving the researcher with the community.

- Active research occurs in an online community with the active participation of the researcher with the online community.
- Traditional research: here, data are generated using data collection methods such as interviews and focus groups conducted online.

(Roberts, 2015: 315)

From Roberts' articulation that research could be passive, active, or traditional. The researcher points out that, traditional research methods were used, where data was collected using open-ended questionnaires and unstructured interviews. This research study used qualitative research methods because they are flexible and dynamic, while the unstructured design of the interview questions brought the ability to extract more data from the respondents. By using qualitative methods, the researcher wanted a context that was natural and not lab-controlled. The researcher also wanted the research sample to be purposive. The next section discusses the research design.

3.4. Research Design

This sub-section defines the basic components of this investigation, such as research questions, unit of analysis and propositions. Rowley (2002: 18) defines a research design as an action plan of how research moves from questions to conclusions. Rowley further describes a research design as the logic that links the data collected to the conclusions drawn about the initial questions of a study, thereby ensuring coherence.

The following is a list of components to include in research design:

- Research questions – Research questions must be carefully formulated through the help of theory embodied in the literature. Questions can be generated from general interest or from the context of a proposed case study.
- Research propositions – These are necessary for descriptive and explanatory studies. The research questions are translated into research propositions. The data collection and analysis might support or refute the research propositions.
- Unit of analysis – This may be an individual, an event, an organization, a team, or a department within an organization. A case study should ask questions about the unit of analysis and subunits if any.

- The logic that links the data to the propositions – Selecting a case must be determined by the research purpose, questions, propositions and theoretical context.
- Criteria for interpreting findings – This is the deciding criteria for the data necessary to support or demolish propositions and interpreting findings.

(Rowley, 2002: 19)

The researcher aligned partially with Rowley's guidelines by including research questions and a unit of analysis, but however derived propositions at the end of the study. Because of this, it would not make sense to let the research questions be guided by propositions, but rather to allow the research study to unfold into new informed propositions.

The following questions were asked in this research:

- What new understanding can be derived on factors that contribute to low eLearning usage?
- What new understanding can be derived on eLearning requirements for improving eLearning usage?
- What new understanding can be derived on content delivery requirements for improving eLearning?
- What new understanding can be derived on technology that can be used to improve eLearning usage?

The next section elaborates on the research philosophy that was followed.

3.4.1. Research Philosophy

This research study followed a social constructivist philosophical approach where the aim was to explore, understand and interpret the low usage of eLearning. Constructivist learning is concerned with knowledge that is constructed and is not transmitted or embedded in an activity or anchored in the context of the activity (Russell & Schneiderheinze, 2005: 39). An example of knowledge construction is the way in which learners interact and respond in a classroom setting (ibid). Using ComTek as a case study, the researcher explored and described the events of eLearning as explained by the CFL division and informants from ComTek. The researcher interacted with the participants at ComTek and came to understand their eLearning environment better.

A research philosophy can be classified into three categories, namely design methodology and user-centred design, social constructionism and pragmatism (Mayende et al., 2016: 97). The three philosophical approaches are explained as follows.

- Design methodology and user-centred design – The design science methodology requires the production of an artefact, while the user-centred design is an iterative process that goes through the design science phases to discover the problem, suggestion, development, evaluation and conclusion.
- Social constructionism – Social constructionism interprets how participants see the situation being studied. The social constructionists' philosophical assumption about participants' meaning of life relies on interaction, and the researcher's intent is to interpret this meaning.
- Pragmatism – In pragmatism, thoughts do not describe, represent or mirror reality, but defines thoughts as the product of the interaction between an organism and the environment. Thought is seen as a tool to predict, act and solve a problem. Philosophical topics are best believed to be true based on their practical uses and successes.

(Mayende et al., 2016: 97-98)

The next section elaborates on the research paradigm used in this research study.

3.4.2. Research Paradigm

This research study followed an interpretive philosophical paradigm where the researcher required the participants to be actively involved such to reflect a more natural understanding of the research setting. While the subjective nature of the interpretive paradigm was a draw-back, the in-depth nature of this paradigm and the deep dive the researcher took in this research study brought a better understanding of ComTek's eLearning environment. Apart from understanding low usage of eLearning at ComTek, the researcher also wanted to interpret events and occurrences using an extant theory, but inductively build on this theory with new discoveries.

Research paradigms differ in nature. A research paradigm is defined as a mechanism by which a researcher can proclaim the validity of particular truth claims (Clear, 2009: 359). These claims are classified into three distinct forms of truth and are supported by different scientific approaches (ibid). There are several paradigms, including positivist and interpretivist paradigms. The positivist researcher *explains* events and occurrences using theory, while the interpretivist researcher *interprets* events and occurrences using theory (Lee & Hovorka, 2015: 4918).

Interpretive research requires the building of process models to aid the interpretation of the dynamics of a situation, as opposed to predictive factor models that define the causal relationship between formally defined constructs, and are common in the natural sciences (Clear, 2009: 358). Clear elaborates on three types of paradigms, namely the traditional/classical science objective paradigm, the social sciences interpretive paradigm and the critical sciences evaluative paradigm.

When referring to interpretation, it means what the author infers in his/her text, is also his/her own understanding and is subjective. What the participants mean with their actions is their understanding of the phenomenon and is subjective, which gives interpretive research its true meaning. The researcher has to understand that the performers or participants have their own actions, and it remains a challenge on how to interpret the understanding of these actions (Lee & Hovorka, 2015: 4919). This challenge has been seen in most fields of inquiry, including interpretive sociology, cultural anthropology, history, hermeneutics and phenomenology (Lee & Hovorka, 2015).

The interpretive paradigm considers the society and is based on symbolical interactionism, ethnomethodology, philosophy of language and sociolinguistics, social computer science and geriatrics, and phenomenology (Zhdanova, 2005: 1065). Zhdanova studied the phenomenon of old age and ageing using the normative paradigm in comparison to the interpretive paradigm. The normative paradigm assumes that participants of social interaction share a common system of symbols and meanings regarding their social-cultural system of values. The interpretive paradigm, on the other hand, proceeds from the lack of a pre-set intersubjective valid system of symbols in the strict meaning of these terms (Zhdanova, 2005). It was discovered that the process of demographic ageing was better understood and effectively analysed using the interpretive framework (Zhdanova, 2005). Figure 3.2 illustrates the classification of research paradigms.

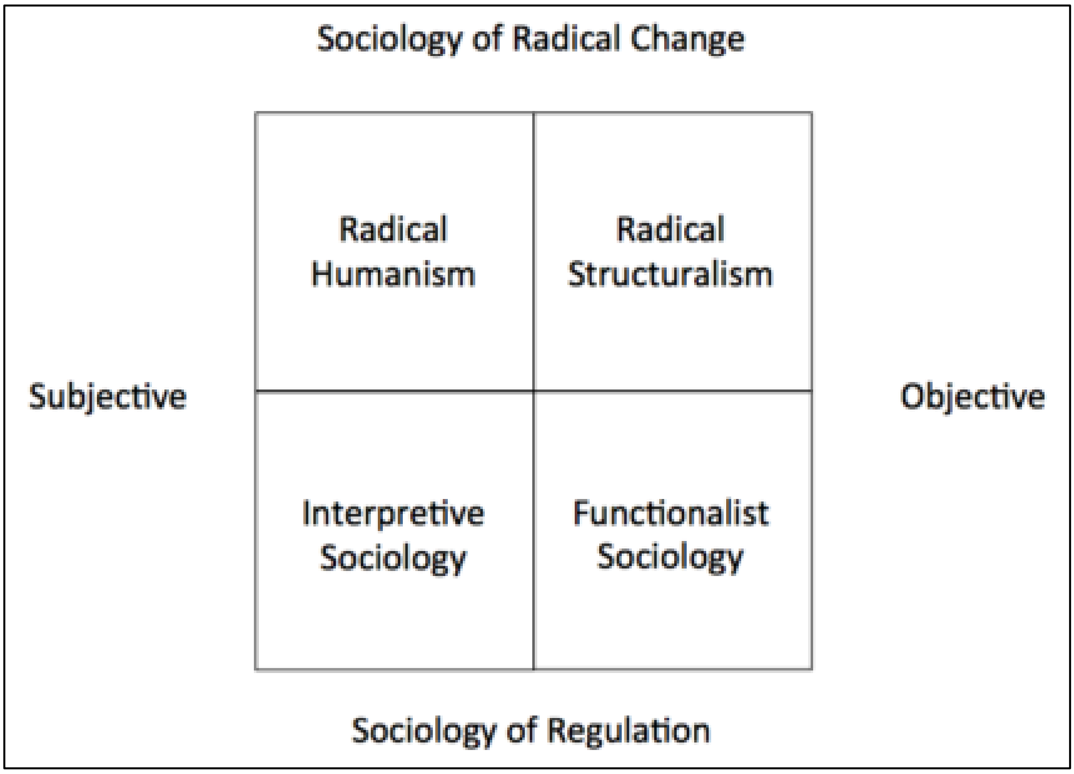

Figure 3.2: Classifications of research paradigms (Molnar & Korhonen, 2014)

Molnar & Korhonen (2014) argue that the social world is a subjective and inter-subjective experience when viewed through the interpretive paradigm lens. They point out that interpretive research deals with active participants rather than passive observers (Molnar & Korhonen, 2014). Social science investigates the social world based on implicit and explicit assumptions of its nature.

Figure 3.2 shows four paradigms that could be used to analyse social theory, namely the functionalist sociology, interpretive sociology, radical humanism and radical structuralism paradigm. Each one of the four paradigms has a different set of metaphysical assumptions about the nature of science, the subjective/objective dimension and the nature of society, which is the dimension of regulation versus radical change (Molnar & Korhonen, 2014).

The next section explains the research approach.

3.4.3. Research Approach

This research study adopted the notion from House (2018: 9) who argued that hypotheses could be generated or tested, and even if a research approach could be either inductive or deductive, the researcher cannot proceed without previous knowledge. House further argues that quantitative research outcomes are nothing but end-products of qualitative pre-decisions. Because of the above-stated arguments, the researcher decided to start with a deductive approach by following an existing theory as a lens to this study and later emerged into an inductive approach as the researcher discovered new interpretations of eLearning, cloud learning, low usage issues and how to curb these issues

Molnar & Korhonen (2014) argue that building interpretive theories tend to be more inductive in nature and the process is typically iterative, and after several revisions, a grounded and substantive theory is normally proposed as an outcome. They indicate that the theorist is often involved in the research as part of the events studied. The theorist experiences the structuring processes alongside the participants trying to preserve their representation. Molnar & Korhonen further argue that extant theories must be avoided as far as possible, as they will contaminate the researcher from thinking inductively.

Baxter & Jack (2008: 553) argue that using extant theories and frameworks in a deductive nature could limit inductive reasoning when exploring a phenomenon. Molnar & Korhonen argue that deductive theories are seldom rejected, or new theories intentionally built, and this could present a drawback towards research innovation. Stemming from these drawbacks, the researcher had to carefully consider which extant theory to use, and why it was important to use it. The reason for using an extant theory was to build a foundation for guiding this research study.

3.4.4. Research Strategy

This study used a single case study as a research strategy. The reason for using a single case was because the CFL division was unique to ComTek, and all eLearning activities were housed at this division during the time of the research study. During this time, CFL was extremely affected by the inadequate usage of eLearning showing low projections on usage graphs. It is advisable to use a single case study when an environment is unique, or the situation is extreme (Baxter & Jack, 2008: 549).

Rowley (2002: 16) points out that, case studies are used in both qualitative and quantitative research approaches and could involve a single case or multiple cases. Rowley says case studies are used as tools for the preliminary and exploratory phases of research as a basis to develop more structured tools for surveys and experiments. Case studies can be used in exploratory, descriptive and explanatory studies (ibid). The application of a case study as a research strategy can be difficult, as the researcher has to descriptively translate a current scenario into a piece of evidence that can claim to be worthwhile or contributing to the body of knowledge. Rowley indicates that, when using a case study, the researcher needs to be extra careful, as case studies have been argued to lack rigour and objectivity compared to other social research methods.

While there are negative perceptions about case studies, such as the lack of rigour and objectivity, there are also positive values in using cases studies. Rowley argues that case studies are well suitable for new research and in instances where existing theories seem inadequate to address issues. They are good for incremental theory building, for introducing a fresh perspective and for answering questions of “how” and “why” (Rowley, 2002: 16). A deeper and more detailed investigation can be done by answering questions such as “how” and “why”.

França, Araújo, & Silva (2013) used a qualitative case study to motivate software engineers. They managed to understand the complex interplay among motivational factors that they deem consistent from the main classic motivation theories. Russell & Schneiderheinze (2005: 39) also used a descriptive case study for developing an understanding of a complex social system. Table 3.3 defines different case types using the interpretation of Baxter & Jack (2008).

Table 3.3: Definitions of Different Types of Case Studies

Case Study Type	**Definition**
Explanatory	This case study is used to answer questions that explain complex causal links in real-life interventions that cannot be answered using surveys or experiments.
Exploratory	This case study is used to explore situations where there is no single set of outcomes and where the outcomes are unclear.
Descriptive	This case study is used to describe a phenomenon and the real-life context in which it occurred.
Multiple-case studies	This case study is used to explore differences between and within cases, with a goal of replicating findings across these cases.

Intrinsic	This case study is used when there is a genuine interest in a case, and the intent is to understand the case better. The purpose must not be to understand some abstract construct, generic phenomenon or to build a theory.
Instrumental	This cases study is used to accomplish something rather than to understand the particular situation. This study type is used to refine theory, and the case is of secondary interest but plays a supportive role in understanding things differently.
Collective	Collective case studies have similarities with multiple cases studies in both description and in nature.

(Baxter & Jack, 2008)

The next section defines data collection methods.

3.4.5. Data Collection Methods

This research study used multiple data collection methods, including unstructured interviews and open-ended questionnaires for primary data collection. Some of the primary data was derived and transcribed from eLearning documents obtained from inside the organization. The first set of questionnaires and interviews were directed to management and focused more on the operational strategy of their divisions regarding eLearning. The researcher also interviewed management informants to give a layout of how eLearning was structured at ComTek at the time of the research, and to also answer some key questions about norms, standards and policies of eLearning at ComTek.

While the above questions were directed to management, more questions regarding learning and system usage were directed to content designers, learners, trainers, facilitators and system administrators, using the same data collection methods including questionnaires and interviews. To allow more feedback and not to lose respondents' interests, the questions per session were limited to about ten to fifteen open-ended questions.

When using a case study as a research method, the researcher becomes an active agent in the process. The researcher must be able to ask the right questions based on the research propositions and must also be able to listen to and interpret responses (Rowley, 2002: 22). This means the researcher, in this instance, must have a sound grasp of the research propositions and questions to approach the study without bias of any sort (ibid).

Rowley speaks more about propositions relating to theory building, hence the propositions are tied to the research questions as hypothesis in a positivistic research paradigm. In this research study the researcher only brings in propositions at the end of the research showing more of an inductive nature of research. So the researcher does not interrogate the propositions which are built as a result of this study. Case studies draw evidence from multiple sources of information including documents, archival records, interviews, direct observation, participant observation and physical artefacts (Rowley, 2002: 17).

These multiple sources of information require different methods of interrogation and could lead to different insights with their own strengths and weaknesses. The key principles for collecting data are:

- Triangulation – The use of evidence from multiple sources to corroborate facts and findings.
- A case study database – This database stores case notes, documents, interview notes and transcripts, and the data analysis document.
- A chain of evidence – The report must make appropriate citations to documents and interview sections in the case study databases upon which it draws.

(Rowley, 2002: 23)

The next section describes the ethics that were considered during this research study.

3.4.6. Ethical Considerations

In this research study, an ethical clearance application process was followed with the university's ethics committee, whereby the researchers supervisor from the university and the researcher at hand signed an agreement on the protection of participants and any intellectual property that formed part of the research study. The organization for which the research was carried out at, also signed a request for information (RFI) form emphasising privacy and confidentiality. All participants and respondents remained anonymous, and they participated in the research study at their own will. The researcher's data collection tools also stated the ethical considerations which protected the participants.

The implementation and use of educational technologies cannot be separated from the social, political and ethical contexts wherein they are developed and used (Ellaway, Pusic, Yavner, & Kalet, 2014: 388). This made it is necessary for the study to reflect on ethics. According to Artífice, Sarraipa, Jardim-Goncalves, Guevara, & Kadar (2017: 1565), qualitative research considers three ethical principles, which are respect for participants, beneficence and justice. Respect of participants involves treating people as autonomous agents, protecting individuals who have diminished autonomy and using informed consent. Beneficence includes protecting respondents from harm while maximising benefits and assessing risks. Justice involves the impartial distribution of burdens and benefits during the selection of subjects (Barbosa, Cunha, Moura, & Margaria, 2017).

Mayende et al. (2016: 98) classify ethics into four basic categories being meta-ethics, descriptive ethics, normative ethics and applied ethics. They indicate that meta-ethics considers the nature of ethical properties, statements, attitudes and judgments. Descriptive or comparative ethics considers people's beliefs about morality. Normative ethics considers the philosophical ethics used in investigations involving people's actions and their morality in speaking. Applied ethics has to do with the philosophical examination of morals. Mayende et al. postulate that ethical considerations include minimising harm, respecting autonomy, protecting privacy and offering reciprocity. These are explained next.

Mayende et al. (2016: 99) define minimising harm as building trust with informants during and after the research study. They point out that respecting autonomy means allowing participants to decide whether they want to participate or not. They say the participants, or the organization researched, will sign consent forms before data are collected. Protecting privacy means data confidentiality is made a priority and includes not using the participants or an organization's real names. Mayende et al. define offering reciprocity as a way of giving informants enough time for feedback as the researcher relies on the informants to gain access to this data.

Artífice et al. (2017) define the declaration of Helsinki as one other international ethical codes standard and professional practice. The declaration of Helsinki was developed by the world medical association and comprises principles regarding human experimentation and research on human material and data. The first version was published in 1964, followed by other versions of 1975, 1983, 1989, 1996, 2000, 2008, and 2013 (Artífice et al., 2017: 1565). The declaration of Helsinki involves the following aspects:

- Risks, burdens and benefits – Risks and burdens of a study must be compared to the foreseen benefits for individuals and groups involved and the target population that they represent.
- Vulnerable groups and individuals – These are groups of individuals that should be protected, and the result of the research must benefit the group.
- Scientific research and research protocols – Research involving people must be subject to scientific principles, and the research protocol must contain a description and a justification.
- Research ethics committees – This is a committee that comments, guides and approves research protocols. This committee considers the legislation of the country of the research while considering international norms and standards. They monitor the study if necessary.
- Privacy and confidentiality – This constitutes a voluntary consent that can be granted by research subjects or participants and can sometimes be granted by family or community leaders through consultation if necessary.
- Informed consent – Informing human subjects or participants about aims, methods, sources of funding, any conflicts of interest, institutional affiliation of the researcher and the benefits and risks of the study. The participants must also be informed about their right to withdraw from the study without redress.
- Use of placebo – This must be avoided and also not be abused.
- Post-trial provisions – Post-trial access provisions must be allowed for participants who still need and think intervention is necessary and beneficial during the trial.
- Research registration and dissemination of results – The research results must be registered in a public database. It is the researcher's responsibility to make the results public. Researchers, sponsors, editors and publishers bear the ethical responsibility of disseminating research results.

(Artífice et al., 2017)

Artífice et al. (2017: 1566) further describe the Nuremberg code, the code of professional ethics of the Association for Educational Communication Technology (AECT), the IEEE code of ethics, and the Software Engineering Code of Ethics and Professional Practice. They argue that the AECT code includes protection of privacy and personal integrity of an individual, protection from prejudicial situations to health, safety, and protection from unethical encounters caused by technology.

The Software Engineering Code of Ethics and Professional Practice involves ethical principles about the public, the client and the employer, the product, judgment, profession, colleagues and self (Artífice et al., 2017: 1566). The principles indicate that professionals must act accordingly considering public interests. Where software is involved, it should be approved only when it is safe, designed according to specifications, passed tests, does not diminish quality of life, does not diminish privacy, or cause harm to the research environment (ibid).

Artífice et al. argue that, there must be integrity of data when developing products and professionals must always consider ethical issues when working on projects. They define the IEEE code of ethics as concerned with the safety, health and welfare of the public, to treat all with honesty and not to discriminate them, and to avoid injury to others as well as their property, reputation, or employment by false or malicious action.

The researcher's argument that online or virtual communities can be used to conduct qualitative research, creates ethical challenges because of the persistence and traceability of quotes, the sensitive data content, and the impact between involved participants and the researcher, as Roberts (2015: 315) guides. To correct this, online ethics had to include ethical approval from an ethics review body prior to the research. This ethical approval included a reflection of the proposed research methodology, privacy protection where applicable, and also protection from harm that could be caused to participants during the time of the research study. Ethical research protects research participants from potential harm including physical, social, psychological, economic and legal harms (Roberts, 2015: 315).

Barbosa et al. (2017) also used signed consent forms to assure anonymity, confidentiality of data, and the right for the subjects to interrupt or withdraw from the study anytime when they feel like. Barbosa et al. (2017) used similar ethical considerations mentioned by Artífice et al. (2017) and Roberts (2015), which include respect for persons, beneficence and justice.

Roberts shows an example in his research of ethical issues that could go wrong, such as the postings of human papillomavirus vaccine on the public internet to primarily American, Australian and Canadian female adolescents and young adults (Roberts, 2015: 16). This bypasses parental consent and could cause harm to these adolescents.

In the next section the researcher explains the research sample.

3.4.7. Research Sample

The sample universe for the case study at the time of the research project was ComTek a telecommunication organization based in Pretoria, South Africa. From the sample universe the researcher had to derive a representative research sample to represent the sample population or universe. To select the participant sample, some inclusion criteria were used to filter the population. The inclusion criteria involved identifying the owners of the eLearning systems. These are the decision makers.

Identifying individuals who manage these systems, those who use the system to write assessments, those who design courses, and those who fall within the user criteria of sample assessments provided for the study. A minimum of 30 and a maximum of 60 participants were used as an assumed sample size. From both the interviews and the interview-representative questionnaires sent, 39 participants responded, making the working sample size 39.

The sample was a small idiographic sample to its population. This sample was representative enough as they conform to same usage standards and policies of ComTek, and are typical ComTek employees where most are from the CFL (Centre for Learning) department where eLearning is hosted and managed. ELearning decision making is housed in this department.

Categories of people included in the sample were content designers/authors/content developers, trainer/facilitator, scheduler/system administrator, IT partner/system architect, team manager/ strategic partner, business analyst/subject expert, vendor/service provider, business owner/customer and learner/trainee. The titles here considered alternative names based on naming preference. An example is a learner could be referred to as a trainee, and at the same time, a system administrator could be a scheduler.

Senior management participants were engaged through preliminary interviews. The managers then engaged their direct reports, who then engaged their operational staff members. The researcher then engaged participants via email, interviews, and open-ended questionnaires. Email advertising was used, no incentives were proposed, and snowball sampling was used as an extended sampling approach as senior managers gave referrals to their direct reports.

There are different ways of selecting a sample; some examples are random/convenience sampling strategies and purposive sampling strategies. Sibona & Walczak (2012: 3511) point out that purposive sampling is a sampling approach where members have to conform to certain selection criteria. This research study used purposive sampling as a sampling strategy. While the researcher had decided to use purposive sampling an understanding of other sampling strategies are portrayed; however, focusing more on unpacking purposive sampling. The following section starts by explaining random and convenience sampling approaches.

3.4.7.1. Random/Convenience Sampling Strategies

Robinson (2014: 32) defines random sampling as a way of randomly selecting a list of cases from a sample universe population and is usually used in opinion polls and social research surveys. Robinson indicates that the sample universe is people in general. A typical example of random selection methods includes randomly selecting phone numbers from a phone book or addresses from an electoral roll. Robinson further defines convenience sampling as a strategy used to locate nearby sources of potential participants, and it considers their proximity and willingness to participate.

Convenience sampling strategies are mostly used in quantitative studies but sometimes used in qualitative studies (Robinson, 2014: 32). Robinson argues that in most cases in psychology studies, researchers indicate they used random sampling, while they did not look at the sample universe population but took advantage of the convenience in proximity and the willingness of participants to participate. According to him, this is convenience sampling.

3.4.7.2. Purposive Sampling Strategies

Robinson (2014) argues that purposive sampling is a non-random strategy that ensures that a particular sample of cases within a sampling universe is represented in the research project. Robinson claims that purposive sampling considers possibilities that certain participants could have a unique, different or important perspective towards the phenomenon at hand, such that they must be included in the sample. In addition to the latter, Watts (2014: 7) argues that the representative sample for purposive sampling must be those who conform to the themes of the research study rather than to only be relative to the overall data corpus.

Robinson (2014: 31-34) gives examples of purposive sampling strategies like stratified, cell, quota and theoretical sampling, and these are used in multiple case studies. Other examples of purposive sampling strategies are significant case, intensity, deviant case, extreme case and typical case sampling, and these are best used in single case studies.

- Stratified Sampling – A purposive selection of categories or groups of cases is done to make sure they are represented in the final sample. The sample is then divided or stratified into categories and allocated target numbers. The selection can be based on the geographical location, demographics, socio-economic considerations, and physical or psychological considerations. There must be a clear rationale that the groups differ meaningfully.
- Cell Sampling – Cell sampling is just like stratified sampling but differs with the fact that cell sampling uses discrete and non-overlapping categories while stratified sampling cells might overlap.
- Quota Sampling – Quota sampling is more flexible than both stratified and cell sampling. Instead of a fixed number of cases per category, it specifies the minimum number of cases required per category on a series of categories. The quotas are monitored during the process of sample collection. The numbers here might grow as and when it becomes necessary.
- Theoretical Sampling – Theoretical sampling takes place during the collection and analysis of data following sampling and provisional analysis of some data. Originally, this sampling strategy was meant for grounded theory, but its principles apply to any other method. Theoretical sampling involves locating cases from new groups of participants or new locations or restructuring an existing sample into a new set of categories that might have emerged during analysis or replacing cells and quotas.
- Significant Case Sampling – Significant case sampling strategy selects participants based on their historical or theoretical significance.
- Intensity Sampling – Intensity sampling strategy locates an insightful, comprehensive, articulate, honest and information-rich case to use for theoretical insight.
- Deviant Case Sampling – Deviant case sampling sought participants with the intention to explore the limits or problems intrinsic to a theory to test the theory or its constructs.

- Extreme Case Sampling – Extreme case sampling locates people who show an extreme or unusual behaviour, ability or characteristic to demonstrate the possibility of a phenomenon.
- Typical Case Sampling – Typical case sampling, or emblematic case sampling, or paradigmatic case sampling as others call it, selects a case precisely because it is a typical example of a theory or therapeutic application to illustrate best practice or theory exemplification.

(Robinson, 2014: 31-34)

Table 3.4 illustrates an approach that could be used for qualitative sampling. This table shows four points or steps from the research study of Robinson's research.

Table 3.4: The Four-Point Approach to Qualitative Sampling

	Name	**Definition**	**Key decisional issues**
Point 1	Define a sample universe	Establish a sample universe using inclusion and/or exclusion criteria	Homogeneity vs. heterogeneity, inclusion and exclusion criteria
Point 2	Decide on a sample size	Choose a sample size or sample size range considering ideal and practical assumptions	Idiographic (small) vs. nomothetic (large)
Point 3	Devise a sample strategy	Select a purposive sampling strategy and specify categories of people to be included in the sample	Stratified, cell, quota, theoretical strategies
Point 4	Source the sample	Engage participants from the target population	Incentives vs. no incentives, snowball sampling varieties, advertising

(Robinson, 2014: 26)

Point 1 to point 4 of qualitative sampling in Table 3.4 is explained next.

- Define a sample universe – First, define the sample universe or target population that might be legitimately sampled in an interview study, then delineate this target population using a set of inclusion and/or exclusion criteria. The inclusion criteria define the attributes that cases must possess and the attributes that might disqualify a case from the study.
- Decide on a sample size – In qualitative studies, the sample size is influenced by both theoretical and practical considerations. There must be a provisional decision on sample size from the initial stage in the design. The provisional sample size must not be a fixed number, but instead an approximate sample size ranges with a minimum and a maximum.
- Devise a sampling strategy – This is the deciding strategy on how to include and exclude cases from the sample. Strategies to use can be categorised as random/convenience sampling strategies or purposive sampling strategies.
- Source the sample – after deciding on a population and a provisional sample, the researcher now has to start doing the real work of sourcing the participants from the real world. This involves skills and ethics, informing the participants what the study entails, its aims, sensitivity, its voluntary nature, anonymity protection and other important aspects of concern.

(Robinson, 2014: 35)

The sample universe in this study was ComTek, and the source sample was selected from the population of ComTek's CFL division and other ComTek divisions with an interest in eLearning, like the HR and IT divisions. In this study, participants were referred to as learners because they hold the role of learners and trainees regarding learning.

This study used purposive sampling. The reason for using purposive sampling was that learners who were perceived to be hands-on and those who have had recent exposure to ComTek's eLearning system during the research were more willing to respond to questions and provide more accurate answers. Table 3.5 is an adaption of the sample size using the guidelines from Robinson's four-point approach.

Table 3.5: The Sample Size Using the Four-Point Approach to Qualitative Sampling

	Step	Strategy	Criteria
Point 1	Define a sample universe	ComTek was the sample universe for the case study at the time of the research project.	Inclusion criteria were used to filter the sample. The inclusion criteria involved identifying the owners of the eLearning systems. These are the decision makers. Identifying individuals who manage these systems, those who use the system to write assessments, those who design courses, and those who fall within the user criteria of sample assessments provided for the study.
Point 2	Decide on a sample size	A minimum of 30 and a maximum of 60 participants were used as an assumed sample size. From both the interviews and the interview-representative questionnaires sent, 39 participants responded, making the working sample size 39.	The sample was a small idiographic sample to its population. This sample was representative enough as they conform to same usage standards and policies of ComTek, and are typical ComTek employees where most are from the CFL (Centre for Learning) department where eLearning is hosted and

	Step	Strategy	Criteria
			managed. ELearning decision making is housed in this department.
Point 3	Devise a sample strategy	Categories of people included in the sample were: Content Designers/Author/ Content Developer Trainer/Facilitator Scheduler/System Administrator IT partner/System Architect Team Manager/ Strategic partner Business Analyst/ Subject expert Vendor/Service provider Business Owner/ Customer Learner/Trainee	Purposive intensity sampling strategy was used, with a blend of purposive significant case sampling.

	Step	Strategy	Criteria
		The titles here consider alternative names based on preference. An example is a learner could be referred to as a trainee, and at the same time, a system administrator could be a scheduler.	
Point 4	Source the sample	Senior management participants were engaged through preliminary interviews. The managers then engaged their direct reports, who then engaged their operational staff members. The researcher then engaged participants via email, interviews, and open-ended questionnaires.	Email advertising was used, no incentives were proposed, and snowball sampling was used as an extended sampling approach as senior managers gave referrals to their direct reports.

Guideline extended from (Robinson, 2014)

Table 3.5 shows the sample frames used in this research study. The roles illustrated in the table were used interchangeably in some instances to facilitate different activities. For example, the content designer, author, and content developer roles were equally used for authoring and publishing content, while the trainer and facilitator roles were equally used for teaching learners. Table 3.6 elaborates on the demographics and the size of the sample.

Table 3.6: Total Number of Responses

	Number of respondents				**Responses Rate**
Role	**Batch 1 (n)**	**Batch 2 (n)**	**Batch 3 (n)**	**Total (n)**	**Total (%)**
Content Designers/Author/ Content Developer	0	1	5	**6**	15.39%
Trainer/Facilitator	1	2	1	**4**	10.26%
Scheduler/System Administrator	2	2	2	**6**	15.39%
IT partner/System Architect	1	0	3	**4**	10.26%
Team Manager/Strategic partner	1	4	1	**6**	15.39%
Business Analyst/Subject expert	1	0	1	**2**	5.13%
Vendor/Service provider	0	0	0	**0**	0%
Business Owner/ Customer	0	0	2	**2**	5.13%
Learner/Trainee	2	2	5	**9**	23.08%
Total Responses	**8**	**11**	**20**	**39**	**100.03%**

Table 3.6 depicts the sample respondents representing the population. The sample was divided into three batches and approached at different times, asking them similar questions that were articulated differently each time. The total number of respondents was 39. From the 39 respondents, 8 were first engaged with, 11 were next, and then 20 were engaged during the last round of data collection. The reason for using batches to collect data from respondents was to triangulate and cater for the convenience of respondents during their busy schedules, and for time convenience.

3.5. Data Analysis

The researcher opted to use thematic analysis to analyse the data. Thematic analysis was chosen to help the researcher to understand the links between datasets, how they relate and how they represent the engagement of learners with their eLearning environment. In the thematic analysis, open coding was used to build and discover new sets of codes that contributed to new knowledge about eLearning low usage factors, requirements to improve eLearning, requirements for cloud computing and requirements for content delivery. Qualitative data can be analysed and synthesised using open coding to distil, identify similarities and sort them to describe a phenomenon (Barbosa et al., 2017). While the choice was to use thematic analysis for this research study, there were also other methods that could have been used to analyse the data, and some of these are tabled in Table 3.7.

Table 3.7: Possible Qualitative Analysis for Research Syntheses

Analysis	**Description**
Constant comparison analysis	Uses a systematic approach to reduce sources to codes inductively and then develop themes from these codes. The themes can be used as headings and subheadings in the literature review section.
Classical content analysis	Uses a systematic approach to reduce sources to codes deductively or inductively and then count the number of codes
Word count	Counts the total number of keywords used, or the number of times a particular word is used during a within-study or a between-study literature analysis
Keywords in context	Identifies a keyword and uses the surrounding words to understand the meaning of this keyword in one source or across multiple sources
Domain analysis	Relationships between symbols and referents are used to identify domains in one or multiple sources
Taxonomic analysis	Creates a classification system that uses pictorial representations like flow charts to categorise domains, which in turn helps the reviewer to understand the relationships among these domains

Analysis	**Description**
Componential analysis	Discovers the differences of sub-components of domains using metrics and tables
Theme analysis	Searches for relationships among domains and how they are linked to the overall cultural context
Discourse analysis	Useful for reviewing literature review sections of empirical articles, literature review articles, theoretical or conceptual articles and methodological articles. It selects representative or unique segments of language use like several lines of an interview transcript and examines the selected lines in detail for rhetorical organization, variability, accountability and positioning.
Secondary data analysis	Analyses pre-existing sources or artefacts
Membership categorization analysis	Examines the communication of research terms, concepts, findings and categories among authors in their works
Semiotics	Uses talk and text as systems of signs assuming that no meaning can be attached to a single term and shows how these signs are interrelated for creating and excluding specific meanings
Manifest content analysis	Uses objective, systematic and empirical means to describe observed aspects of communication
Qualitative comparative analysis	Uses a systematic approach to analyse similarities and differences across sources used for theory building and assesses the causality in findings across these sources. This allows the reviewer to make connections between previously built categories, test them and develop them further.
Narrative analysis	Uses stories to give meaning to research findings, treats data as stories and enables reviewers to reduce the data to a summary.

Analysis	Description
Text mining	Analyses text from multiple sources to discover and capture semantic information.
Micro interlocutor analysis	Analyses information from focus groups of researchers, scholars, and practitioners about which participants responds to each question, the order that each participant responds, the characteristics of the response and the nonverbal communication used.

(Onwuegbuzie, Leech, & Collins, 2012: 12)

While there are various qualitative data analysis methods to use in research, there are also different data sources used to collect data from, and the researcher must ensure that the correct qualitative techniques are used to analyse this data. Next, Onwuegbuzie et al. (2012: 11) define the relationship between data sources and possible qualitative techniques to use when analysing this data.

Table 3.8: Relationship between Data Source and Qualitative Technique

Data Source	Qualitative Technique
Talk	Discourse analysis, narrative analysis, semiotics, qualitative comparative analysis, constant comparison analysis, keywords-in-context, word count, membership categorisation analysis, domain analysis, taxonomic analysis, componential analysis, theme analysis, classical content analysis
Observations	Qualitative comparative analysis, constant comparison analysis, keywords-in-context, word count, domain analysis, taxonomic analysis, componential analysis, theme analysis, manifest content analysis
Drawings/ Photographs/ Video	Qualitative comparative analysis, constant comparison analysis, word count, manifest content analysis, secondary data analysis
Documents	Semiotics, qualitative comparative analysis, constant comparison analysis, keywords-in-context, word count, secondary data analysis,

	domain analysis, taxonomic analysis, componential analysis, theme analysis, classical content analysis, text mining

(Onwuegbuzie et al., 2012: 11)

The analysis of a case study is based on examining, categorising and tabulating evidence to assess whether the evidence answers the research questions of the study. The strategy is to analyse data using the questions that have shaped the data collection of the study, and encapsulate the objectives of the study. A judgement must be attained on whether the end qualitative propositions are representable by the scientific evidence. Braun & Clarke (2006) indicate that case studies use all relevant evidence, while the data analysis considers all major and rival interpretations, addresses the most significant part of the study, and draws on the researcher's prior expert knowledge in the area of study.

This study used thematic analysis and the phases that the researcher followed to analyse the data are discussed below. The phases of thematic analysis involve:

- Familiarising yourself with the data;
- Generating initial codes;
- Searching for themes;
- Reviewing themes;
- Defining and naming themes; and
- Producing the report.

(Braun & Clarke, 2006)

Generating initial codes depends on whether the themes are data-driven or theory-driven. The theory approach codes the data with specific questions that the researcher has in mind (Braun & Clarke, 2006). The thematic analysis comprises elements where claims are required to be supported with textual evidence that requires the identification of themes within the textual evidence and results in a highly interpretive exercise (Guest, MacQueen, & Namey, 2012: 17). The next section elaborates on the credibility of this research study.

3.6. Credibility of the Research

Barbosa et al. (2017) discuss reliability, replicability, validity and credibility as the extent to which research results can match reality. In qualitative research, researchers often use the word credibility to describe the quality of their research work. This study also referred to the quality of this work using the word credibility.

The credibility of this research study was cultivated by data source triangulation where multiple source-types of data were used to attain two goals, namely representation and legitimation of data as guided by Onwuegbuzie, Leech, & Collins (2012: 8). In this research study, multiple sources of data were used in conjunction with multiple data collection methods. Hussein (2009: 3) refers to using multiple data collection methods as the use of methodological triangulation. To address representation, Onwuegbuzie, Leech, & Collins (2012) refer to representation as the ability to extract the adequate meaning of information, while legitimation is accounted for by using multiple data source types.

This study achieved representation by using between-source triangulation where the feedback from unstructured interviews, open-ended questionnaires and documents were converged to show the same results of the inadequate usage of eLearning. It also showed the need to improve the current eLearning environment, and the possible causes of low eLearning usage that are illustrated in the data analysis chapter.

The researcher also used between-source complementarity triangulation where Atlas CAQDAS (Computer-Aided Qualitative Data Analysis Software) software was used to illustrate the link between the three data sources and to clarify the information obtained through the data analysis process. By using an inductive approach in the research study for building theory, the researcher discovered new information during the data gathering process, which could have led to low usage of eLearning. Some of this new information was well used for between-source expansion to expand the range of causes of low eLearning usage.

The researcher followed Onwuegbuzie et al.' s guidelines below where they explained that multiple data sources could help improve representation. They describe between-source triangulation, between-source complementarity, between-source development and between-source expansion.

- Between-source triangulation seeks to converge and corroborate information from different source types.
- Between-source complementarity seeks to elaborate, enhance, illustrate and clarify information from one source type with information from another source type.

- Between-source development uses data from one source type to help inform data from another source type.
- Between-source expansion seeks to expand the breadth and range of information using different source types for different pieces of information.

(Onwuegbuzie et al., 2012: 8)

While representation has to do with the ability to extract the adequate meaning of information, legitimation refers to the credibility, trustworthiness, dependability, confirmability and transferability of syntheses made. Legitimation can be accounted for by using multiple data source types through:

- between-source triangulation, which refers to assessing the level of convergence and corroboration of information extracted from the different data source types; and
- between-source initiation, which refers to discovering inconsistencies and contradictions that lead to reframing the syntheses made.

(Onwuegbuzie et al., 2012: 8)

Hussein (2009: 3) points out that triangulation aims to reveal complementarity, convergence and dissonance among findings. Hussain shares the types of triangulation:

- Data triangulation or data sources triangulation – Multiple data sources are used in the same study for validation purposes. It is argued that there exist three types of data triangulation, namely time, space and person. These reflect variations on the time the data was collected, the people involved at the time and the research setting during the time.
- Theoretical triangulation is using multiple theories in the same study to support or refute findings using multiple lenses to interpret the problem. The purpose is to provide a broader and deeper understanding of the research problem.
- Investigator triangulation is using more than two researchers in any of the research stages of the same study and using multiple observers, interviewers, or data analysts in the same study for confirmation purposes.
- Analysis triangulation or data analysis triangulation is using more than two data analysis methods in qualitative and quantitative paradigms in the same study for

validation and completeness purposes. Validation is done by using more than two methods to analyse the same set of data.

- Methodological triangulation is using more than two methods to study the same phenomenon under investigation. It is used in social sciences and occurs at the level of research design and data collection.

(Hussein, 2009: 3-4)

Barbosa et al. (2017), Onwuegbuzie et al. (2012), and Hussein (2009) collectively discuss research credibility and representation through triangulation. Rowley (2002: 20) discusses generalisation. Rowley argues that generalisation is established when a theory has appropriately informed a case study, and the case study can add to that theory. Generalisation is mostly known for quantitative studies; however, by generalisation in qualitative case studies, Rowley is not referring to statistical generalisation. Rowley argues that generalisation here is controlled by analytical results extended from a previously established theory of which the empirical evidence about the study can be compared to and seen to add to the theory.

Onwuegbuzie et al. (2012) elaborate on credibility, trustworthiness, dependability, confirmability and transferability of synthesis, while Barbosa et al. (2017) mention reliability, replicability, validity and credibility. In the researcher's view, based on this research work and research work by others, the elements of credibility in qualitative studies vary depending on the researcher's view and the investigation at hand, and could still be argued and innovated further. The following section is a discussion and summary of the chapter at hand.

3.7. Discussion and Summary

This chapter discussed the research process that was followed to conduct the research. Baxter & Jack (2008: 555) indicate that in a qualitative research process, the research questions and propositions must be clearly written and substantiated. The case design must be appropriate, the right purposive sampling strategies used, and the data must be systematically managed and correctly analysed. Using Baxter & Jack's guidelines, the researcher ensured that the propositions derived at the end of the research study had a relationship with the research questions to address. The propositions could remain true or false until tested empirically.

Prajapati et al. (2015: 284) recommend that good research must be systematic, logical and empirical. In this research study, the researcher made sure that the series of events were logical, starting with empirically articulating the problem, asking the right questions, gathering literature, finding the relevant theory to guide the study, gathering data, and analysing the data. Similarly, Tutunji (2015) emphasises literature review, research planning and data analysis. The researcher used Tutunji's guidance to make sure that the data was analysed accordingly using a planned approach and supported by the literature.

This research study was inductive in nature. An extant theory was used to help guide the research study, and the result was a conceptual framework illustrating a new way to derive understanding of low usage of eLearning in telecommunication organizations in South Africa. The researcher generated research questions from literature, collected data, analysed the data, and then derived a conceptual framework. At the end of the research study, the researcher derived propositions. The researcher used some elements of the research process by Halverson (2009: 86) as a guideline, where the process refers to an inductive research approach.

The researcher used qualitative methods to attain flexibility and dynamism with a more natural context. The advantages of using qualitative research are guaranteed researcher and respondent interaction, making the research feedback to also be guaranteed. The researcher did not use quantitative studies because of limitations such as data manipulation weaknesses, inadequate feedback, instrument error and the effort it might take to redirect questions to participants. Another research method the researcher could have used was mixed methods. Wiedemann (2013: 338) articulates that mixed methods overcome the shortfall of qualitative and quantitative research paradigms. Creswell (2009), House (2018), Wiedemann (2013) and Mayende et al. (2016) claim that mixed methods improve results, strength, overcome shortfalls of qualitative and quantitative methods, and increase completeness.

As the goal was only to build theory, understand human behaviour and to have in-depth understanding, the best research method to use was qualitative research methods. With qualitative research or with any research, there is a research design process to follow. Rowley (2002: 18) defines a research design as an action plan of how research moves from questions to conclusions. Rowley describes the components of a research design to be the research questions, propositions, unit of analysis, research purpose, theoretical context and interpreting findings. This study used some of Rowley's elements of research design and clearly identified the research questions, unit of analysis, research purpose, theoretical context, interpretation of the findings, and derived research propositions.

Every study is based on a research philosophy. Mayende et al. (2016: 97) point out that research philosophy can be classified into three categories, namely the design methodology and user centred design, social constructionism, and pragmatism. This research study followed a social constructivist philosophical approach where the aim was to explore, understand and interpret why the usage of eLearning tools for writing assessments are underutilised.

The research paradigm followed was an interpretive philosophical paradigm where the researcher required participants to be actively involved such that a more natural understanding of the research setting was reflected. Interpretive research deals with active participants rather than passive observers (Molnar & Korhonen, 2014). Lee & Hovorka (2015: 4919) refer to interpretation as the author/researcher's subjective text and understanding. What the informants/respondents/participants mean with their actions is only their understanding of a phenomenon, which is also subjective. This gives interpretive research its true meaning. Molnar & Korhonen also refer to interpretive research as being subjective.

ComTek's CFL (centre for learning) division had a unique function of housing and managing all learning activities for the organization during the time of the study. During this time, CFL was extremely affected by the problem of the inadequate usage of eLearning, showing low projections on usage graphs. For this reason, the researcher decided to embark on a single case study as a research strategy to examine the cause of this low usage projections. Baxter & Jack (2008: 549) point out that it is advisable to use a single case study when an environment is unique, or the situation is extreme. When using a case study, however, the researcher needs to be extra careful, as case studies have been argued to lack rigour and objectivity compared to other social research methods (Rowley, 2002: 16).

For data collection, multiple data collection methods were used, including unstructured interviews and open-ended questionnaires for primary data collection. Some of the primary data was derived and transcribed from eLearning documents obtained from the organization. The researcher also interviewed management informants to give a layout of how eLearning was structured at ComTek during the time of the research. While management was interviewed, more questions to do with eLearning and system usage were directed to content designers, learners, trainers, facilitators and system administrators, using the same data collection methods including questionnaires and interviews.

When conducting research, there must be ethical procedures accounted for. In this study, an ethical clearance process was followed with the university where the institution and the researcher signed an agreement on the protection of participants and any intellectual property that formed part of the research study.

This research study used purposive sampling as a sampling strategy. There are different ways of selecting a sample, some of which are random/convenience sampling strategies, and purposive sampling strategies. Sibona & Walczak (2012: 3511) point out that purposive sampling is a sampling approach where members have to conform to certain selection criteria. The sample was divided into three batches and approached at different times, asking them the same questions articulated differently. The total number of respondents was 39. From the 39 respondents, 8 were first engaged with, 11 were next, and then 20 were engaged during the last round of data collection. The reason for using batches to collect data from respondents was to triangulate and cater time and for the convenience of respondents during their busy schedules.

To analyse the data, the researcher opted for the thematic analysis methods. The researcher decided to use thematic analysis to understand the links between datasets, how they relate and how they represent the engagement of learners with their eLearning environment. In the thematic analysis, the researcher used open coding to build and discover new sets of codes that contributed to new knowledge about eLearning low usage factors, requirements to improve eLearning, requirements for cloud computing and requirements for content delivery. Qualitative data can be analysed and synthesised using open coding to distil, identify similarities and sort them to describe a phenomenon (Barbosa et al., 2017).

The credibility of the research study was cultivated by data source triangulation where multiple source-types of data were used to attain two goals, namely representation and legitimation of data as guided by Onwuegbuzie, Leech, & Collins (2012: 8). Onwuegbuzie, Leech, & Collins (2012) refer to representation as the ability to extract the adequate meaning of information, while legitimation is accounted for by using multiple data source types. The researcher achieved representation by using between-source triangulation where the feedback from unstructured interviews, open-ended questionnaires and documents were converged to show the same results of inadequate usage of eLearning, the need to improve the current eLearning environment and the possible causes of low eLearning usage that are illustrated in the data analysis chapter.

The researcher also used between-source complementarity triangulation where Atlas CAQDAS (Computer-Aided Qualitative Data Analysis Software) software was used to illustrate the link between the three data sources and to clarify the information obtained through the data analysis process. By using an inductive approach in this research study for building theory, the researcher discovered new information during the data gathering process that could have led to the low usage of eLearning. Some of this new information was well used for between-source expansion to expand the range of causes of low eLearning usage. The next chapter presents and analyses the data.

CHAPTER FOUR
Data presentation and analysis

4.1. Introduction

This chapter presents and analyses the data. As the data was collected from various sources, it is necessary to first present the data according to the different sources that were used from which to collect the data. The first presentation and analysis are from questionnaire data, followed by document data and lastly, interview data. The chapter shows how thematic analysis and inductive coding style were used, often referred to as grounded analysis. In this type of analysis, the codes are generated directly from reading and thinking about the data, rather than only using deductive coding where themes and codes are pre-set.

In this chapter, the researcher discovered that the process of inductive coding is more like an upward spiral with an up and down twist. Just when the researcher thought that an understanding of low eLearning usage at ComTek was reached, more data was discovered as further analysis was done. The researcher learned that the inductive coding process was iterative and the initial codes were broken down into sub-codes. A code is a symbol that is applied to text to categorise the text and is related to the research questions and themes. Using inductive coding, the researcher showed connections between codes were built. Grounded codes are classified as tags, codes, categories and themes.

The steps that were followed here are useful to perform open and coaxial coding, to formulate initial code categories, and also to formulate sub-categories of the code categories. It was said earlier that a code must be related to the research questions and themes. This chapter addresses the main question and its subsequent sub-questions and creates code categories, codes and themes that relate to these questions. The code categories or classifications in this research study were the following:

- Category 1: Low usage rate influences
- Category 2: eLearning requirements
- Category 3: Content delivery requirements
- Category 4: Cloud computing requirements

The next sub-section presents and analyses questionnaire data. Subsequently, interview and document data are analysed.

4.1.1. Presentation and Analysis of Questionnaire Data

The data collected from questionnaires are presented and analysed. The data are categorised according to the following analysis themes: low usage influences, eLearning requirements, cloud computing requirements and content delivery requirements.

4.1.1.1. Low Usage Rate Influences from Questionnaire Data

The table below shows the responses about low usage influences.

Table 4.1: Low Usage Rate Influences

Respondent	Respondent's view
#1	… requires you to be on the organization network … access takes too long and is intermittent
#2	… system slow response when a large number of people are accessing the system at the same time

Respondent	Respondent's view
#3	… normally I don't get any problems when accessing assessments
#5	… don't have enough computers we can use to do assessments … sometimes take long to complete because we have to wait for one PC to be free and then we can complete
#6	… server issues … having to find the location of courses … downloading issues … not having the correct versions of software
#7	… have not really experience problems
#8	… not user-friendly
#9	… slow and often unresponsive … challenges with assessments are the poor quality of question formulation
#10	… login error … system is down at times
#11	… system response times were exceedingly slow … infrastructure was not set up to support a organization-wide load … user demand is high … system not available from outside the firewall/remotely for those employees who wish to complete the training in their own time

Table 4.1 illustrates the respondents' views on the problems perceived at ComTek and to what they amount. Some of the respondents say it takes too long to access assessments on the organizations eLearning system. Others also indicate that learners' have to be on the organization's network to access the assessments, which in turn creates an inconvenience for

them. There is also a large number of learners accessing the system, and this makes it too slow, according to respondents. Some respondents believe there are not enough computers reserved for them to use for accessing eLearning. There are also other technical-related problems such as server problems, software version problems, system downtimes and login problems.

Among the myriad of problems, there are also infrastructure design issues. Respondents also say that the systems are not user-friendly and the assessments were poorly designed. To further understand the respondents' description of problems, the researcher had to further analyse the responses by examining the word usage in these responses. Using the Atlas QAQDAS tool, the network diagram in Figure 4.1 resulted. In this network diagram, the researcher linked the responses from the different respondents by the words they used in their sentences. It is necessary to do this to get an extensive feel of the responses and reduce any bias.

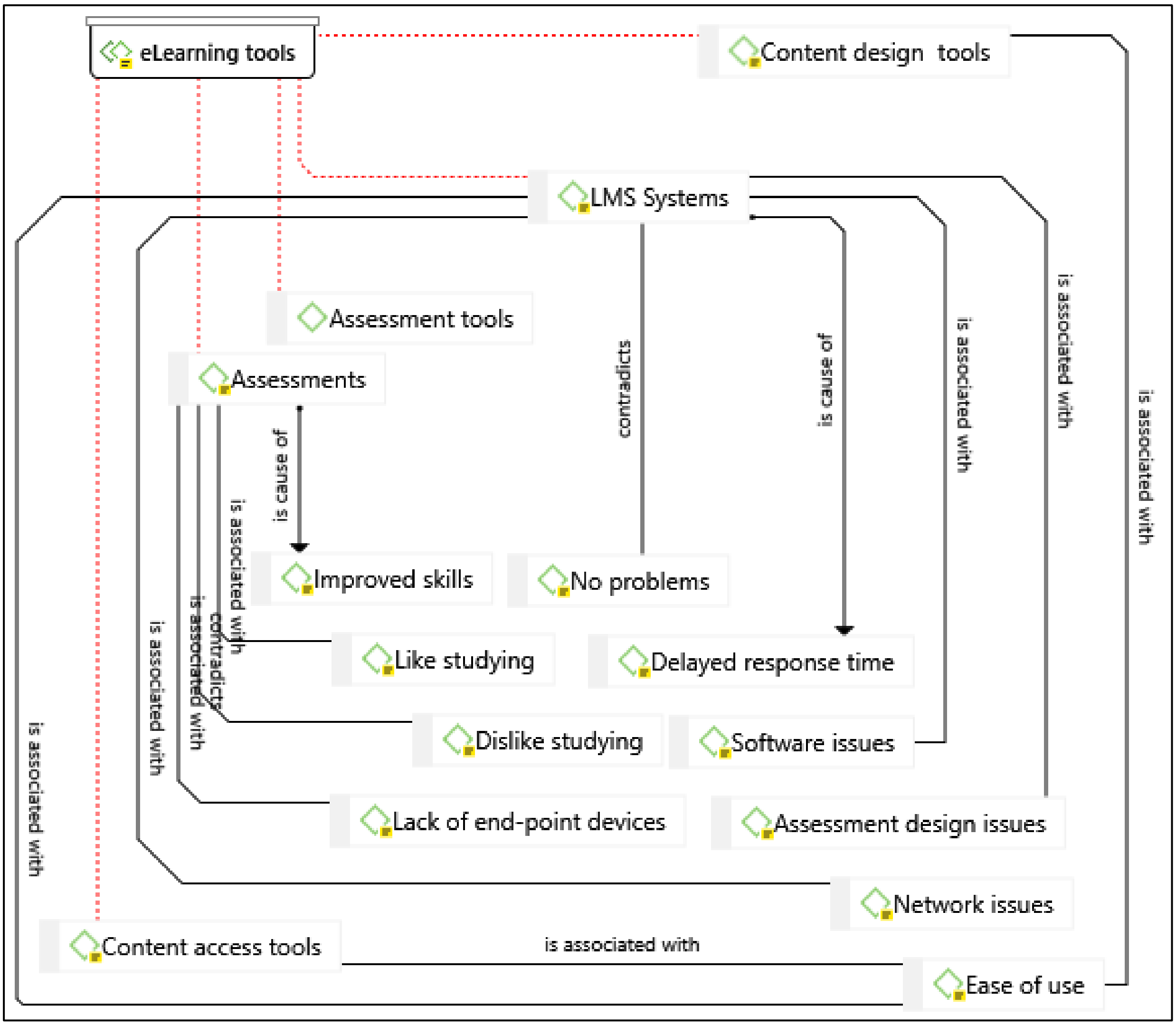

Figure 4.1: Network diagram for low usage rate influences

Usage rate or participation in eLearning assessments is linked to the eLearning tools used in the organization. Figure 4.1 categorised the eLearning tools as the LMS system, content design tools, assessment tools and content access tools assessments. Assessments are classified as tools for the sake that the learners will use the outcome of these assessments to determine their level of knowledge and skills. The Atlas QAQDAS software was used to do a network view of these eLearning tools to discover how the words from one participant's responses link to the other participants' responses.

By this method of analysis, the researcher discovered that there are actually more systems than anticipated by the research. In this research, the researcher focused more on the LMS system as a tool for eLearning; however, more tools like content design tools, content management tools, content access tools and assessment tools seemed to arise in the words the respondents were using. When linking the words, the researcher came across common words used that translated into common codes when grouped. The analysis of content design tools and content access tools resulted in a common code, named “Ease of use”. The analysis of assessments resulted in the codes “improved skills, like studying, dislike studying, and lack-of-endpoint devices”. The analysis of the LMS systems resulted in the codes, “no problem, delayed response time, software issues, assessment design issues, ease of use, and network issues”.

Table 4.2 summarises the above narrative and shows the codes generated from the low usage rate influences theme.

Table 4.2: Codes Generated from Low Usage Rate Theme (Questionnaire Data)

Primary Codes	**LMS systems**	**Content design tools**	**Content access tools**	**Assessments**
Secondary Codes	No Problem	Ease of Use	Ease of Use	Improved Skills
	Delayed Response Time	Improved Skills		Like Studying
	Software Issues			Dislike Studying
	Assessment Design Issues			Lack-of-Endpoint Devices
	Ease of Use			
	Network Issues			

4.1.1.2. ELearning Requirements from Questionnaire Data

Table 4.3 shows the responses about eLearning requirements.

Table 4.3: eLearning Requirements Responses

Respondent	Respondent's view
#1	… the opportunity to learn at your own pace in the comfort of your preferred space … access anytime anywhere … opportunity to access new information quickly and conveniently
#2	… on-time learning … access anytime anywhere
#3	… access anytime anywhere … ability to reach a large number of people … access to computers … access to eLearning content
#4	… convenient … office access … have improved my Photoshop skills
#5	… keeps us informed about latest product we are offering … access on computer or mobile device on the Internet/online … has improved my knowledge about new offerings, example summer campaign etc.
#6	… prefer a hard copy to make notes, re-read, make sense of what I am reading

Respondent	Respondent’s view
	… CDs or learning software at home … access from various sources and not just one source
#7	… convenient … CDs or learning software … access from CDs or learning software at home … access anywhere, learn at own pace
#8	… people need to be educated about the benefit … must not be seen as been pushed to people throats … access in a classroom setup
#9	… computer literate and read with understanding and insight … positive orientation towards lifelong learning … access anytime anywhere … work at my own pace … learning is always available … not have to travel long distances to colleges
#10	… convenient … access from anywhere … access from computer or mobile device on the Internet/online
#11	… more accessible and more flexible … effective blended learning strategy

Respondent	Respondent’s view
	… improved performance … access anytime anywhere … appropriate interaction, practice … on-demand access and availability

In the eLearning requirements table above, respondents indicate that it is necessary for them to learn at their own comfortable time and space. They want to access information anytime and anywhere, yet quickly and conveniently. While accessing learning information or learning content anytime anywhere might be convenient for learners, there are also disadvantages. In the literature, Melicheríková & Busikova (2012) indicate that with less or no personal contact, eLearning could pose a disadvantage of the low motivation of learners, but could also be an advantage to stronger independent learners. Melicheríková & Busikova (2012) further indicate that teachers, trainers or facilitators, in some cases, who are less skilled in ICT or computers, could affect the learning outcome of the learners negatively.

There is also a need to reach a huge number of learners, a need for access from mobile devices and easy access to learning content. Respondents want to use eLearning as a method to upskill themselves and be kept up to date about learning content. While most of the respondents want access anytime and anywhere, some respondents want to access eLearning from external storage devices like CDs.

Respondents feel the need for learners to be computer literate and need to have a positive attitude towards eLearning. They feel that eLearning will reduce the long distances they currently travel to take part in doing assessments. There is a great feeling that eLearning will improve performance. Figure 4.2 shows the connection and summation of respondents’ words and how they link and are grouped to form codes.

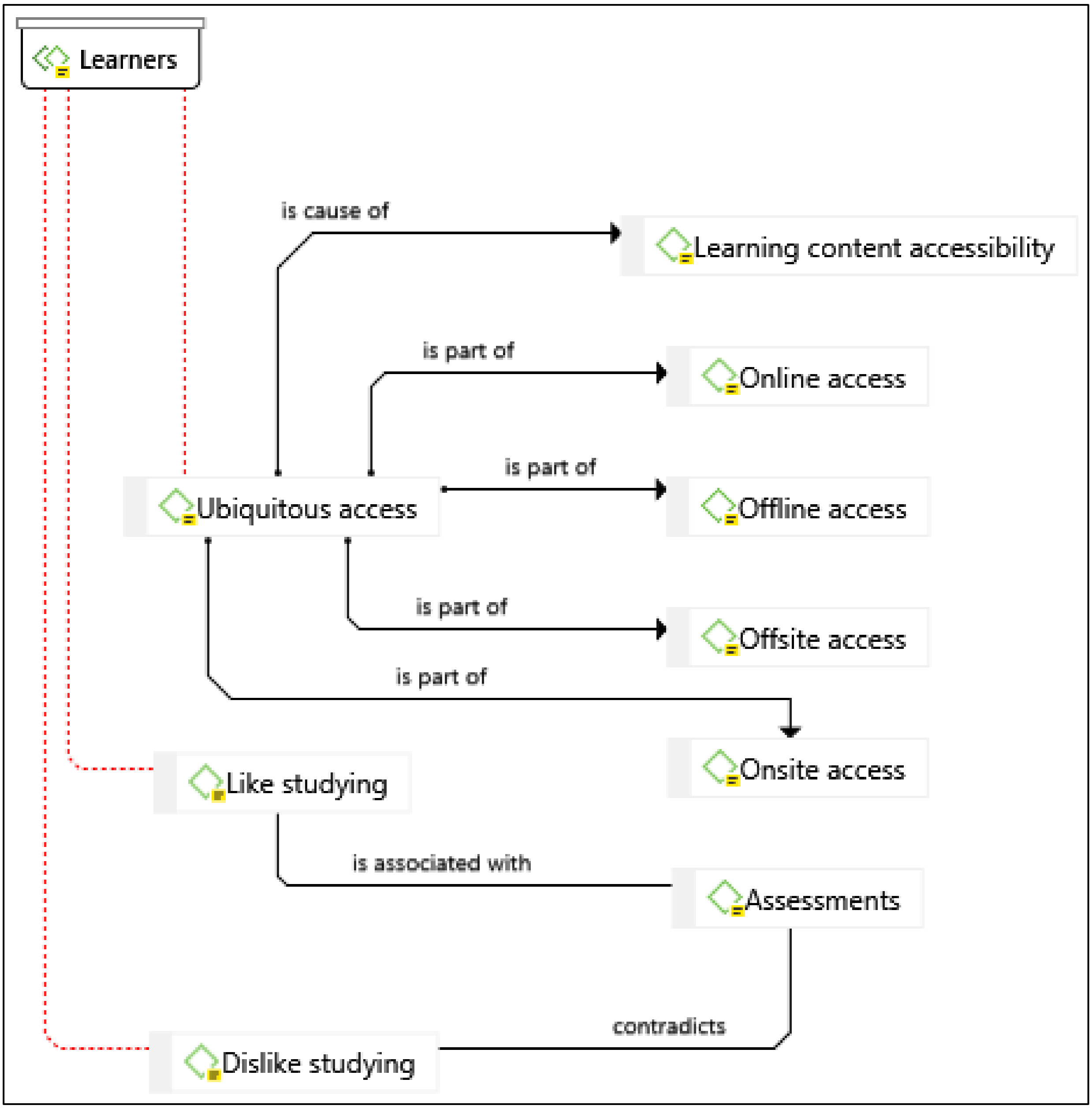

Figure 4.2: Network diagram for eLearning requirements

With any eLearning system, there are certain requirements to examine for the system to produce the required results and be relevant to the eLearning environment and what it is needed for. When grouping participants' responses about eLearning requirements, the following codes were attained: ubiquitous access, like studying, and dislike studying. It was discovered that some learners like studying while other learners dislike studying. While this is the case, the most popular or common requirement from the network diagram above was ubiquitous learning. Ubiquitous learning means studying anywhere and anytime.

Ubiquitous learning includes onsite access, offsite access, offline access and online access. Onsite access means accessing eLearning content inside the organization premises, and this can be online or offline. Offsite access means outside the organization premises. Offline access means accessing learning content on CDs, local and external hard drives, memory sticks, and other moveable devices.

Table 4.4 summarises the above narrative and shows the codes generated from the eLearning requirements theme.

Table 4.4: Codes Generated from eLearning Requirements (Questionnaire Data)

Primary Code	**Ubiquitous access**	**Learner types**
Secondary Codes	Learning content accessibility	Like studying
	Online access	Dislike studying
	Offline access	
	Offsite access	
	Onsite access	

4.1.1.3. Cloud Computing Requirements from Questionnaire Data

Table 4.5 shows the responses about cloud computing requirements.

Table 4.5: Cloud Computing Requirements

Respondent	**Respondent's view**
#1	… access anytime anywhere
#2	… access anytime anywhere

Respondent	Respondent’s view
#3	… access anytime anywhere … ability to reach a large number of people
#4	… convenient
#5	… access on computer or mobile device on the Internet/online
#6	… access from various sources and not just one source
#7	… convenient … access anywhere, learn at own pace
#8	… no related comment
#9	… access anytime anywhere … learning is always available
#10	… convenient … access from anywhere
#11	… more accessible and more flexible … access anytime anywhere … on-demand access and availability

The cloud computing requirements theme came as a need to address the research question: “What new understanding can be derived on technology that can be used to improve eLearning usage?”. Cloud computing can be used as a way to curb the low usage rate of eLearning by using services such as SaaS, IaaS, and PaaS to improve accessibility and promote ubiquitous learning. Literature indicates that eLearning needs to be based on powerful hardware and software infrastructures to support heterogeneous learning resources and act as a ubiquitous learning environment (Despotović-Zrakić et al., 2013: 301). Cloud computing also has benefits in cost reduction, quick and effective communication, security, privacy, flexibility and accessibility (Bora & Ahmed, 2013).

In Table 4.5, the respondents express their eLearning needs to be anytime-anywhere learning, convenience and flexibility, emphasising anytime-anywhere learning. Next, the network diagram in Figure 4.3 links the respondents' words to see what responses they have in common.

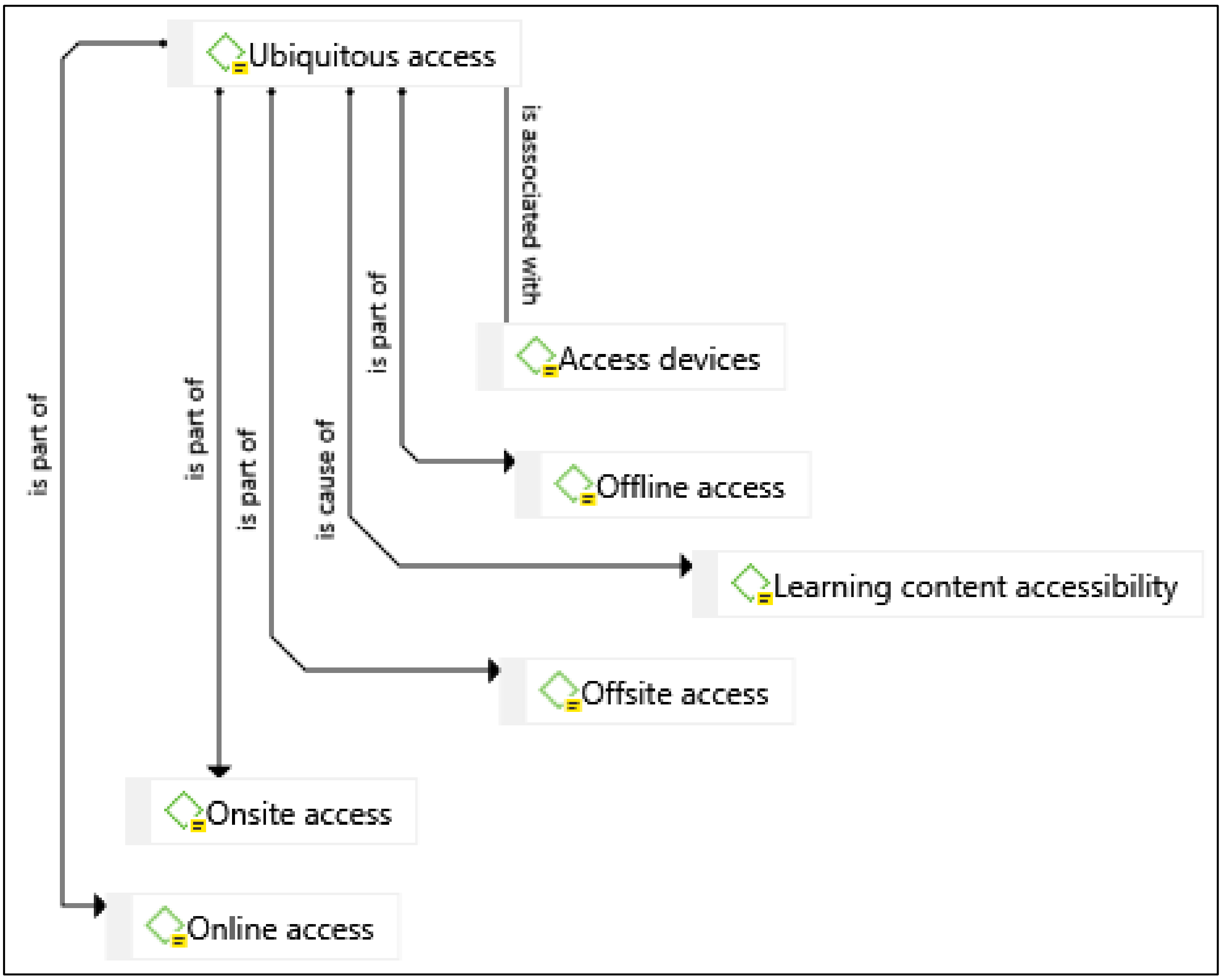

Figure 4.3: Network diagram for cloud computing requirements

In the cloud computing requirements network diagram above, ubiquitous learning is the main code generated in the same way as in the eLearning requirements codes. According to the respondents' view, ubiquitous learning includes online, offline, onsite and offsite access requirements. Learning content accessibility refers to the availability and ease of access to eLearning assessments and content. In the same manner, online, offline, offsite and onsite access refers to the manner in which the respondents feel they want to access the assessments.

As some respondents want to access the eLearning offline and onsite, a private cloud can be used to offer this service, and for online and offsite access, a public cloud can be used. From the literature in the study, cloud computing can be classified as private, public, hybrid and community cloud models, of which all models share infrastructure characteristics like management, ownership and location (Zrakić et al., 2013: 302).

As a matter of interest, the researcher wanted to know whether respondents were ready to accept cloud computing as a solution for eLearning. Thus, respondents were asked to give feedback on whether the organization was ready for cloud computing. Seven respondents then responded as tabled below in the cloud readiness table. Six out of seven said the organization was ready for cloud computing while one said no.

Table 4.6: Cloud Readiness

Is the organization cloud ready?	**Total responses**	**% Total responses**
no	1	14.29%
yes	6	85.71%
Total	**7**	**100.00%**

Most respondents (85.71%) indicated that the organization is ready for eLearning. This is a good estimation even though it does not reflect that the whole population of ComTek will think alike. It is an indication that ComTek has started indulging in cloud computing and some of the learners will appreciate eLearning on the cloud.

Table 4.7: Codes Generated from Cloud Computing Requirements (Questionnaire Data)

Primary Codes	**Ubiquitous access**
Secondary Codes	Learning content accessibility
	Online access
	Offline access
	Offsite access
	Onsite access
	Access devices

	Cloud readiness

4.1.1.4. Content Delivery Requirements from Questionnaire Data

Table 4.8 shows the responses about content delivery requirements.

Table 4.8: Content Delivery Requirements

Respondent	Respondent's view
#1	… the opportunity to learn at your own pace in the comfort of your preferred space … opportunity to access new information quickly and conveniently
#2	… inside organization premises … on-time learning
#3	… easy to access eLearning inside the organization … convenient
#4	… convenient … inside office access
#5	… access inside organization premises
#6	… prefer a hard copy to make notes, re-read, make sense of what I am reading … CDs or learning software at home … access from various sources and not just one source
#7	… convenient … CDs or learning software … access from CDs or learning software at home
#8	… access in a classroom setup

Respondent	Respondent's view
	… access through Intranet
#9	… learning is always available … access both inside and outside organization premises
#10	… convenient … access from computer or mobile device on the Internet/online
#11	… effective blended learning strategy … appropriate interaction, practice … on-demand access and availability

Content delivery requirements emerged as respondents had a desire for better-designed course content and assessments. The respondents wanted an opportunity to learn at their own preferred time and space. This required the assessments and course-content to be delivered in a manner that accommodated ubiquitous learning. Content delivery is a subset of learning and similarly necessary for eLearning. As cloud services are considered in this study, eLearning on a cloud platform affects the way eLearning is presented and delivered. As some of the respondents preferred doing eLearning via CDs, at home, and in the office, the eLearning presentation and access thereof had to also meet the criteria of the chosen method.

In this part of the research, the researcher did not do further analysis by linking the words of respondents using QAQDAS software due to the similarity of the requirements between eLearning requirements and cloud requirements, which are already analysed earlier in this section. However, through reading the data content and manually extracting codes the below codes resulted.

Table 4.9: Codes Generated from Content Delivery Requirements (Questionnaire Data)

Primary Codes	Content access device	Ubiquitous Access	Content dissemination
Secondary Codes	computer	online access	hard copy
	mobile device	offline access	notes
		offsite access	CDs
		onsite access	learning software
		access devices	Internet
		cloud readiness	

With further analysis, it was realised that a phenomenon that is closely aligned to content delivery is the learning styles of respondents. With this phenomenon as an emerging subject in the study, it became critical to have it further analysed. In this analysis, the researcher examined the respondents' responses to how they react and respond to different events. Their reactions could be auditory, visual or kinaesthetic. To achieve this, a questionnaire was sent to the respondents to fill-in to determine their style of learning. The feedback from this questionnaire is summarised in Table 4.10.

Table 4.10: An Overview on Dominating Learning Styles at ComTek

Events	**Learning Styles**		
	Auditory	**Visual**	**Kinaesthetic**
Learning preferences	25%	62.5%	12.5%
Assembling equipment	12.5%	81.25%	6.25%
Receiving directions	50%	50%	-
Remembering people	31.25%	18.75%	50%
Learning Vocabulary	12.5%	18.75%	68.75%
Hobbies	37.5%	25%	37.5%
Remembering things	31.25%	-	68.5%
Destructions	31.25%	18.75%	50%
Not forgetting things	18.75%	50%	31.25%
Understanding	43.75%	12.50%	43.75%
Individual talent	43.75%	31.25%	25.00%
Weight	**337.5**	**368.75**	**393.5**

In Table 2.10, the weights of the learning styles at ComTek were calculated by summing up the averaged percentages per learning style and taking the highest percentage as the dominating learning style. It was found that most of the respondents are kinaesthetic learners, with an overall weight of 393.5 kinaesthetic weight compared to visual weight with 368.75 and auditory weight with 337.5. While the dominating learning style was kinaesthetic learning, the other remaining learning styles must still be considered when creating learning content and assessments but concentrating most on the kinaesthetic method as the main learning method.

At this point, it looked like the study was captured by the learning styles unintentionally. Not to miss the focal point of the study, which is eLearning on the cloud, it was, however, necessary to understand that one of the core aspects of learning is to capture the methods the learners are most comfortable to use when learning. Table 4.11 tabulates the respondents' understanding of learning styles.

Table 4.11: Respondents' Understanding of Learning Styles

Respondent	Respondent's view
#1	…the way learning content is formulated with the purpose of getting its original and precise meaning across to its rightful audience.
#2	…every person has his own learning style preference
#3	…various learning styles … learning styles are determined by your target audience
#4	… methods of how learning can be done
#5	… a way of passing knowledge in various methods
#6	…preferred style that a learner is comfortable with
#7	…learn best by doing, but if the content is not practical, I like to take notes and use them for revision
#8	…personal attributes, tendencies and interests plays a role in learning preference/styles. i.e. introvert and extrovert …each individual has their own unique way of learning, either it be listening, doing or talking about it …the learner rationalises the information in order to make sense of it
#9	…different learning methodologies for learner
#10	…method you prefer using or to be used in your learning activity
#11	…no comment
#12	…to learning new ways
#13	…it is the way you prefer learning
#14	…eLearning, virtual learning, on-the-job training, etc.

Respondent	Respondent’s view
#15	…a learner’s preferred way to learn, e.g. via reading/pictures (visual) learning, or listening (auditory), or doing (kinaesthetic)
#16	…learning online

It was necessary to understand what the respondents thought about learning style surveys, as these surveys could be useful to understand the learners’ learning styles first, before exposing course content and assessments to them. The literature states that an individual’s learning style is mostly influenced by his/her personality, their way of thinking and preferences of pictures, sounds or actions (Sepic et al., 2010). Respondents said learning styles are about the way content is formulated to get the right meaning across to the right audiences. They indicated that every learner has an own preferred learning style. Some respondents said the best way to learn is to learn by doing.

As the study progressed and advanced, new information that the researcher thought could be useful to address eLearning, emerged. While still remaining in line with the study, the conceptual framework was slightly adjusted to accommodate this new information. In the expanded conceptual framework, cloud services are emphasised together with a learning style questionnaire as important components to form part of the conceptual framework. Figure 4.4 shows the improved conceptual framework.

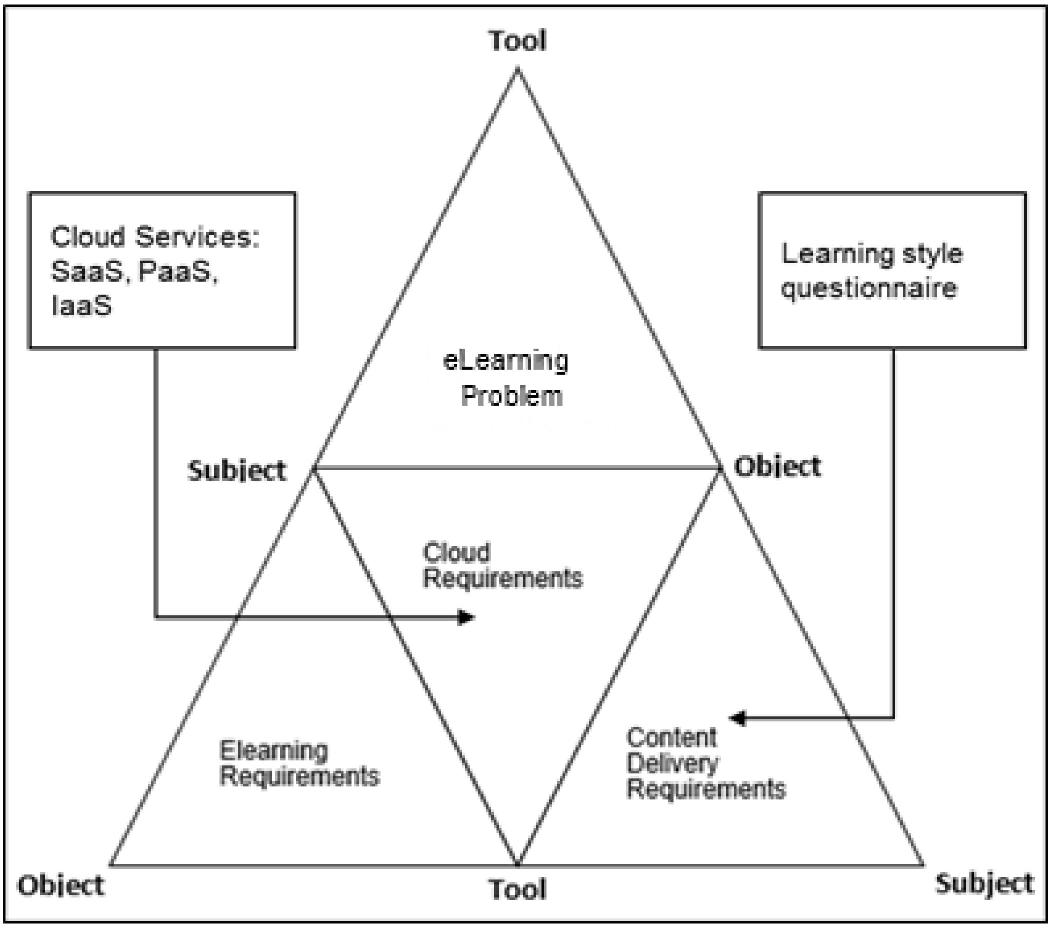

Figure 4.4: Improved conceptual framework

The improved conceptual framework highlights that cloud requirements include cloud services like SaaS, PaaS and IaaS. In the literature, Lei et al. (2009: 865) describe cloud computing as a cloud service model that uses virtualisation technology and is highly scalable and reliable and is highly secured. Jingzhao (2017: 1) indicates that the key point of cloud computing is that infrastructure, development platforms, and software applications are components of services which can be acquired from service providers for a fee. Melicheríková & Busikova (2012) expand the latter statement focusing on security. They indicate that to improve security for eLearning, the infrastructure must be hardened for security and privacy. Inferring from the literature, when using cloud services, there is less needing to worry about security and scalability, as the cloud service model is highly secure and scalable. The organization must use these services to design and implement eLearning. The learners must access eLearning on the cloud with the aid of these cloud services.

In the conceptual framework, subsequent to gaining access to eLearning, the learners are first supplied with a learning style questionnaire to fill in. This learning style questionnaire is used to determine the learners' learning styles prior to the system retrieving the learning content and assessments. Once the learning style has been determined, the learning content and the assessments will be presented as auditory, visual or kinaesthetic.

If a learner's learning style is auditory, the audio content will be presented, and the learner will be expected to listen. If the learner has a visual learning style, then videos will be presented, and the learner will be expected to watch the videos. If a learner's learning style is kinaesthetic, the learner will be expected to interact with the learning content and assessments by doing. In the works of Poulova & Simonova (2012), a learning style questionnaire named LCI (learning combination inventory) was used to discover learners' learning styles prior to accessing a course on their eLearning system.

As illustrated in the original activity theory model, the subject, the object and the tool remain as is, while other elements are introduced as part of the improved conceptual framework. The subject refers to the learner, the object refers to the eLearning content and assessments, and the tool refers to the eLearning system. To investigate whether it would be viable to implement the learning style questionnaire, another secondary survey had to be done to understand the respondents' views about the learning style questionnaire. The responses to the survey are presented in Table 4.12.

Table 4.12: Respondents' Views About Learning Style Questionnaires

Respondent	**Respondent's view**
#1	… good way of gathering information about the general acceptable way of learning
#2	… value adding to the learning experience – with more information on the learning styles of the target audience the most … appropriate solution can be developed.
#3	… makes the design process easier
#4	… makes you productive and save time
#5	… good

Respondent	Respondent’s view
#6	… interesting and causes one to be curious
#7	… something I was not aware of until I was completing it
#8	… learning styles change over the years … the demand of life does have an impact – Basic learner demographics
#9	… none
#10	… they will help advocate the need to accommodate learners and not always impose methods of learning to them
#11	… no comment
#12	… it will help the person who is doing the survey to get a way forward
#13	… don’t know
#14	… these are blended learning methodologies that facilitate accelerated learning apart from the traditional classroom setup … examples of learning styles include e-learning, on-the-job training, virtual training, observations, etc.
#15	… they are accurate for the moment … as the individual grows, his/her learning preference may also change
#16	… no comment

While learning styles are important to consider when engaging in an eLearning project, it was necessary to find out from respondents how they felt about having learning style assessments as a way to determine their learning approaches. In the process, some respondents expressed this as a good way of gathering information about acceptable ways of learning, while some felt like the questionnaire offered them a value-add regarding developing the right methodology to present courses and assessments to learners. Some thought that having learning style assessments will make the design process easier, while some thought that this approach of learning could make learners more productive and curious to learn.

While some respondents were unaware of learning style questionnaires, some thought an individual's learning style could change over time and is based on the demands of life. They thought that learning styles change with age and are only accurate for a moment. Some respondents thought the learning styles advocate the need to accommodate learners and not always impose methods of learning to them. Table 4.13 shows the codes that were generated from the analysis of learning styles.

Table 4.13: Learning Style Codes Generated from Content Delivery Requirements (Questionnaire Data)

Primary Codes	**Preferred way of learning**	**Learning methods**	**Way to organise learning content**	**Aimed at target audiences**	**Way of rationalising information**
Secondary Codes	Preferred way to learn	Method	Way learning content is formulated	Target audience individual/ unique/ personal	Rationalise information
	Way you prefer learning	Learning methodology		Introvert	
	Learning new ways	How learning can be done		Extrovert	
	Own learning style preference	Various methods		Tendencies and interests	
	Preferred style				
	Own unique				
	way of learning				
	Way of passing knowledge				

Primary Codes	**Preferred way of learning**	**Learning methods**	**Way to organise learning content**	**Aimed at target audiences**	**Way of rationalising information**
	Learning by reading/ pictures (visual)				
	Learning by listening (auditory)				
	Learning by doing (kinaesthetic)				

From the data that was received about content presentation, at least five primary codes were created. From the five codes, some codes made sense when correlated to the literature while some did not make much sense and are not discussed here. The data above reflect that most learners at ComTek regarded learning styles as the preferred way of learning. Most of the respondents could have felt that the word “style” had a lot to do with an individual’s way of doing things.

Earlier in this study, it was said that a learning style is a manner in which a person expresses himself or herself characterised by all features differentiating him or her from others (Sepic et al., 2010). Now, examining the data in conjunction with the definition from Sepic et al. (2010), it shows that both have used the word “way”. The data further indicate a learning style is a learning preference, and this inclined to have a close relationship with the concept of differentiating a person from others in his/her oneness, regarding learning preferences.

Bousbia et al. (2009) elaborate on an educational preferences layer that refers to attributes like preferred learning time, environmental preference, information representation and encoding methods. There is a close correlation of data with the literature regarding this, giving a concrete argument that a learning style is a preferred way of learning.

The data show three types of learning styles, which are learning by listening, learning by reading or by pictures and learning by doing. The three learning styles represent an auditory, visual and kinaesthetic learning approach, respectively. McNutt & Brennan (2005) confirmed the three learning styles that were discovered in the data. Here, another correlation is shown, which indicates that most of the respondents understand the concept of learning styles.

Some respondents thought that learning styles include information rationalisation. While this is the case, it was not clear what the respondents wanted to imply. Thus, no further analysis was done on this theme. The respondents could have wanted to imply that using different learning styles brings some rational thinking to the person or learner pursuing learning content. Whether the learning content is visual, auditory or kinaesthetic, it, however, does not imply that it is rational or not. Thus far, data from questionnaires have been analysed. The next section discusses the analysis of data collected from documents.

4.1.2. Analysis of Document Data

This section presents and analyses the data collected from documents. The data are categorised according to the analysis themes, low usage influences, eLearning requirements, cloud computing requirements and content delivery requirements.

4.1.2.1. ELearning Requirements from Document Data

Documents collected showed that ComTek had an interest in improving their current eLearning environment. The documents highlighted a list of features necessary for ComTek to achieve its eLearning investment goals. This list comprised features like webcasting (record, deliver, watch and manage), assignment submissions, chats, discussion forums, file uploads and downloads, grading, online news and announcements, online quizzes, surveys, wiki, scalability, modularity and extensibility, technology compliance, accessibility and security compliance. ComTek was using Moodle as an LMS system during the time of the research.

The documents indicated that Moodle is SCORM compliant and is divided into modules like schedules, system administration module, collaboration module, reports module, course catalogue, course administration, notifications module and others not mentioned in the documents. Table 4.14 shows ComTek’s history of eLearning.

Table 4.14: ComTek's eLearning History

Year	LMS status
2012 – 2017	Launch on new Learning Management System (Moodle LMS)
2011	Host a Proof of Concept for a new LMS
2010	Hosting space inadequate, platforms end of life and is not SCORM compliant
2009	An in-house learning platform was created to host eLearning content
2007	EKP discontinued pursuing an alternative system
2004	EKP LMS replaces the Virtual Campus
1998	Virtual Campus Founded – SEP & CFL

From 1998 until the time of the study, ComTek had been working on upgrading their eLearning environment gradually. A couple of systems were deployed to facilitate eLearning. In 1998, ComTek used virtual campus, and from 2004 to 2007, EKP was used. In 2009, an in-house system was developed but discontinued in 2010. Then in 2011, a proof of concept for Moodle was done and then deployed in 2012. ComTek had been using Moodle since 2012 until the time of the research study. In Table 4.15, the data from documents show ComTek's eLearning stakeholders.

Table 4.15: Training Stakeholders

Training stakeholders	
Role	**Function**
Line Manager	… needs analysis, course design and developments
Trainer	… training
Learner	… assessments and evaluations

ComTek's training stakeholders, as in Table 4.15, had three roles to play, namely a management role, training role and a learning role. The line manager was responsible for doing needs analysis, managing the designing of courses, and was responsible for learning development. The trainer was responsible for training the learners and got involved in elaborating on training needs. The learners were responsible for writing assessments and were evaluated via these assessments. Some of the stakeholders were LMS system stakeholders and their roles are described in Table 4.16.

Table 4.16: LMS System Stakeholders

LMS system stakeholders	
Role	**Function**
Administrators	… does course-enrolment using programme/class data
Programme Coordinator	… pulls programme reports and sets programme objectives
Learner	… requests assignments and assessments, requests content permission
Facilitator	…pulls assessments reports, assigns assignments and assessments, and assigns content permission.

The LMS system stakeholders were the second category of eLearning stakeholders. The LMS system stakeholders were the administrators responsible for course enrolment. The programme coordinator was responsible for drawing programme reports and setting programme objectives. The learners' responsibility was to request assessments, assignments, necessary content permission and to write these assessments. The facilitator's role was to pull assessment reports, assign assessments and assignments, and provide the necessary content permissions to the learners. Table 4.17 shows the eLearning codes generated from document data.

Table 4.17: Codes Generated from eLearning Requirements (Document Data)

Primary Code	**Internal systems**	**Stakeholders**
condar Codes	Moodle LMS (Active during the time of the study)	Line Manager

	No-name in-house system (Discontinued)	Trainer
	EKP LMS (Discontinued)	Learner
	Virtual Campus (Discontinued)	Administrators
		Programme coordinator
		Facilitator

Table 4.17 shows the codes generated from ComTek's document data. These codes were categorised as internal systems and stakeholder data. Moodle was the LMS used during this time. The stakeholders were line managers, trainers, learners, administrators, programme coordinators and facilitators.

4.1.2.2. Content Delivery Requirements from Document Data

From the discussed eLearning requirements, the researcher deduced the following requirements as content delivery requirements, namely webcasting (record, deliver, watch and manage), assignment submissions, chats, discussion forums, file uploads and downloads, grading, online news and announcements, online quizzes, surveys, wiki, scalability, modularity and extensibility, technology compliance, accessibility and security compliance. As an organization, ComTek also wanted to attain a competitive advantage by selling eLearning courses to outside customers. Figure 4.5 shows the high-level architectural layout as envisioned by ComTek in their documents.

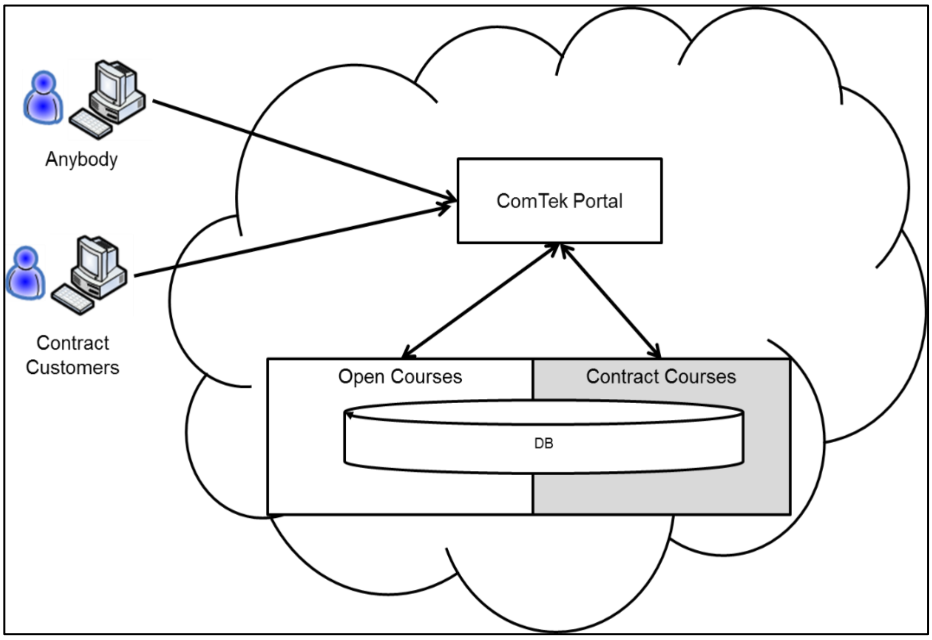

Figure 4.5: Access for ComTek's external suppliers/customers

Figure 4.5 indicates that external contracted customers, paying customers and ComTek vendors were to access eLearning course content and assessments using secure HTTPS access via a separate link from other customers, while any other customer would use the guest access. The portal would have two databases for open courses and contracted courses. There would also be two portals, namely one enterprise portal and one internal portal. Only the external customers would be on the enterprise portal, while employee learners would access the internal portal using their organization's network credentials for access.

In ComTek's documents, the researcher found a software architectural assessment that was already done as a concept. The documents first acknowledged the vast number of expensive commercial LMSs available in the marketplace. The assessment indicated the high costs involved in these commercial LMSs as procurement costs for sourcing, configurations and maintenance. Before they could use the RFP route to source a new LMS solution for ComTek, the documents indicated that it was beneficial to test and implement the Moodle LMS solution that was found to be popular and proven to be used by other organizations for learning. The documents had indicated that with research done during the time the document was drafted, it had been proven that Moodle was a capable LMS and had revealed some interesting facts about Moodle deployments such as:

- “Market Share: In a comparison of the top twenty most popular products used by corporations of all sizes, Moodle ranked 1st with the highest market share (20.16%) when the document was drafted.”
- More than 180 registered South African learning/education institutes and training institutes had deployed Moodle during that time.
- There were more than 50 000 Moodle deployments in more than 213 countries worldwide during this time.
- During this time, when comparing the same top LMS products regarding cost per learner to acquire, install and customise the LMS, Moodle ranked 1st in time to roll out/implement, satisfaction with cost, ease of installation, ease of customisation, ease of use for course designers and assessment capabilities.

Whether the above was true, this study cannot advocate; however, the data was used as facts on why ComTek looked at implementing Moodle as part of their eLearning solution.

Figure 4.6 shows how the eLearning model fits into ComTek’s enterprise framework as a telecommunication organization.

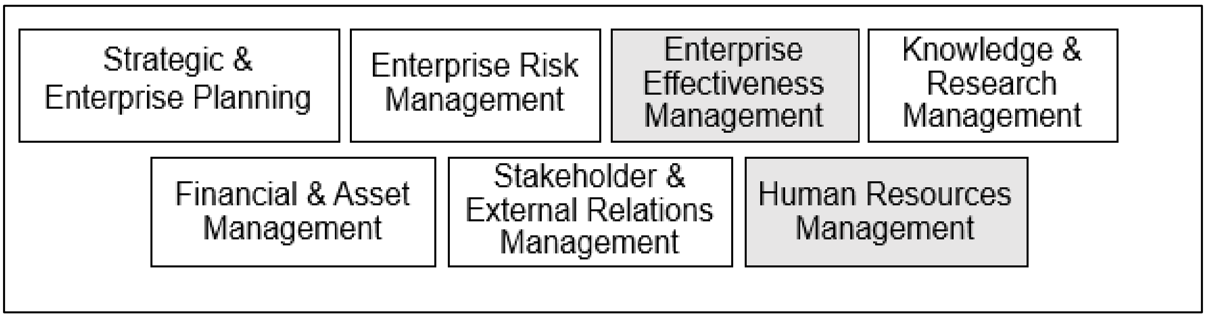

Figure 4.6: ComTek’s eTOM mapping

eTOM is short for “enhanced Telecommunication Operations Map” and it is a framework used by ComTek to attain a competitive direction in the telecommunication industry. eTOM, just like other enterprise architecture frameworks, served as a guide to manage the organization. The researcher did not much examine the eTOM framework, as it does not form part of the study. In the eTOM framework at ComTek, eLearning was designed to be part of the enterprise effectiveness management and human resources management divisions on the framework. Table 4.18 shows the content delivery codes generated from the document data.

Table 4.18: Codes Generated from Content Delivery Requirements (Document Data)

Primary Codes	Organising learning content	Content dissemination	Compliance
Secondary Codes	modularity	online news	security compliance
	extensibility	announcements	technology compliance
	accessibility	content uploads	
	scalability	content downloads	
	grading	webcasting (record, deliver, watch and manage)	
		chats	
		discussion forums	
		online quizzes	
		surveys	
		wikis	

The primary codes in Table 4.18 were categorised as organising learning content, content dissemination and compliance. The secondary codes for organising learning content were modularity, extensibility, accessibility, scalability and grading. The secondary codes for content dissemination were online news, announcements, content uploads, content downloads, webcasting (record, deliver, watch and manage), chats, discussion forums, online quizzes, surveys and wikis. The next section analyses the data about the interviews.

4.1.3. Analysis of Interview Data

By collecting interview data, the researcher wanted to know what management thought about ComTek's eLearning environment. The researcher wanted to find out the types of LMSs used, the problems perceived or actual eLearning problems they came across, the performance of these LMSs and the capacity they could handle. The researcher was also interested in the processes followed regarding software acquisition, their view on whether eLearning is costly or is a worthwhile investment, and the advantages and disadvantages of having eLearning in the organization.

A manager respondent who was interviewed had the following to say about eLearning at ComTek during the period of the research:

ELearning software's used at ComTek were Moodle and SumTotal. Both LMSs were implemented around the same time and ran in parallel since their implementation. Moodle was implemented internally due to budget constraints, as it was open source software. While Moodle was implemented for internal purposes, SumTotal was implemented for external users like customer facing users, franchisers, dealers and agile workers. Moodle housed all courses and assessments compulsory to the organization like ethics courses, governance courses, products courses, health and safety requirements courses and business continuity management courses. SumTotal did not run on the organization's premises and did not integrate with ComTek's infrastructure, while Moodle ran 100% on customer premises. SumTotal was a licenced software whereby ComTek paid fixed annual fees for it, while Moodle was an open source software, which the organization did not pay for licensing but would, however, pay for support from third parties if it was necessary. SumTotal was licensed for 2 700 users initially at the time of its implementation and was later expanded to 10 000 users. SumTotal was better than Moodle in terms of functionality, specifications, compatibility, reports, rich graphics, template designs and also producing better learning results.

The interviewed manager-respondents said they were happy with SumTotal as an LMS system of choice. They also said they were in plans to roll out the SumTotal LMS to ComTek's sales departments and other departments. According to the respondents, it was difficult to compare Moodle and SumTotal regarding improvements in learning outcomes, as both LMSs catered for different audiences, and the learners' frequency of accessing assessments and learning depended on where they were physically located at the time, what content was currently accessed and what launches were currently hosted.

ComTek did not have a content management system but used a document management system called eDox to store learning content. Regarding the software acquisition processes that were followed, the respondents indicated that they followed procurement processes where a tender was organised, followed by an RFP (request for proposal) and an RFQ (request for quotation) to which a known vendor responded. This process was followed because ComTek already knew what they were looking for, so there was no need for assessments and RFIs (request for information). The vendor who responded to the RFP and RFQ happened to be using SumTotal; hence, ComTek ended up using SumTotal as their other LMS system.

When buying an eLearning system or any other information system, there must be some architectural assessment. Respondents, however, said that with SumTotal, there was no architectural assessment done, as they did not have the luxury of time, and they only had two months to offer training online. They did not do any analysis or comparison with other software. In any organization, the information technology department has to be aware of or be involved in any software deal by the organization. With SumTotal, however, the respondents said that the IT department did not have any interest in assisting them through the process of attaining the software. They indicated that the IT department had their own priorities and obligations.

There were advantages perceived with eLearning, namely reduced cost, less training facilities needed, less travelling, learning anywhere and anytime, and facilitate learning anytime anywhere. ELearning is more an investment than a cost. At first, simulation software like Articulate and Captivate needed to be deployed and licensed. For LMS platforms to be put in place, an enough budget for licensing must also be in place.

Apart from all positive feedback about eLearning, there were also system-problems encountered daily. These problems were software implementation time was always longer than the time set for content delivery. The training environment was not conducive and eLearning prioritisation took a back seat in the organization. Culture is a problem between the old and younger learners, and there were system and behavioural issues and process problems. Users usually had issues with system interaction caused by password problems and communication about system downtimes. To improve the eLearning, the researcher wanted to introduce cloud computing. Thus, the researcher had to ask the respondents a few questions about cloud computing. Some respondents did not know much about cloud computing and did not have much to say.

Manager respondent #2 had the following to say when interviewed.

SumTotal could handle great volumes and is accessible anytime anywhere. The technical support was good, and the LMS produced results and had great reports and learning parts. The organization had seen a 50% increase in access rate, and there had been a low failure rate at 3% when using SumTotal. Moodle was used organization-wide and for internal assessments. Moodle was free open source software, while SumTotal was licensed software used by the contracted vendor during the time of implementation. The process followed to acquire SumTotal was a procurement process where a feasibility study was done, and a comparison was made between SABA LMS and SumTotal, and other LMSs the respondent could not remember.

For contentment management, the organization used in-house developed software called e-dox and bookshelf, and the SumTotal repository. For the organization to have a viable eLearning system, some aspects were to be considered. Regarding access, there would have to be reliable connectivity concerning course offerings, tutorials and assessments. There would have to be voice recording such that there is a properly simulated virtual facilitation. Regarding social cohesion, learners would have to be ready to use the system or the technology, and labour unions would have to be involved for broader coverage of employee relation aspect. ELearning at ComTek was not viewed as a cost as it was viewed to save the organization money in the long term and was viewed as an investment.

While the respondents understood the investment in eLearning, they also perceived problems with their eLearning environment. System problems perceived included system stability, network issues, escalating network and internet downtimes, coverage issues, connectivity issues and network cable theft, which affects external access. Process problems perceived included red tapes in implementation processes, less adherence to store processes and course preparation time during working hours consuming time. User problems perceived were users not being able to adopt technology, as different age groups respond differently to the adoption of the technology. The young users were easier to deal with in eLearning acceptance, while the older users were not technology savvy and wanted to stick to the traditional ways of learning.

Regarding cloud computing, the response received was the view that cloud computing reduces maintenance costs and risks as the service provider is responsible for this, and a penalty fee would be charged if the SLA (service level agreement) was not met for whatever reason. Table 4.19 extracts codes from analysis of the interview data.

Table 4.19: Codes Generated from Low Usage Rate Theme (Interview Data)

Primary Codes	System issues	Connectivity issues	Content design tools	Content access tools	User behaviour
Secondary Codes	unstable systems	network downtimes	ease of use	ease of use	culture
	software implementation time	internet downtimes	improved skills		forgot-password problems
	system downtimes	coverage issues			course preparation time
		network cable theft			technology adoption

In Table 4.19, the primary codes generated were system issues, connectivity issues, content design tools, content access tools and user behaviour. From these primary codes, secondary codes were developed. These codes will make sense as the analysis chapter unfolds. Table 4.20 tabulates eLearning codes generated from the interview data.

Table 4.20: Codes Generated for eLearning Requirements (Interview Data)

Primary Code	Internal systems	External systems	Internal stakeholders	External stakeholders	Courses
Secondary Codes	Moodle LMS (current)	SumTotal (current)	line manager	customer facing users	organization ethics courses
			trainer	franchisers	governance courses
			learner	dealers	products courses
			administrators	agile workers	health and safety requirements courses
			programme coordinator		business continuity management courses
			facilitator		

In Table 4.20, the primary codes are internal systems, external systems, internal stakeholders, external stakeholders and courses. The secondary codes are also mentioned in the table as branches of the primary codes. Table 4.21 tabulates the content delivery codes from the interview data.

Table 4.21: Codes Generated for Content Delivery Requirements (Interview Data)

Primary Code	Content management systems	External systems	Internal stakeholders	External stakeholders	Internal Courses
Secondary Codes	No content management systems	SumTotal (current)	line manager	customer facing users	ethics courses
	document management system		trainer	franchisers	governance courses
			learner	dealers	
			administrators	agile workers	
			programme coordinator		
			facilitator		

Table 4.21 shows the content delivery codes categorised as content management systems, external systems, internal stakeholders, external stakeholders and internal courses. The secondary codes that link to these primary codes are shown in the table and helped to do an analysis as the study unfolds. Table 4.22 tabulates cloud computing codes from interview data.

Table 4.22: Codes Generated for Cloud Computing Requirements (Interview Data)

Primary Code		
Reduce Cost	Reduce Risk	Service Level Agreement

In this category, the only codes the researcher could generate were primary codes. These meant that respondents perceived cloud computing as able to reduce cost, reduce risk and improve service delivery using service level agreements.

After generating codes from questionnaire data, document data and interview data, the researcher then consolidated these codes to help generate themes. Table 4.23 shows the consolidated codes and their themes.

Table 4.23: Consolidated Code Categories from Questionnaires, Interviews and Documents

Category 1: Low usage influences
LMS systems, Content design tools, Content access tools, Assessments, System issues, Connectivity issues, User behaviour, Content management systems, External systems, Internal stakeholders, External stakeholders, Internal courses, Delayed response time, Software issues, Assessment design issues, Ease of use, Network issues, Skills, Lack-of-endpoint devices, Unstable systems, Network downtimes, Culture, Software implementation time, Password problems, Coverage issues, Course preparation time, Network cable theft, Technology adoption, User behaviour
Category 2: eLearning requirements
Ubiquitous access, Learner types, Internal systems, Stakeholders, External systems, Internal stakeholders, External stakeholders, Internal courses, Learning content accessibility, Online access, Offline access, Offsite access, Onsite Access, Moodle LMS, Line manager, Trainer, Learner, Administrators, Programme coordinator, Facilitator, Customer facing users, Franchisers, Dealers, Agile workers, Organization ethics courses, Governance courses, Products courses, Health and safety requirements courses, Business continuity management courses
Category 3: Content delivery requirements
Content access device, Ubiquitous access, Preferred way of learning, Learning methods, Way to organise learning content, Aimed at target audiences, Way of rationalising information, Organising learning content, Content dissemination, Compliance, Modularity, Extensibility, Accessibility, Scalability, Grading, Online news, Announcements, Content uploads, Content downloads, Webcasting (record, deliver, watch, and manage), Chats, Discussion forums, Online quizzes, Surveys, Wikis, Security compliance, Technology compliance
Category 4: Cloud computing requirements
Ubiquitous access

Now that the categories of codes were outlined, they can now be presented as themes. The themes will reflect how the codes shape the global themes and tie back to the research questions, and the problem addressed. The three figures in Chapter 5 give a more clear view of codes, basic themes, organised themes and a global theme.

In the data analysis chapter at hand, the researcher used the thematic analysis method to analyse the data. The researcher generated codes and grouped them into themes that were guided by the research questions. The researcher used literature, an existing theory to drive the research study, some research questions, and then generated codes during a process of analysis, grouped the codes into themes, and derived a set of findings. The next chapter discusses and interprets the findings.

CHAPTER FIVE
Discussion of findings

5.1. Introduction

This is the second last chapter of the research study where the findings are discussed and interpreted. This chapter gives an overall view of the researcher's understanding of the cause of low eLearning usage at ComTek. After analysing the data and deriving codes and themes in the previous chapter, the findings of what these codes and themes meant from a data and literature perspective, are explained. These findings are then linked back to the research questions to derive an understanding of eLearning low usage.

5.2. Discussions and Interpretation

Open distance learning and online learning are recently trending topics within learning and education. While this remains a growing field in research, organizations and institutions must have the knowledge and skills to implement eLearning using the right platform and the right tools. This research study discusses the causes of the low usage of eLearning systems. It is discovered that the low usage of eLearning could be caused by numerous causal factors, but the researcher investigated only three factors, (1) the technology used, (2) the presentation of assessments, and (3) the behaviour of learners.

The theory that closely matched this investigation was the activity theory. The activity theory indicates that "mediation through tools and technology is not a neutral process, the tools have an influence over the interaction between the subject and the object" (Hashim & Jones, 2007). In this research study, the researcher used the activity theory to understand the behaviour of eLearning users when they interact with the learning management systems to gain skills and knowledge.

The researcher proposed cloud computing as a way to improving low usage of eLearning. When cloud computing is correctly deployed, cloud services like infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS) can be used to attain learning anytime and anywhere. Most organizations have ideal technology and infrastructure arrangements, ideal training processes, good motivation for teachers and learners, adequate support for their management teams, and in general, a conducive learning environment. Organizations might have a well-planned eLearning environment and good strategies, but extant literature highlights that cloud-driven eLearning systems/projects could also face several challenges (Williams et al., 2010).

The challenges affecting learners include social isolation, long response time from the teacher, understanding of course content and learning expectations and the reliability of technology (Williams et al., 2010). Other challenges such as social challenges, such as negative emotions including fear of the unknown, alienation, stress, guilt and anxiety, could also hinder motivation and persistence of using and accepting eLearning (Dziuban et al., 2017). This study discovered that the low usage on eLearning could have been caused by three factors, namely, a poor eLearning design, learners not ready to use eLearning technology and the poor presentation of eLearning content. Figure 5.1 and subsequent figures illustrate the findings, showing the codes, basic themes, organising themes and a global theme.

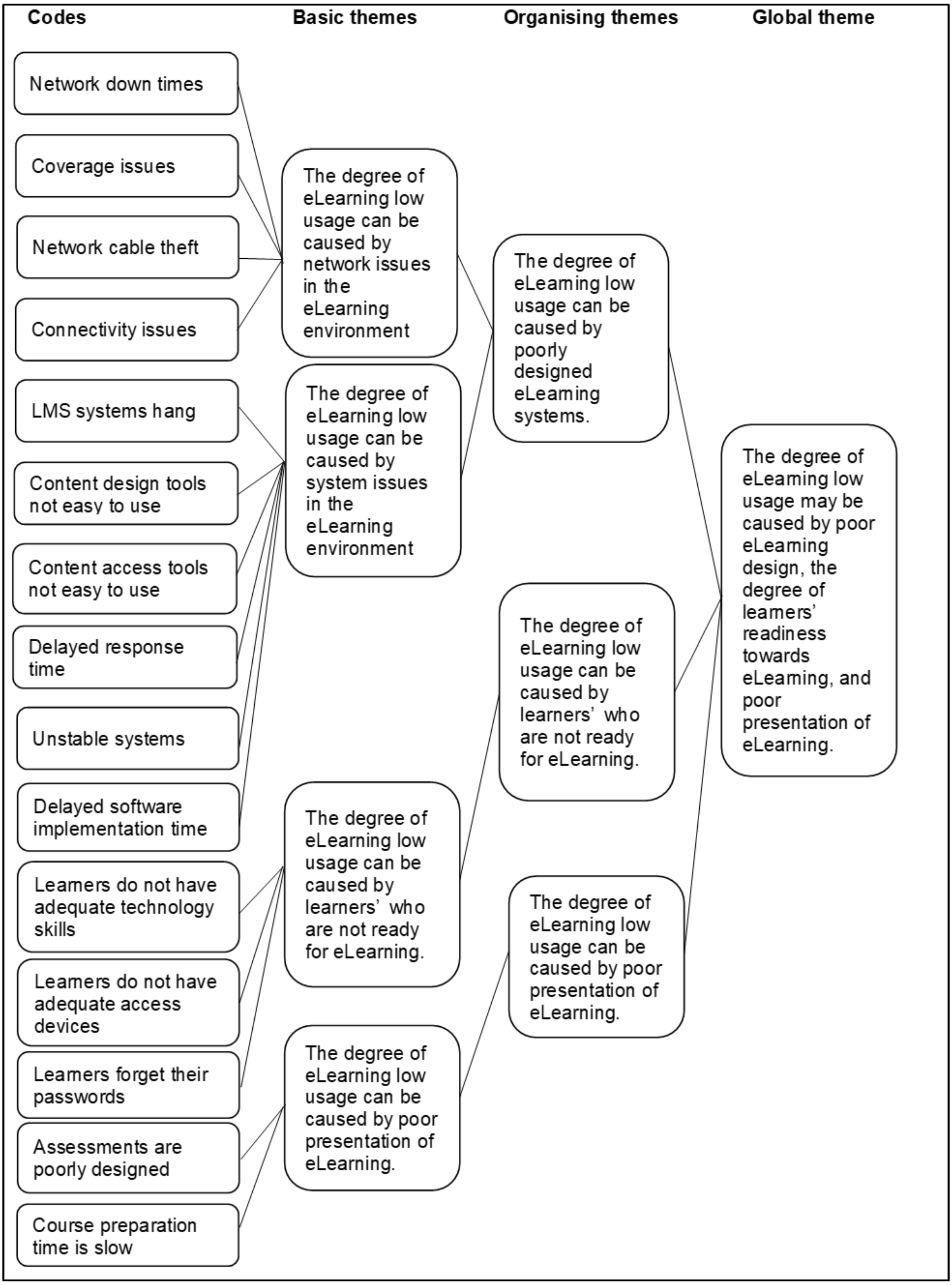

Figure 5.1: Analysed themes including codes, basic themes, organising themes and the global theme influencing the problem

What new understanding can be derived on factors that contribute to low eLearning usage? Figure 5.1 shows how the codes were used to build toward the global theme that answered the above question. The researcher found that the factors contributing to eLearning low usage were poor eLearning design, learners not being ready to use eLearning technology and poor presentation of eLearning content. Network and system issues in the eLearning environment were identified as basic themes. Network issues referred to network downtimes, coverage issues, network cable theft and connection issues. System issues were caused by hanging LMS system, complex content design tools, slow response time and delayed software implementation times in some instances. Learners caused learner readiness issues by not having adequate skills, access devices and learners forgetting their passwords. Poor presentation of content was because of poor assessment design. Figure 5.2 shows analysed codes, basic themes, organising themes, and a global theme which describes the eLearning requirements.

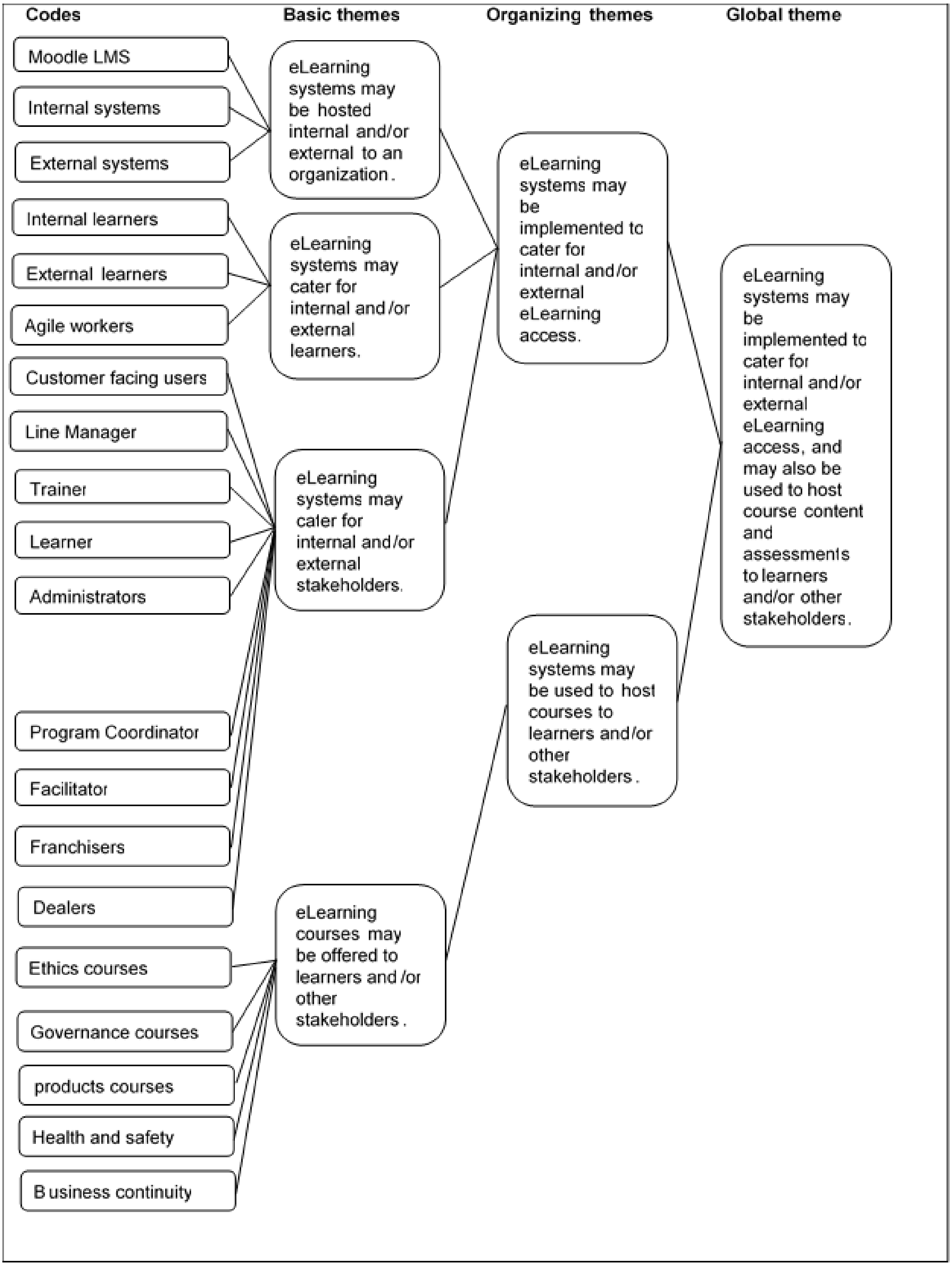

Figure 5.2: Analysed themes including codes, basic themes, organising themes and the global theme influencing the eLearning requirements

What new understanding can be derived on eLearning requirements for improving eLearning usage? Figure 5.2 shows how the codes were used to build towards the second global theme that answered the above question. The requirements to improve eLearning usage include hosting eLearning course content internally and externally to the organization. The organization could host eLearning content to agile workers, internal learners and external learners. ELearning users could include customer facing, line managers, trainers, learners, administrators, programme coordinators, facilitators, franchisers and dealers. The eLearning courses could be ethics courses, governance courses, products courses, health and safety courses and business continuity courses. Figure 5.3 shows analysed codes, basic themes, organising themes, and a global theme which describes the content delivery requirements.

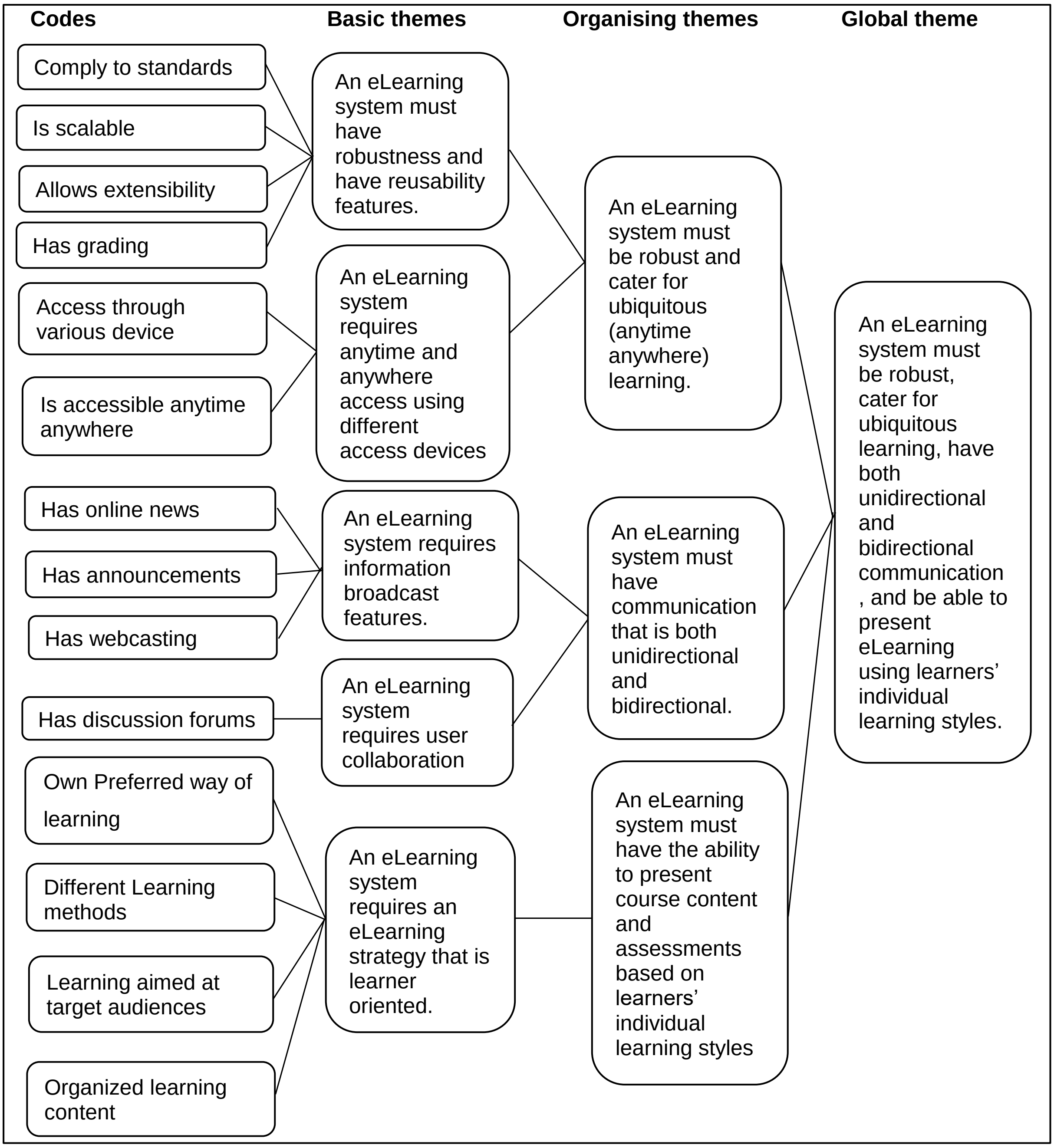

Figure 5.3: Analysed themes including codes, basic themes, organising themes and the global theme influencing the content delivery requirements

What new understanding can be derived on content delivery requirements for improving eLearning? What new understanding can be derived on technology that can be used to improve eLearning usage? Figure 5.3 shows how the codes were used to build towards the third global theme that answered the above questions. Content delivery requirements are influenced by robustness in eLearning systems, a technology that caters for anytime and anywhere eLearning access, the use unidirectional and bidirectional communication, and the use individualised learning styles. ELearning systems must comply with standards, must be scalable, must be extensible, and must have a grading feature. ELearning systems must be accessible from various devices such as mobile phones. ELearning systems must have broadcast features, collaboration and be learner oriented. Features like online news, announcements, webcasting, and discussion forums will improve the content delivery requirements. Content delivery strategies that are learner-oriented, aimed at target audiences and using different learning methods are key for improving content delivery.

5.3. Summary of Findings

Table 5.1 reflects on the initial propositions. The proposition is first highlighted, following a reflection on the literature and then revisiting the findings as discussed in earlier in the chapter.

Table 5.1: Summary of Findings

Research Question	**Scientific Reflection**	**Findings**	**Propositions**
What new understanding can be derived on factors that contribute to low eLearning usage?	Challenges for eLearning low usage could include social challenges such as negative emotions including fear of the unknown, alienation, stress, guilt and anxiety. These social challenges could hinder motivation and persistence of using, and accepting eLearning (Dziuban et al., 2017). Williams, Hussain, & Griffiths	Low usage of eLearning at some telecommunication organizations in South Africa may be caused by poor eLearning presentation, and learners' not being ready to accept eLearning. Findings further indicate that the network infrastructure and eLearning systems at some telecommunication organizations in South	eLearning low usage is caused by poor eLearning presentation and learners not being ready to accept eLearning.

Research Question	Scientific Reflection	Findings	Propositions
	(2010) elaborated on low usage challenges like social isolation, long response time from teachers, understanding of course content and learning expectations, and the reliability of technology.	Africa are not designed in a way to deliver seamless eLearning. There could have been other issues to do with individual learner confidence, as the literature suggests.	
What new understanding can be derived on eLearning requirements for improving eLearning usage?	If we want to improve eLearning usage, then the accessibility and availability of eLearning systems must be considered. Literature indicates that Servers, laptops, tablets, apps, smartphones, emails and stored information are all a subset of the cloud paradigm and are managed and supported remotely by a cloud service providers like Google Apps, Microsoft Azure, Heroku and Amazon Web Services	Lack of access devices may contribute to the learners' readiness to use eLearning technology. Using cloud computing services can allow the user/customer of the service to acquire access devices as subsets of the cloud offering. The access devices may be managed and supported remotely by the service provider.	Optimal network connectivity and availability of devices to access eLearning are both essential requirements necessary to improve eLearning usage.

Research Question	Scientific Reflection	Findings	Propositions
	(Bernal et al., 2016; Moaiad et al., 2016). This means the access devices can be included in the package offering from the service provider. Benefits of SaaS include: reducing the cost of licensing when acquiring application software, multiple applications can be consumed by clients at the same time, the responsibility to limit and control application usage is with the application provider, no need for infrastructure to deploy software, there is an API provided for configurations even if customisation is limited, and the SaaS model uses secure socket layers (SSL), (Bokhari, Shallal, &		

Research Question	Scientific Reflection	Findings	Propositions
	Tamandani, 2016: 890-891).		
What new understanding can be derived on content delivery requirements for improving eLearning?	McNutt & Brennan (2005) used pre-tests and post-tests to realise the effect of learning using individualised learning styles. Xiang-Feng (2014: 543) indicates that online learning challenges are the disconnection between teachers and the development process, paying less attention to the design of the learning environment, inadequate teaching activities and less ideal teaching effects.	Poor presentation of eLearning content may discourage learners to use eLearning systems. An eLearning system must be robust, cater for ubiquitous learning, and must be based on an individual's learning styles.	Using individualised learning styles to deliver eLearning content does improve eLearning usage.
What new understanding can be derived on technology that can be used to improve eLearning usage?	Cloud computing offers highly scalable IT capabilities where data and services coexist in a shared and dynamically scaled set of resources (Zrakić et al., 2013: 302). Cloud Computing reduces	By introducing cloud computing, organizations can improve eLearning accessibility and availability. Cloud computing can mitigate poor eLearning design as the service provider	Using cloud computing will solve the problem of eLearning availability and accessibility by providing learning anytime anywhere.

Research Question	Scientific Reflection	Findings	Propositions
	the risk of technical and physical resource management and maintenance (Bernal et al., 2016).	of eLearning will take responsibility and accountability for the design and presentation. When using cloud services, resources can be shared and utilised optimally.	

This chapter discussed and tabled the findings of the research study. An understanding of the research questions is shown, and propositions are derived from the findings. The summary of findings table above shows the research question, scientific evidence, findings, and the propositions derived from this research study. The propositions derived from this research study are:

P1: eLearning low usage is caused by poor eLearning presentation and learners not being ready to accept eLearning.

P2: Optimal network connectivity and availability of devices to access eLearning are both essential requirements necessary to improve eLearning usage.

P3: Using individualised learning styles to deliver eLearning content does improve eLearning usage.

P4: Using cloud computing will solve the problem of eLearning availability and accessibility by providing learning anytime anywhere.

The next chapter finally concludes, give recommendations, and points out what future research should involve extending this research study.

CHAPTER SIX
Reviewing the Conceptual Framework

6.1. Introduction

In this chapter the researcher explains how the extant theory was used to build a conceptual framework. In qualitative studies theories are rather built than tested, while in quantitative studies theories are tested. Instead of focusing on a grounded approach of theory building, the researcher decided to rather use an existing theory to help guide the research study towards building a conceptual framework. The chapter begins with reflecting back on the activity theory framework and its main elements which were used as a steering of the study. The activity theory elements referred to here are the subject, the tool/artefact, and the object. To this extent the researcher only focused on this one extant theory because it was believed that it has enough elements in its oneness to help identify the root cause of low eLearning usage. The activity theory puts focus on the users of eLearning, the eLearning tools like LMS systems etc, and the course material and assessments written. This chapter shows how the researcher expands from a basic activity theory framework with few elements to an advanced conceptual framework that helps the researcher to understand where the cause of low eLearning usage is rooted from, and adds cloud services to help curb low eLearning usage.

6.2. Extant Activity Theory

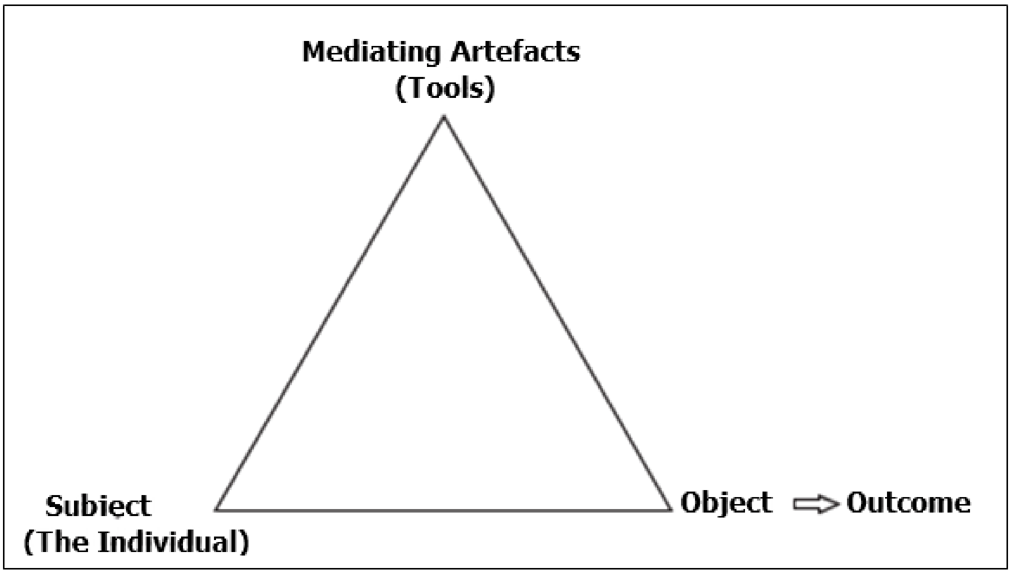

Figure 6.1: Vygotsky's first generation model of mediated action (Kinsella, 2018: 497)

In chapter 2, heading 2.2.1 of the theoretical background, the researcher explains the activity theory. For the reason that the researcher wanted to focus on only the subject, the tools, and the object in the activity theory, the researcher only needed the very basic framework of the activity theory by Vygotsky. The activity theory is meant to explore the relationship between human behaviour within individual members of a group and their mediation using artefacts that form a stimulus between members and the outcome of their mediation (Kinsella, 2018: 496-497). When individuals intervene and interact with artefacts, they enable change within the current culture of a setting by transforming an object into the desired outcome.

Next, the researcher explains the conceptual framework.

6.3. The Conceptual Framework

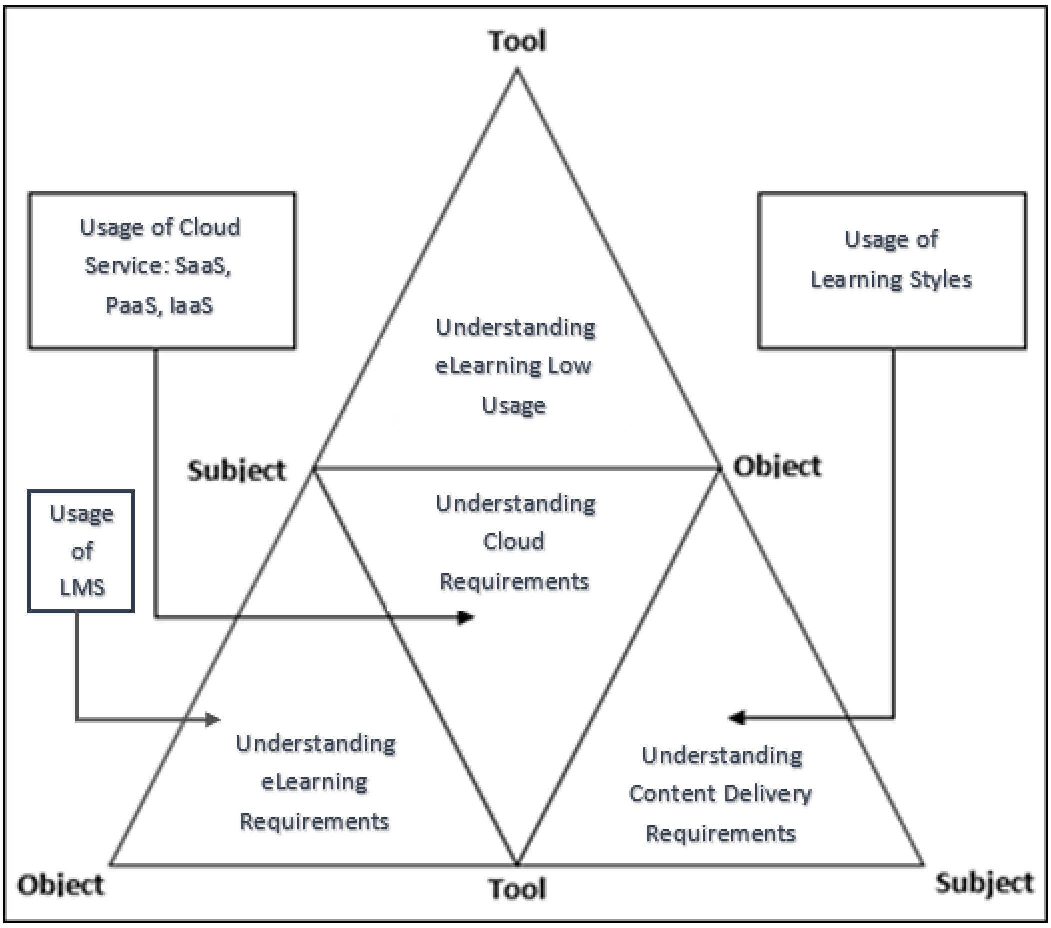

Figure 6.2: Improved conceptual framework

In Chapter 4, heading 4.1.1.4 the researcher explains the improved conceptual framework. The improved conceptual framework highlights that cloud requirements include cloud services like SaaS, PaaS and IaaS. In the literature, Lei et al. (2009: 865) describe cloud computing as a cloud service model that uses virtualisation technology and is highly scalable and reliable and is highly secured. Jingzhao (2017: 1) indicates that the key point of cloud computing is that infrastructure, development platforms, and software applications are components of services which can be acquired from service providers for a fee.

In the improved conceptual framework the cloud computing services are used as cloud delivery services that will enable ubiquitous access to eLearning. Ubiquitous access to eLearning fulfils the cloud requirements of the conceptual framework. In Table 6.1 below the researcher explains important concepts of cloud computing services as depicted in the conceptual framework. It is important to portray an understanding of cloud computing aspects in this regard, and the researcher had to explain cloud computing when explaining the conceptual framework.

Table 6.1. Conceptual Framework - Understanding Cloud Requirements

Cloud Computing Services		
Definitions of cloud computing services Jingzhao (2017) describes IaaS, PaaS, and SaaS below as explained in Chapter 2, heading 2.4.8.1.		
Definition of IaaS	**Definition of PaaS**	**Definition of SaaS**
Infrastructure as a service as service is made-up of IT facilities, computers, storage, networks and other software and hardware facilities.	PaaS offers a platform to develop, design, combine and manage functional units of the cloud learning platform.	SaaS provides educational web application services for elementary schools, middle and high schools, and training and adult education organizations, via the internet.
Benefits of cloud computing services Bokhari, Shallal, & Tamandani (2016: 890-891) indicates the following benefits of IaaS, PaaS, and SaaS below as in Chapter 2, heading 2.4.14. of this study.		
Benefits of IaaS	**Benefits of PaaS**	Benefits of SaaS
Infrastructure can be increased or decreased on demand. Clients are given the capability to start virtual machines.	Development process is flexible. Own server storage space is decreased.	Reduced cost of licensing. Multiple applications can be consumed by clients at the same time. The responsibility to limit and control application

Offers a network as a service and caters for load balancing. Reduces human resource and hardware costs. Offers an improved return on investment.	Streamlined deployment versions. Data security, recovery and backup capabilities. Reduced need for expert management and maintenance of infrastructure. Developers can work on the same application. Tools provided for customers to control and customise the environment to suit their needs.	usage is with the application provider. API provided for configurations even if customisation is limited. SaaS model uses secure socket layers (SSL).

Cloud Monitoring Ghahramani et al. (2017: 14) indicates tools like CloudWatch, AzureWatch, CloudStatus, Realize Hyperic, Nimsoft Monitis, Aneka, CloudKick, and UpTime for cloud monitoring in Chapter 2, heading 2.4.11.
QoS (Quality of Service) Ghahramani et al. (2017: 8) also gives a hint on cloud computing QoS in Chapter 2, heading 2.4.10. The three important aspects according to Ghahramani et al. are performance, dependability, and configuration.
Impacts on cloud computing user companies and organizations

In Chapter 2 of this research, heading 2.4.6, Tvrdíková (2016), Tvrdíková (2016) argues that organizations must upskill their employees with the skills to determine the content, volume, quality and price of ICT services. Tvrdíková says qualification structures will have to change, whereby employees will have to be more skilled about business in the areas of using ICT to gain a competitive advantage, creating new products and services, attracting new customers, improving response time to external organization events, and reducing the costs of business processes.

In Figure 6.3 below, the researcher derives an understanding of eLearning low usage using the conceptual framework focusing on the subject, the tool, and the object.

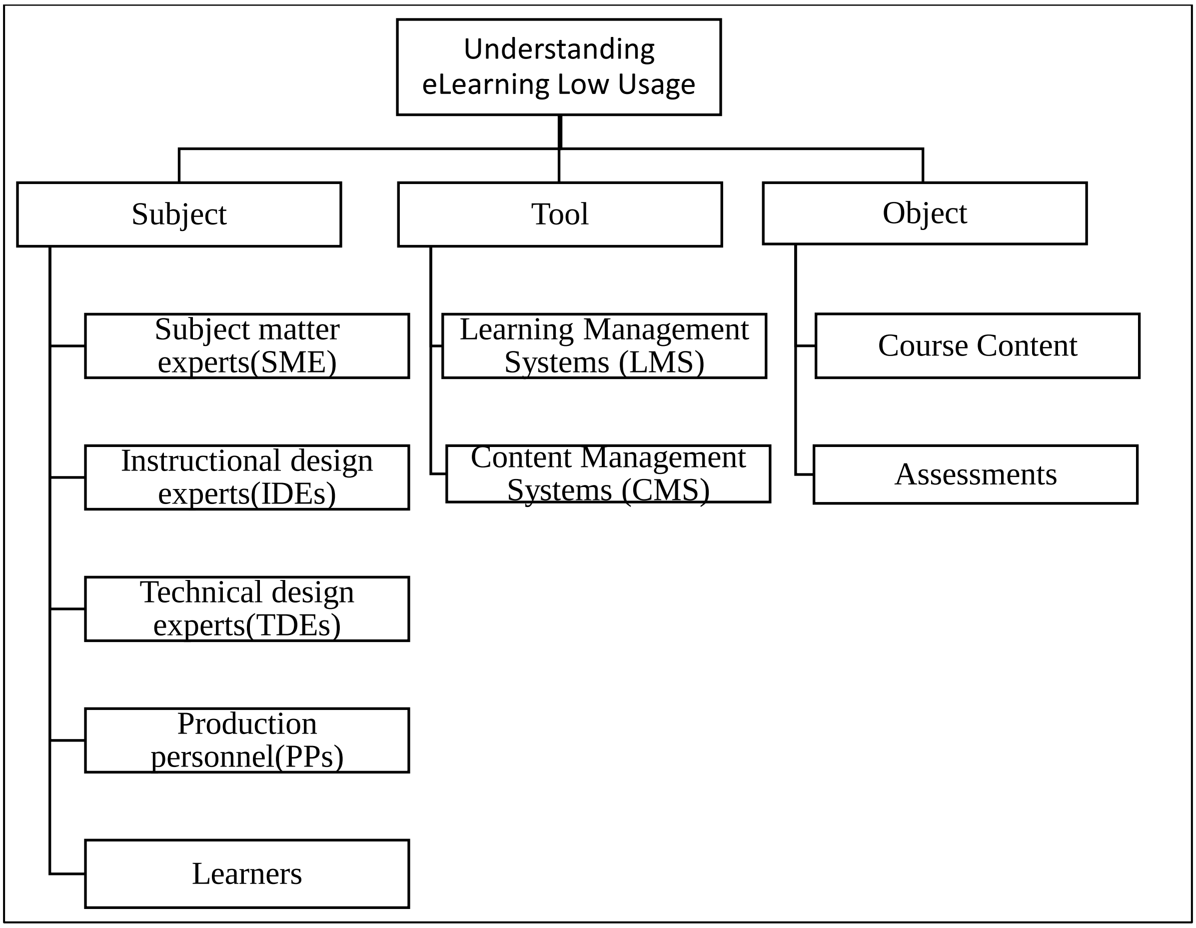

Figure 6.3: Conceptual framework - Understanding eLearning Low Usage

In Chapter 2, heading 2.2.2, the researcher explains the eLearning problem and maps it in the conceptual framework. In this study, the eLearning problem addressed is the low usage of eLearning. The low usage problem could have been caused by the subject, the tools, or the object. The subject includes the subject matter experts (SMEs), instructional design experts (IDEs), technical design experts (TDEs), production personnel (PPs) and the learners. The tool includes the learning management systems (LMSs) and content management systems (CMSs). The object represents the course content and assessments.

In Table 6.2 the researcher expands the conceptual framework by mapping the real world problem into the conceptual framework to illustrate how it derives an understanding of the problem at hand.

Table 6.2. Conceptual framework - Understanding eLearning Low Usage

eLearning Problem

During mid-2016 to mid-2017 compared to preceding years since 2012 when eLearning was initially implemented at ComTek, about 50% of compliance and training assessments had shown a decline of below 80% in both usage rate and pass rate. Of the 50% of assessments, some were between 40% and 50% in usage rate.

The low usage symptoms at ComTek resulted in low compliance, low contribution to skills enhancement, and low recognition of the organization's investment in eLearning.

Subject	Tool	Object
Respondents	LMS (e.g. Moodle)	Assessments

Objective

To understand the factors that contribute to low eLearning usage.

Finding

Low usage of eLearning at some telecommunication organizations in South Africa may be caused by poor eLearning presentation, and learners' not being ready to accept eLearning. Findings further indicate that the network infrastructure and eLearning systems at some telecommunication organizations in South Africa are not designed in a way to deliver seamless eLearning. There could have been other issues to do with individual learner confidence, as the literature suggests.

Proposition

eLearning low usage is caused by poor eLearning presentation and learners not being ready to accept eLearning.

This means that, rather than addressing the lack of time to access eLearning onsite, the research work suggests that more focus needs to be put on enhancing the design of eLearning, the learners’ readiness to accept the technology, and the presentation of content.

In Figure 6.4 the researcher shows how the eLearning requirements must be mapped in the conceptual framework focusing on the subject, the tool, and the object.

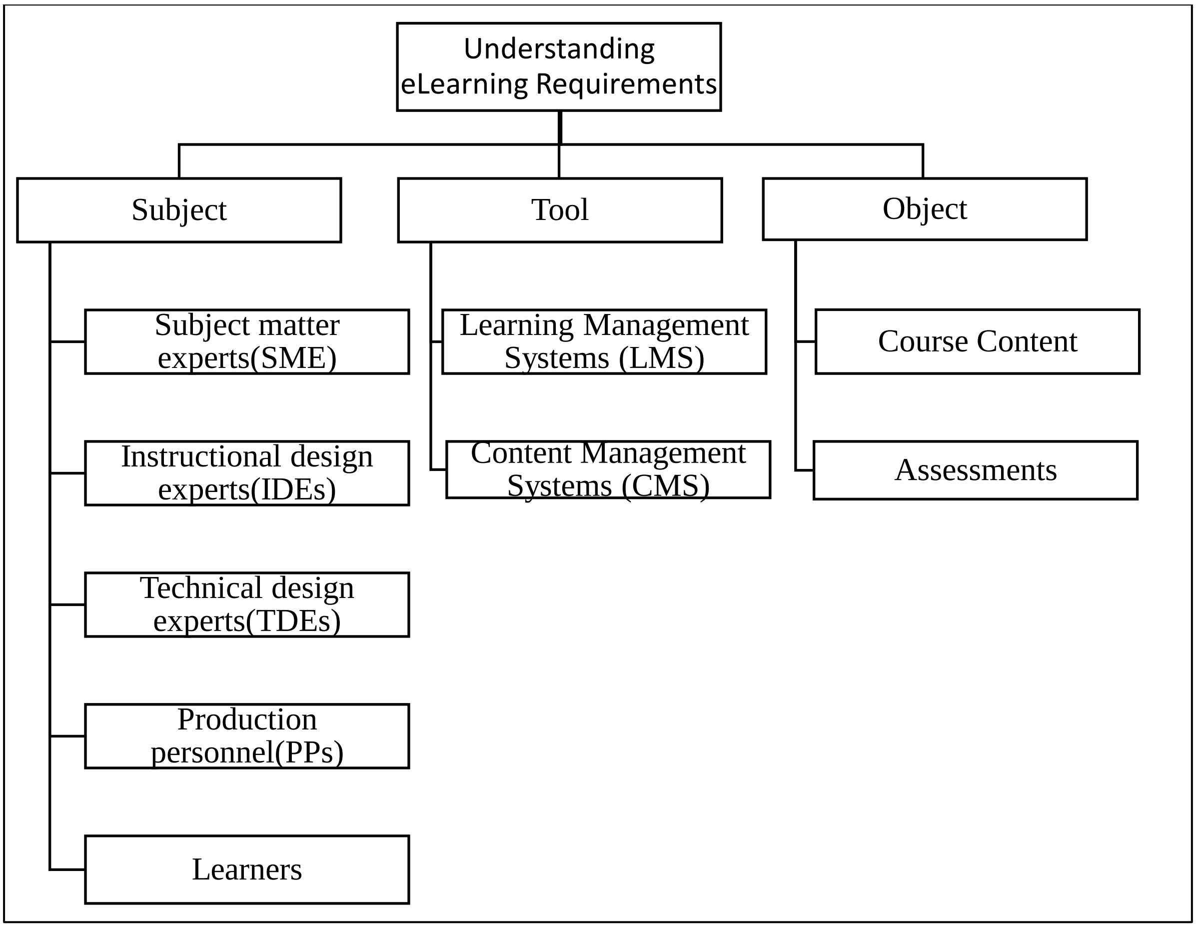

Figure 6.4: Conceptual framework - Understanding eLearning Requirements

ELearning requirements include the necessary subjects, the tools, and objects with which the subjects interact. By the subjects or stakeholders in eLearning, the researcher refers to subject matter experts (SMEs), instructional design experts (IDEs), technical design experts (TDEs) and production personnel (PPs). Ibarra-Florencio, Buenabad-Chavez, & Rangel-Garcia (2014) indicate in their study that the expert stakeholders are necessary for an eLearning project to be successful. The basic tools to enable proper eLearning are learning management systems (LMSs) and content management systems (CMSs), as Ganchev, O' Droma, & Andreev (2007) had mentioned in their study. The object represents the course content and assessments to be written by the learners in the eLearning course.

In Table 6.3 the researcher expands the conceptual framework by mapping the real world eLearning requirements into the conceptual framework to illustrate how it derives an understanding of eLearning requirements necessary to curb low eLearning usage.

Table 6.3. Conceptual Framework - Understanding eLearning Requirements

eLearning Requirements

Subject	**Tool**	**Object**
Respondents	LMS (e.g. Moodle)	Assessments

Objective

To understand eLearning requirements towards improving eLearning usage.

Finding

Lack of access devices may contribute to the learners' readiness to use eLearning technology. Using cloud computing services can allow the user/customer of the service to acquire access devices as subsets of the cloud offering. The access devices may be managed and supported remotely by the service provider.

Proposition

Optimal network connectivity and availability of devices to access eLearning are both essential requirements necessary to improve eLearning usage.

In Figure 6.5 the researcher shows how the content delivery requirements must be mapped in the conceptual framework focusing on the subject, the tool, and the object.

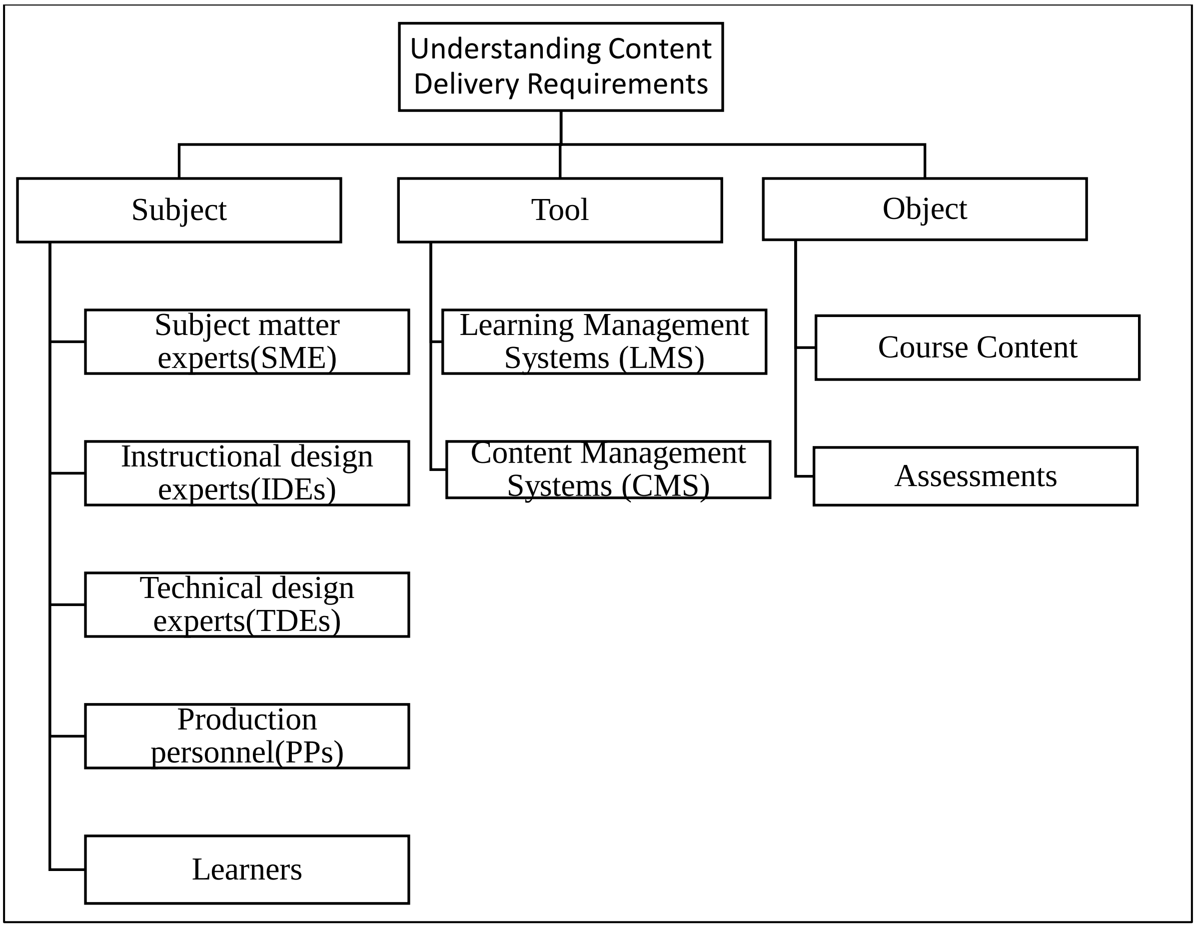

Figure 6.5: Conceptual framework- Understanding Content Delivery Requirements

When considering content delivery, the eLearning implementors must also consider a paradigm where learning is individualised, and must prioritise learners' learning styles for learning to take place seamlessly, as advised by Kostolanyova & Nedbalova (2017: 4). Content delivery requirements include the necessary subjects (stakeholders) to deliver content, the necessary tools (LMS, CMS), and the objects (Course content, Assessments) with which to interact.

In Table 6.4 the researcher expands the conceptual framework by mapping the real world content delivery requirements into the conceptual framework to illustrate how it derives an understanding of content delivery requirements necessary to curb low eLearning usage.

Table 6.4. Conceptual framework- Understanding Content Delivery Requirements

Content Delivery Requirements

Subject	**Tool**	**Object**
Respondents	LMS (e.g. Moodle)	Assessments

Objective

To understand content delivery requirements towards improving eLearning.

Finding

Poor presentation of eLearning content may discourage learners to use eLearning systems. An eLearning system must be robust, cater for ubiquitous learning, and must be based on an individual's learning styles.

Proposition

Using individualised learning styles to deliver eLearning content does improve eLearning usage.

In Figure 6.6 the researcher shows how the cloud delivery requirements must be mapped in the conceptual framework focusing on the subject, the tool, and the object.

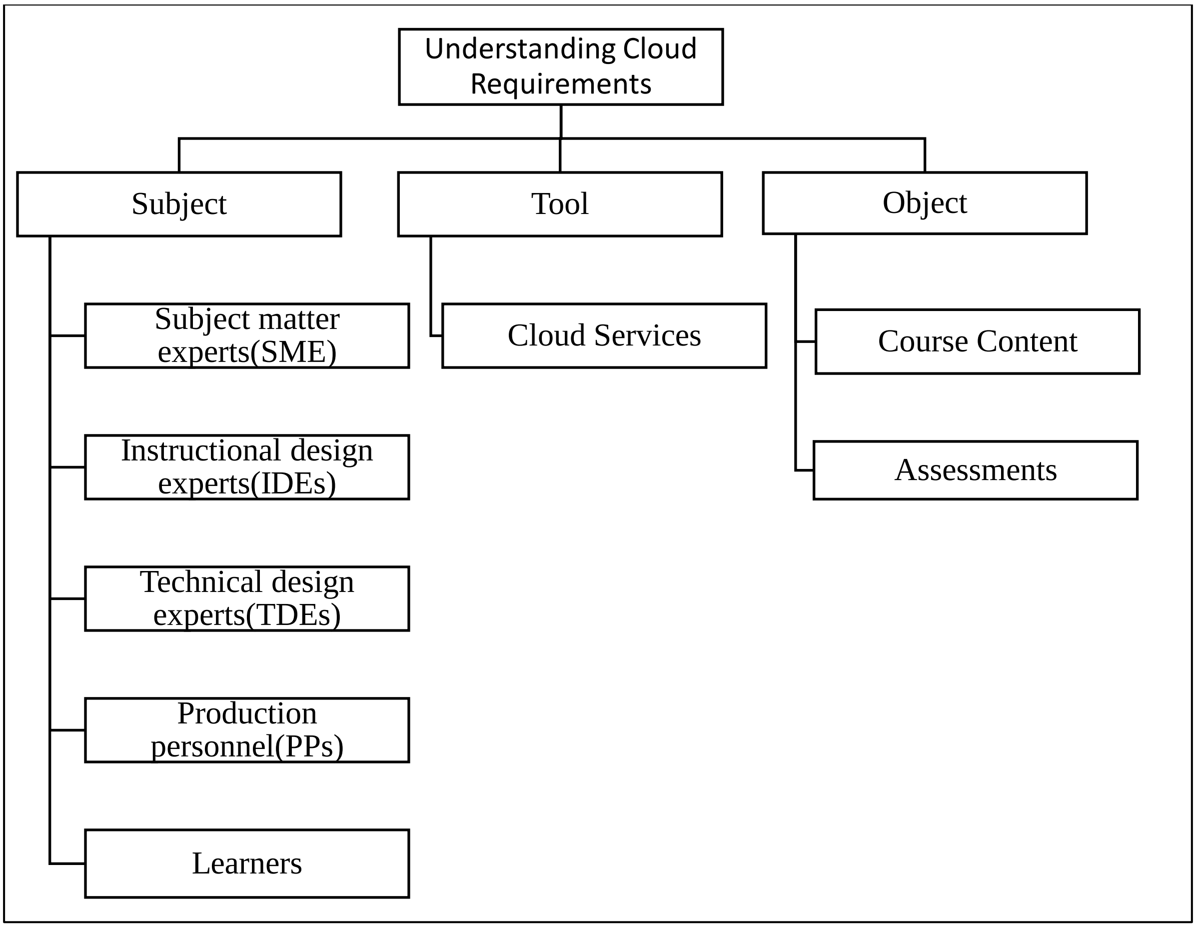

Figure 6.6. Conceptual framework - Understanding Cloud Requirements

The subject and the objects refer to stakeholders and assessments as previously defined in other units of the conceptual framework. Stakeholders are subject matter experts (SMEs), instructional design experts (IDEs), technical design experts (TDEs) and production personnel (PPs). Assessments include products assessments, organization ethics, health and safety requirements, and business continuity management. The tools refer to the services offered by cloud computing, like IaaS, PaaS and SaaS. With cloud computing services in place learners can study anytime and anywhere, while the organization saves costs as cloud computing services are fully maintained at a cloud service provider's premises.

Zrakić et al. (2013: 302) define cloud computing as "*an abstract, scalable and controlled computer infrastructure that hosts applications for the end-users*". Bernal (2016: 64) defines cloud computing as a new way to decentralise data centres, virtualise infrastructure and platform and provide access to services through the Internet, unlike the traditional corporate LAN.

In Table 6.5 the researcher expands the conceptual framework by mapping the real world cloud delivery requirements in the conceptual framework to illustrate how it derives an understanding of cloud delivery requirements necessary to curb low eLearning usage

Table 6.5. Conceptual framework - Understanding Cloud Delivery Requirement

Cloud Delivery Requirements

Subject	**Tool**	**Object**
Respondents	LMS (e.g. Moodle)	Assessments

Objective

To understand a technology that can be used to improve eLearning usage.

Finding

By introducing cloud computing, organizations can improve eLearning accessibility and availability. Cloud computing can mitigate poor eLearning design as the service provider of eLearning will take responsibility and accountability for the design and presentation. When using cloud services, resources can be shared and utilised optimally.

Proposition

Using cloud computing will solve the problem of eLearning availability and accessibility by providing learning anytime anywhere.

CHAPTER SEVEN
Conclusions, recommendations and further research

7.1. Conclusion

This research study addressed a case of eLearning low usage. It is true that most organizations do not fully realise the value and potential of eLearning for their training needs. The reason the researcher had to embark on this research study was because of a perceived problem of low eLearning usage at an organization named ComTek. At the initial stages when the eLearning environment was established, a fair usage routine was perceived because of the excitement of using new systems and the stringent compliance organization policies to use the eLearning environment. Following the steady usage routine a drop was noticed in usage rate based on a set target measurement for determining eLearning success. It was not known what the true cause of low eLearning usage was at the early stages of the research study.

The researcher had to source literature from research studies where similar problems were discussed. Different research literature acknowledged the problem of low eLearning usage based on their own context and understanding. Literature from academic research indicates that low usage can be caused by learners who are not ready to use eLearning, learners who have low computer experience, learners who have low confidence and learners who have a negative attitude towards eLearning technologies. Other influences could be poor infrastructure, demographic divides, lack of skilled staff, inadequate technology education levels, psychological issues, social issues and cultural issues.

The topic that was decided upon to present the study was: “FACTORS IMPEDING THE USAGE OF ELEARNING AT A TELECOMMUNICATION ORGANIZATION IN SOUTH AFRICA: BRIDGING THE GAP WITH CLOUD SERVICES”. This topic represents the addressing of eLearning low usage by discovering the factors which impede the usage of eLearning. The topic also addresses cloud computing as a way to bridge the gap of eLearning low usage by using cloud services. The researcher did not have any intervention in mind when indulging in the research study. Hence, at the end of the study, a conceptual framework for understanding the factors of eLearning low usage was built. The conceptual framework may be tested in future research as a matter of advancing the research endeavour.

ELearning is a major aspect driving this study. Literature describes eLearning as a technology that caters for ubiquitous and seamless learning. Literature indicates that eLearning is a combination of wireless and mobile technologies used to enable learning. Learning and training with the aid of eLearning may take place using the internet, the intranet or the extranet. ELearning must be personalised and must be dependent on individuals' learning styles.

Next, the activity theory is further explained.

7.1.1. The Activity Theory Framework

The activity theory framework is useful when one wants to understand human activities, how people interact, and how people behave when they use tools or artefacts to achieve a social practice. The activity theory further indicates that the process of understanding human behaviour using the activity theory involves a community, rules defined by the community and a division of labour.

The activity theory literature did not remain a silo in this study, but had to be tied to the problem this research study was addressing. To achieve this knot, the researcher had to conceptualise the activity theory, showing how its elements were connected to the research objectives of the study.

The conceptual view of the activity theory in this study shows that focus needs to be placed on the subject, the object and the tools or artefacts used to understand the eLearning low usage factors. In the same manner, the eLearning requirements, the content delivery requirements and the technology requirements need to be addressed when addressing the low usage factors.

To curb eLearning low usage, literature suggests that learners need computer skills, learner engagement, accessibility, flexibility and self-paced learning. The learning system must also consider learners' learning styles when presenting learning content.

7.1.2. Causes of low eLearning usage

It is discovered that the low usage of eLearning could be caused by numerous causal factors, but the researcher investigated only three factors, (1) the technology used, (2) the presentation of assessments, and (3) the behaviour of learners. From the researcher's investigation, the low eLearning usage problem was actually caused by poor eLearning design, the inadequate readiness of learners to use eLearning for their training needs, and poor presentation of eLearning. In the basic themes in the data analysis section, the researcher realised that network and eLearning systems were not designed in a way to deliver eLearning seamlessly. There could have been other issues to do with the individual learner's confidence, as the literature suggests.

7.1.3. Requirements to curb low eLearning usage

To curb low eLearning usage or to improve eLearning usage, the eLearning plan at hand must cater for adequate access devices. This will improve and contribute to the to the learners' readiness to use eLearning technology. If the eLearning plan includes the use of cloud computing services for hosting eLearning, this can allow the users/customers of the eLearning services to acquire access devices as subsets of the cloud offering. These access devices will be managed and supported remotely by the service provider.

With a variety of advantages like synchronous and asynchronous learner engagement, accessibility, flexibility, self-paced learning, interactivity and increased availability and skill development, the buy-in and usage of eLearning can be improved (Dlalisa, 2017). ELearning, being a self-paced learning method, allows learners to work on training tasks as quickly or slowly as they prefer (DeRouin, Fritzsche, & Salas, 2005: 922).

7.1.4. Requirements to improve eLearning content delivery

Poor presentation of eLearning content may discourage learners to use eLearning systems. An eLearning system must be robust, cater for ubiquitous learning, and must be based on an individual's learning styles. When considering content delivery, the eLearning plan must consider a paradigm where learning is individualised, and must prioritise learners' learning styles for learning to take place seamlessly, as advised by Kostolanyova & Nedbalova (2017: 4). Content delivery requirements include the necessary subjects to deliver content, the necessary tools, and the objects with which to interact.

While the literature has mentioned that learning styles need to be considered in eLearning, Panda & Puhan (2015: 157) have a concern about acoustic learning for hearing aid users. They say the processed sound from speakers might limit the amount of gain and reduce sound and speech quality. Muljo, Perbangsa, & Pardamean (2018: 49) argue that online learning could create feelings of isolation among learners who might feel like they do not have a sense of belonging to their online learning community. However, the researcher thought that eLearning better addresses issues of individualism by allowing learners to express themselves without fear of being judged by others face to face. However, studies show that this might not always be the case, according to Muljo et al. (2018).

7.1.5. Cloud Computing Requirements for eLearning

By introducing cloud computing, organizations can improve eLearning accessibility and availability. Cloud computing can mitigate poor eLearning design as the service provider of eLearning will take responsibility and accountability of the design. When using cloud services, resources can be shared and optimally utilised to leverage the organization's requirements. Cloud computing has benefits of cost reduction, quick and effective communication, security, privacy, flexibility and accessibility (Bora & Ahmed, 2013).

The researcher proposed cloud computing as a way to improving low usage of eLearning. When cloud computing is correctly deployed, cloud services like infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS) can be used to attain learning anytime and anywhere. Most organizations have ideal technology and infrastructure arrangements, ideal training processes, good motivation for teachers and learners, adequate support for their management teams, and in general, a conducive learning environment, but have not yet indulged in cloud computing as a way to improve their eLearning capabilities.

7.2. Recommendations

To understand the problem of eLearning low usage, the organization must use the activity theory and focus on the tools (LMS systems) used, the object (courses and assessments) worked on, and the subject (Learners) doing the work. When embarking on an eLearning project, it is important to consider learners' learning styles and present eLearning according to the learners' learning styles, whether auditory, visual or kinaesthetic.

Since the researcher had an indication that the respondents possessed qualifications at a diploma level and higher, it served as proof that the learners had the ability to learn, and were somewhat technology savvy, and were thus in a position to embrace eLearning technology as a tool for learning. Seeing that the respondents did not view technology to be a cost, the researcher concludes that the organization had the capacity to embrace eLearning and cloud computing technology at the time of the research study.

It is imperative for organizations to move their applications and systems to the cloud to enjoy cloud service offerings like IaaS, PaaS and SaaS. Cloud computing offers learners the chance to learn anytime and anywhere.

7.3. Further Research

This research study was not holistically completed as there could have been other areas to include if it had not been for limitations perceived as highlighted earlier in the study. For this reason, the researcher suggests that further research must be on intensively examining learning styles, cognitive theories and other technologies relating to cloud computing such as fog computing.

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APPENDICES

APPENDIX 1: EDITING CERTIFICATE

Editing Certificate

Client: **PHOEBUS MERE**

This certificate is to record that I, Yvonne Thiebaut, have completed a copy-edit, layout and reference list check of your thesis "**FACTORS IMPEDING THE USAGE OF ELEARNING: BRIDGING THE GAP WITH CLOUD SERVICES**".

The edit included the following:

Spelling; Tenses; Vocabulary; Punctuation; Pronoun matches; Word usage; Sentence structure; Table and figure numbers and layout; Content (limited); Reference list check and format

The edit excluded the following:

Correctness or truth of information (unless obvious); Correctness/spelling of specific technical terms and words (unless obvious); Correctness/spelling of unfamiliar names and proper nouns (unless obvious); Correctness of specific formulae or symbols or illustrations

Name of Editor: Yvonne Thiebaut

Qualifications: Bachelor of Arts Honours (Psychology) degree and Bachelor of Arts (Theatre Arts & Drama) degree

Signature:

Date Issued: 07 January 2019

The editor will not be held accountable for any later additions or changes to the document that were not edited by the editor, nor if the client rejects/ignores any of the changes, suggestions or queries, which he/she is free to do. The editor can also not be held responsible for errors in the content of the document or whether or not the client passes or fails. It is the client's responsibility to review the edited document before submitting it for evaluation.

APPENDIX 2: PLAGIARISM PLEDGE

DPSET02/10

Plagiarism Pledge

1. I have read Unisa's plagiarism policy.
2. I understand Unisa's plagiarism policy.
3. I agree to abide by Unisa's plagiarism policy.
4. All academic work, written or otherwise, that I submit is expected to be the result of my own skill and labour.
5. I understand that, if I am guilty of the infringement of breach of copyright/plagiarism or unethical practice, I will be subject to the applicable disciplinary code as determined by Unisa.
6. I understand that my supervisor will use Turnitin (or similar plagiarism tool) to check submitted research for plagiarism.
7. The supervisor has the right to return any work to be revised if plagiarism is detected.

Student's name: Phoebus Mere

Student number: 55145922

Student Signature

01/05/2015

Date

APPENDIX 3: REQUEST FOR INFORMATION FORM

Form Company Wide | REQUEST FOR INFORMATION | Group Human Resources

REQUEST FOR INFORMATION

The High Level Process

In short you need to find an Executive and Subject Matter Expert (SME) in the area you need information and obtain their support and approval.

R - Responsible; A – Accountable; C – Consult with; I - Inform

Steps	Requester	Promoter	Line Executive	HR Business Partner	SME
Need for information exists. Requester contacts HR Business Partner for advise on the process	R	I		C	
Requester to complete approval form (TE-HR9020 – see below) and forward it to the relevant Line Executive for approval	R/A	I		C	
Line Executive approves/do not approve request and information to be provided	I	I	R/A	I	I
Line Executive informs the Requester of outcome	I	I	R/A	I	I
SME provides information through a discussion session	A	I	I	I	R
Requester submits final copy of research [illegible] approval and submits research document to Requester and cc requester's promoter for record keeping and archiving	R/A	I	I	I	I

Document No.: TE-HR9020
Version: 1.3
Repository: HR-000760

Group Human Resources
- For Group HR Use Only -
Proprietary And Confidential Company Information

Implementation Date: 2003-08-26
Process Owner: Group Culture - Transformation
Page 1 Of 3

● Page 2

Telkom

REQUEST FOR INFORMATION

NAME OF RESEARCHER:	PHOEBUS MERE
SERVICE ORGANISATION:	TGIT: IBS
SALARY REF NUMBER:	4503429
JOB TITLE & LEVEL:	Developer
PROMOTER:	Alister Witbooy
E-MAIL:	merep1@telkom.co.za
TELEPHONE NUMBER:	0123116285
STUDY INSTITUTION:	UNISA
LECTURER/ STUDY LEADER/	Richard Naidoo

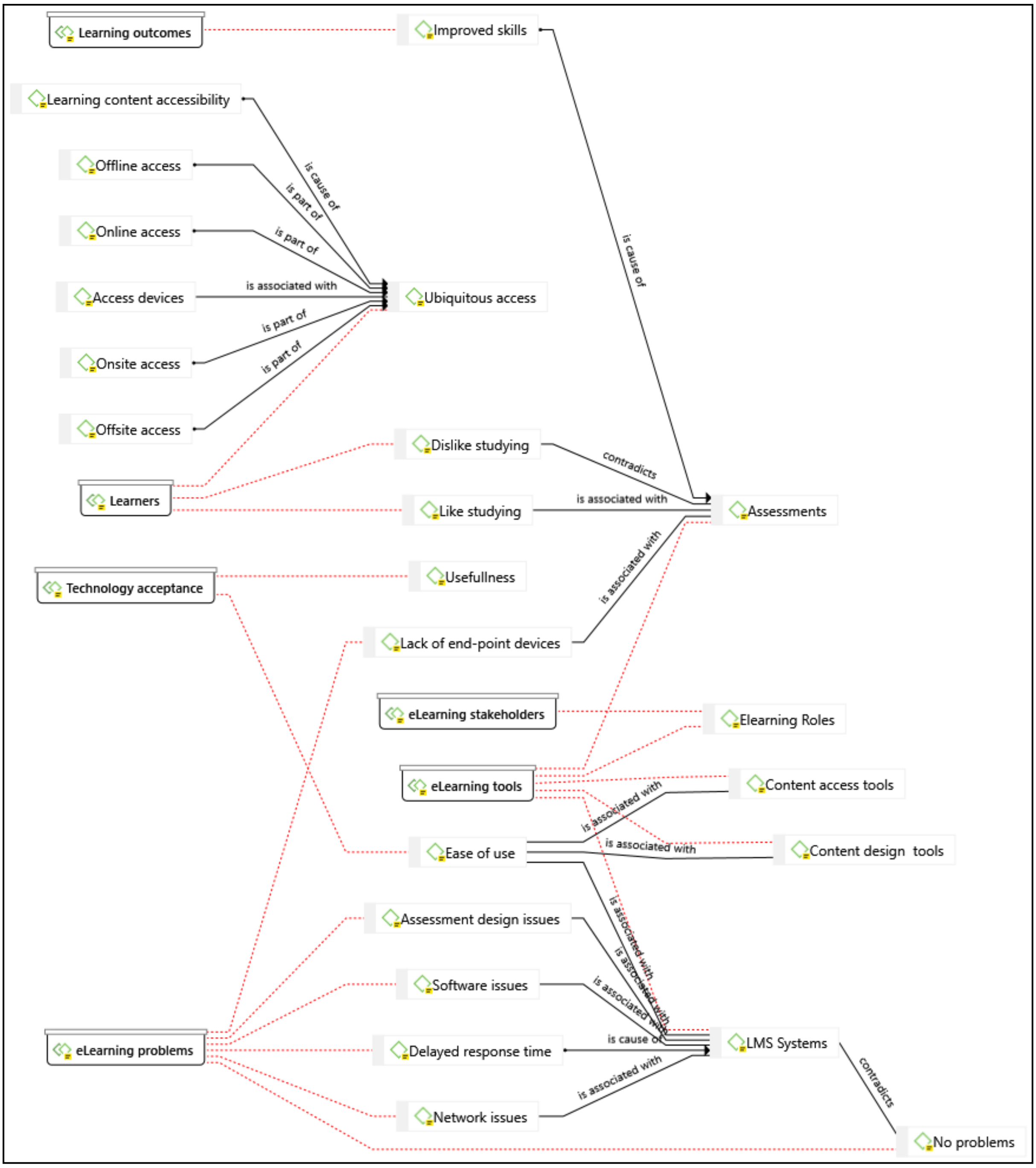
Description of research topic	Elearning on a cloud computing platform taking advantage of Iaas, Paas and Saas services using Moodle/TLMS as a tool.
Information required	Information about Telkom elearning environment, TLMS, Sumtotal, Course design, Assessments
Purpose of Information	Information gathered will contribute as data for the research study and problem formulation
How will the information be used?	Information will be used for academic purposes and proper ethics will be considered
Who will have access to this information?	Phoebus Mere, Richard Naidoo, and UNISA

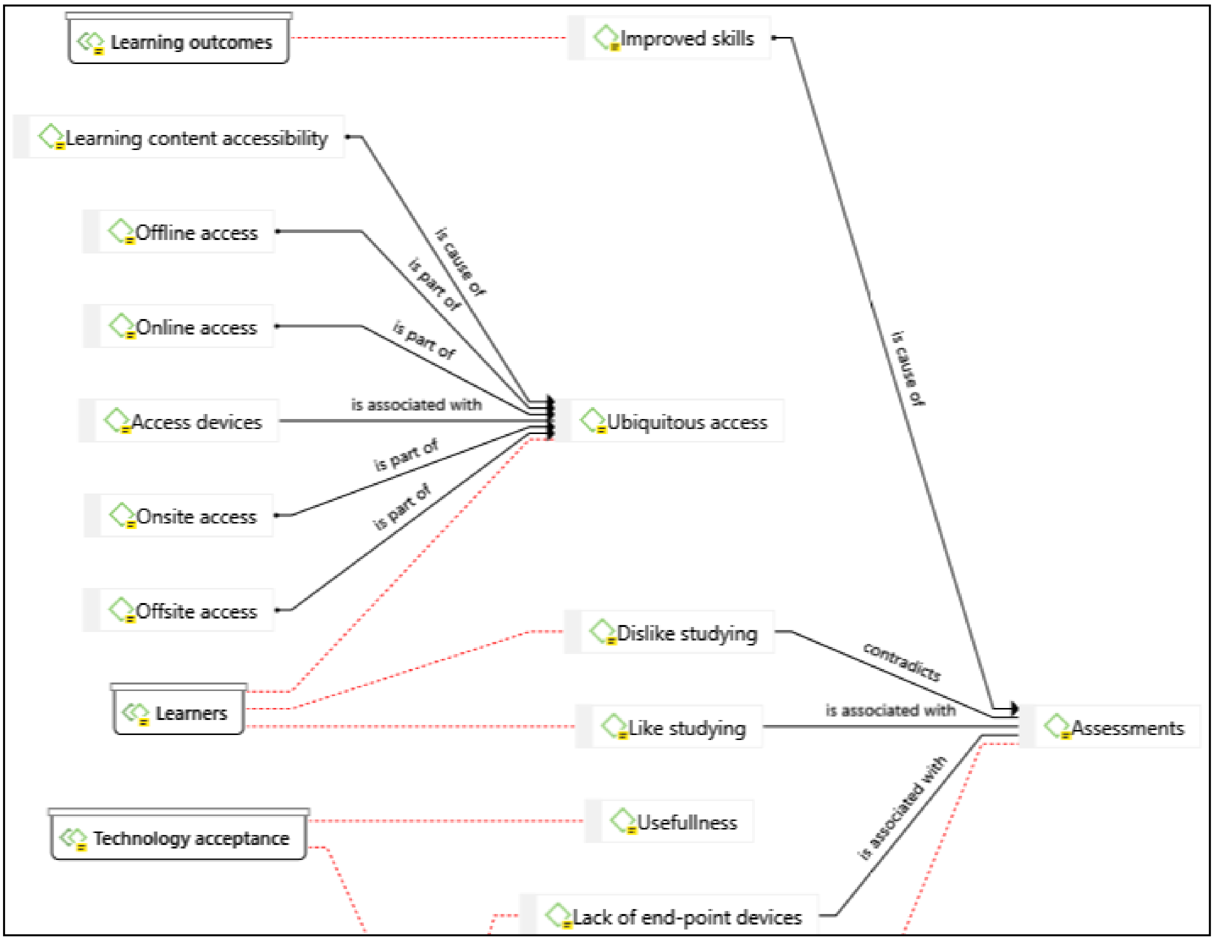
Where will the research project / assignment be published?	UNISA

FOR OFFICIAL USE – TO BE COMPLETED BY HR BUSINESS PARTNER IN CORPORATION WITH SME AND LINE EXECUTIVE

Process A	
SO where research will be conducted	HR (Functional Comp Management)
Name: SME (Subject Matter Expert)	Otsile Mabyane
Name: HR Business Partner	Nomabele Jantjies
Recommendation (Yes/No) Line Executive	YES
Reason	
Information that will be provided	e-learning layout; TLMS staff; Admin Processes; Usage stats; Learning tools; Security concerns
Date	22/09/2015
Signature	[illegible]
Approved / Decline By: (Line Executive)	[illegible]
Date	18/09/2015
Process B	
Checked final document and satisfied with the content YES / NO (N.b. if no, researcher needs to change or remove content and resubmit)	
Date	
Name and signature of SME or person who provided the information and checked the document	
Approved By: (Line Executive)	
Date	

APPENDIX 4: ANALYSED RESULTS USING ATLAS Ti SOFTWARE

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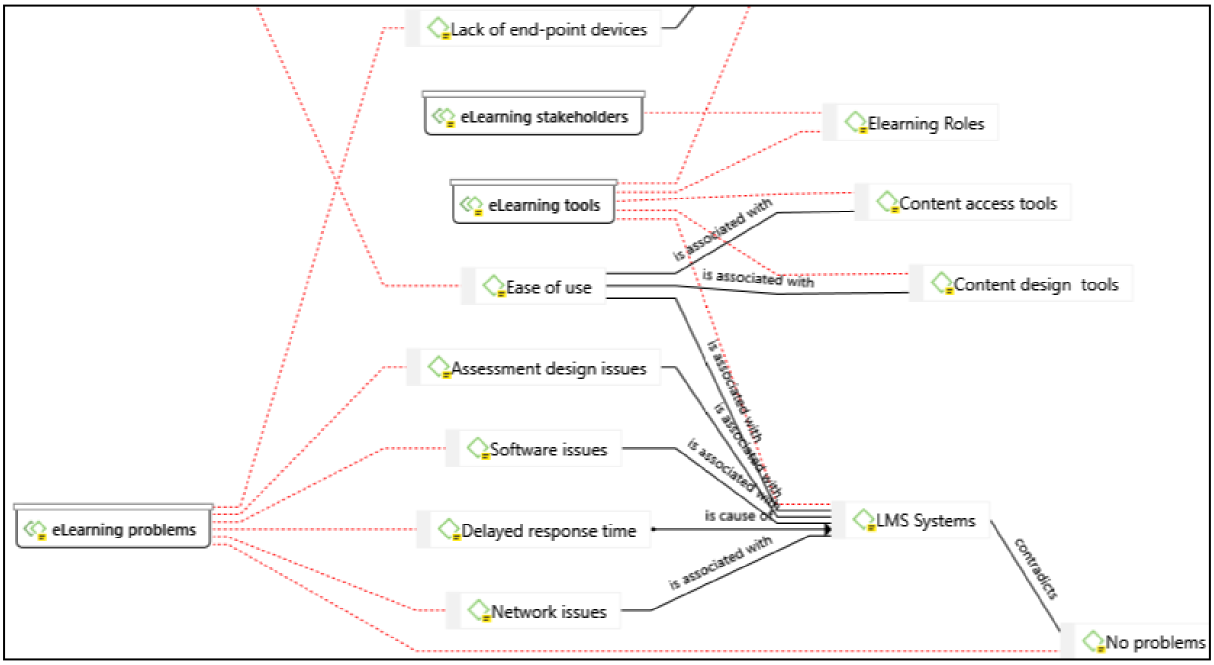
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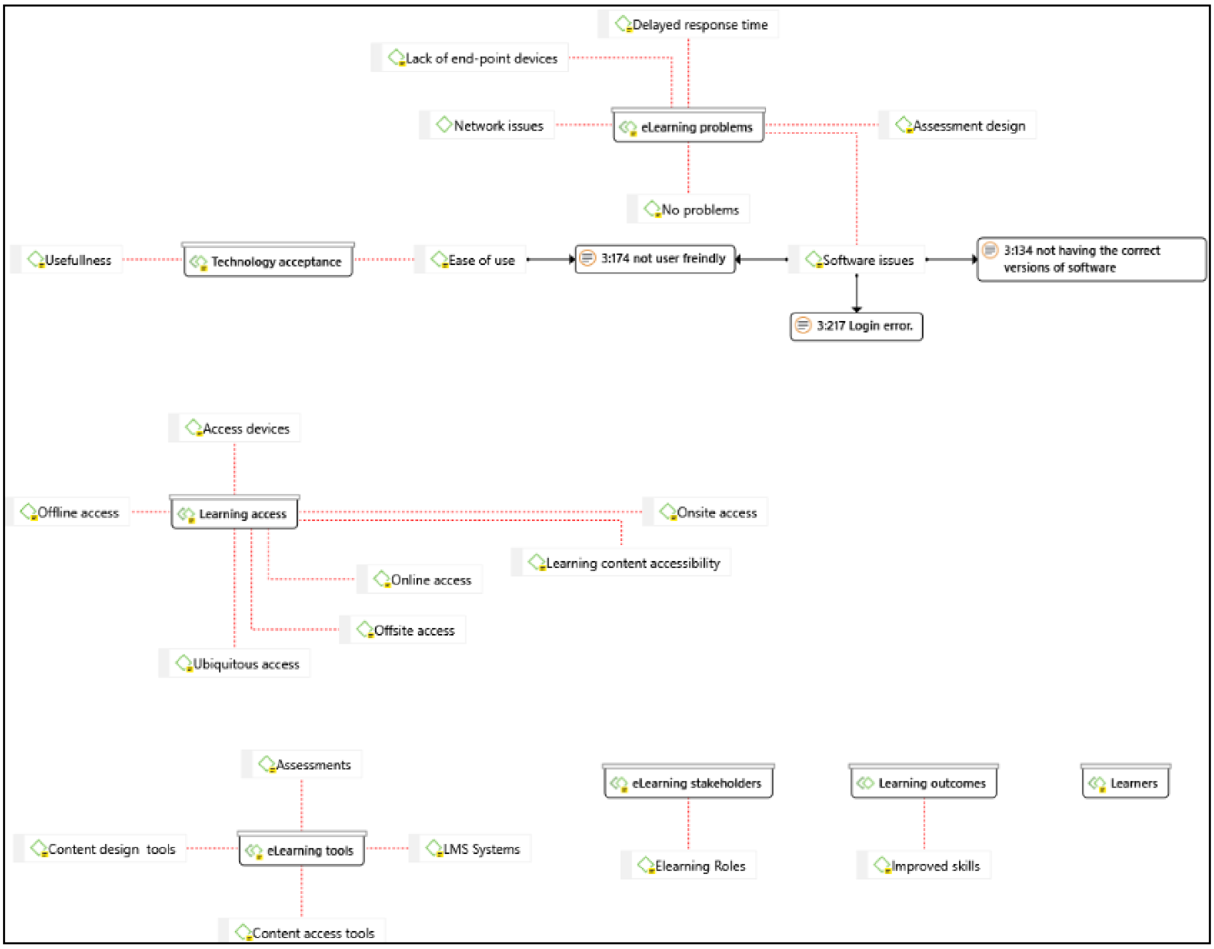
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Access devices
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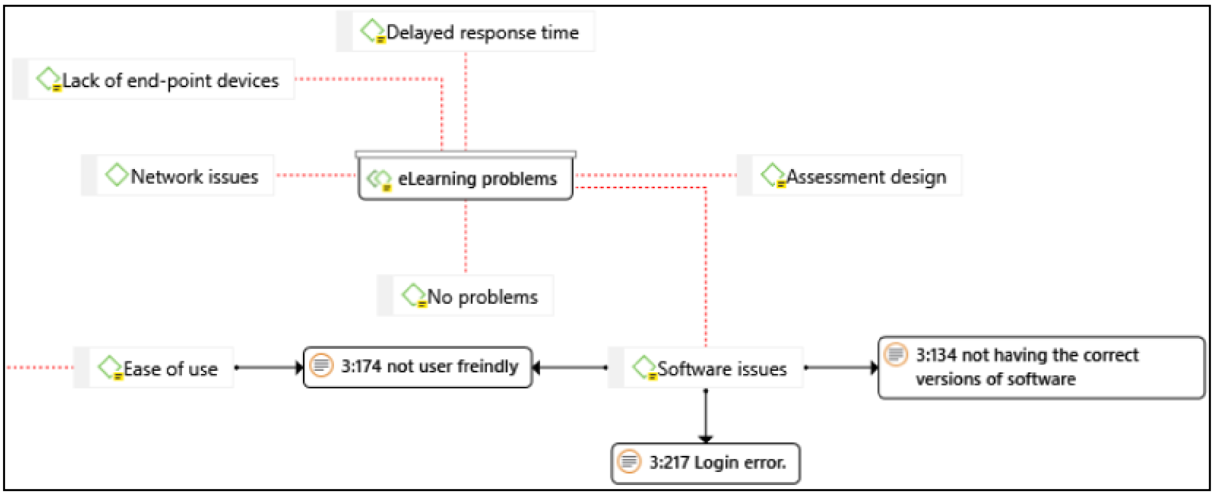
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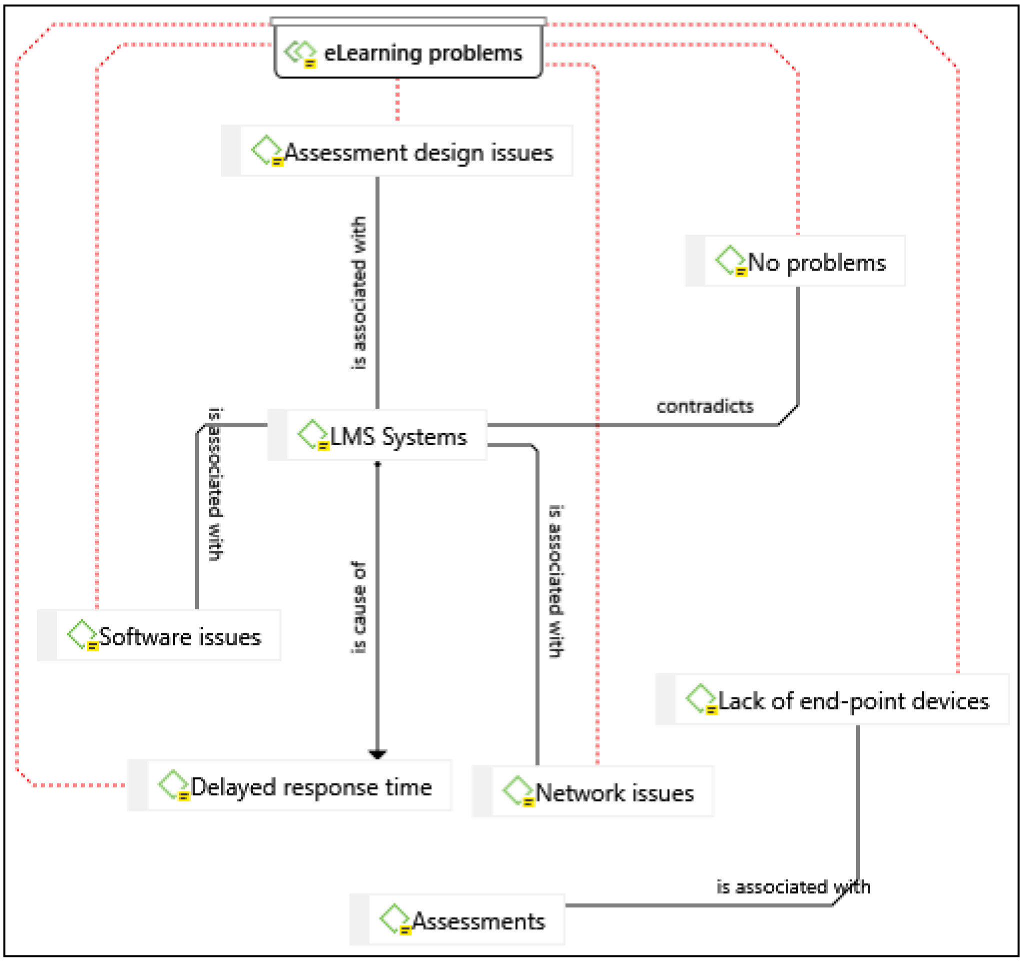
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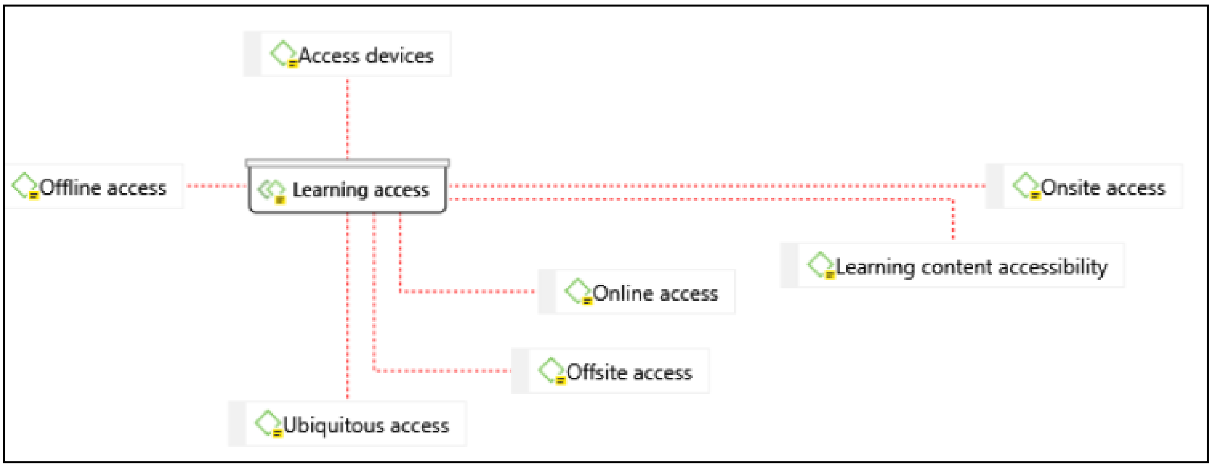
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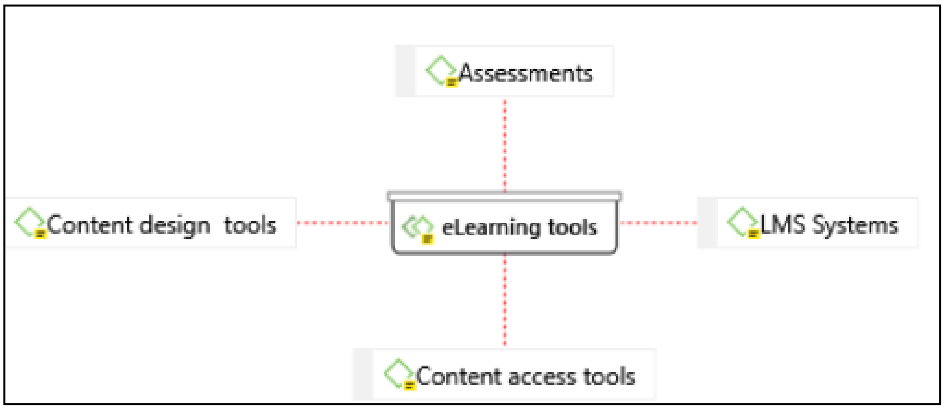
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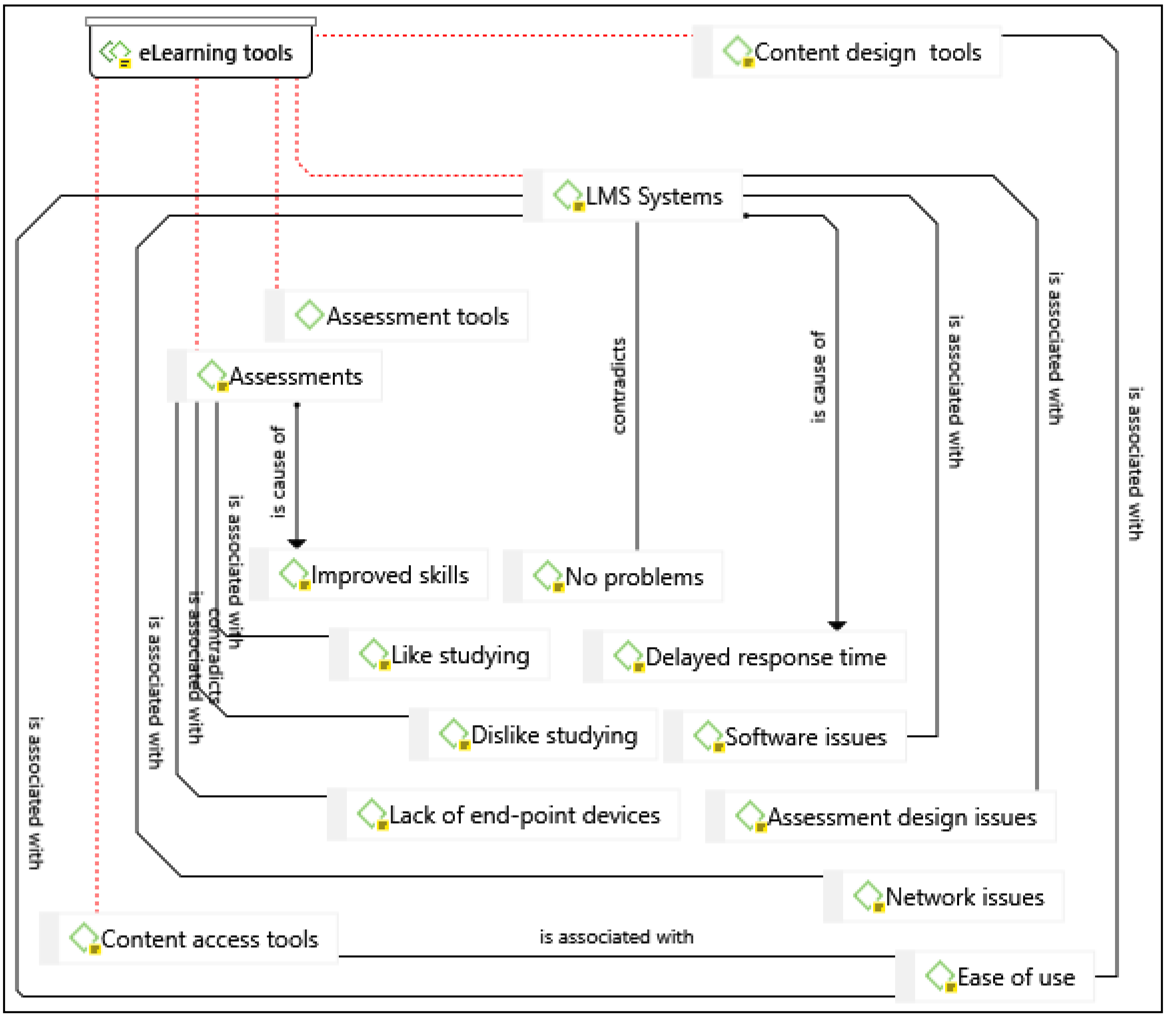
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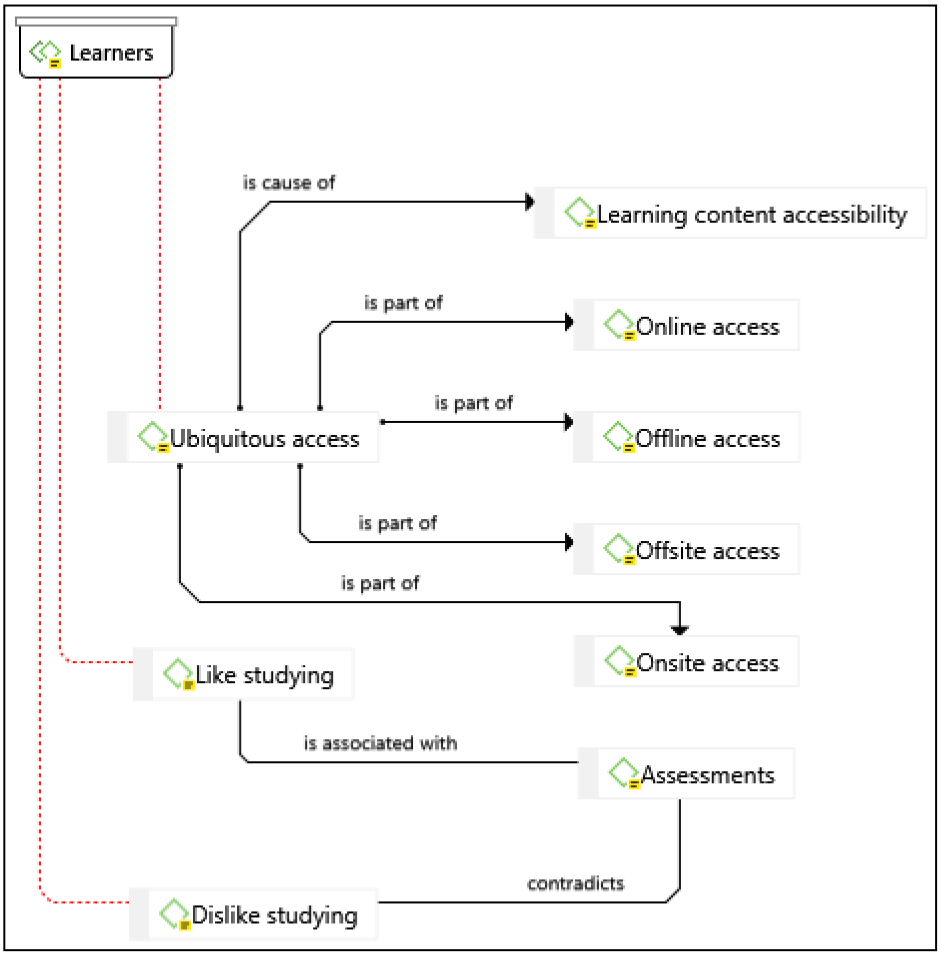
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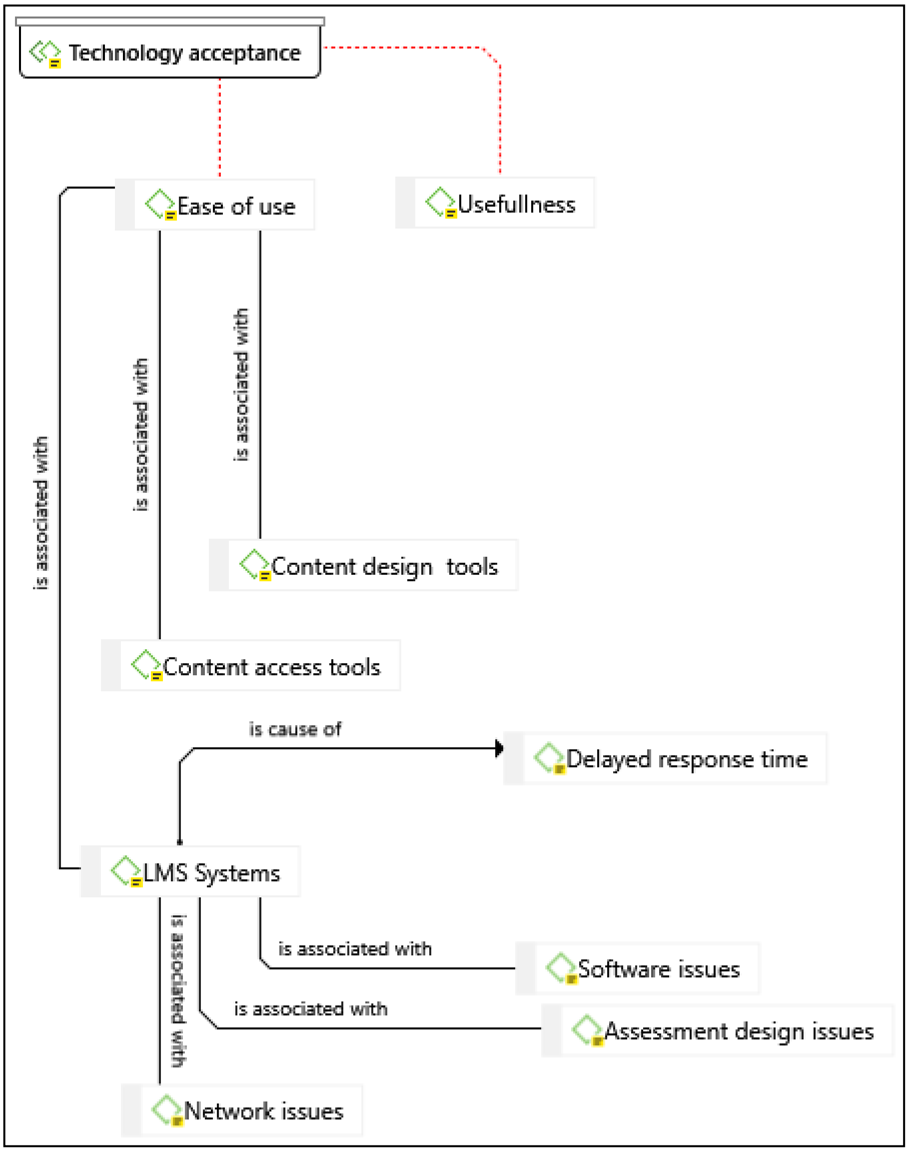
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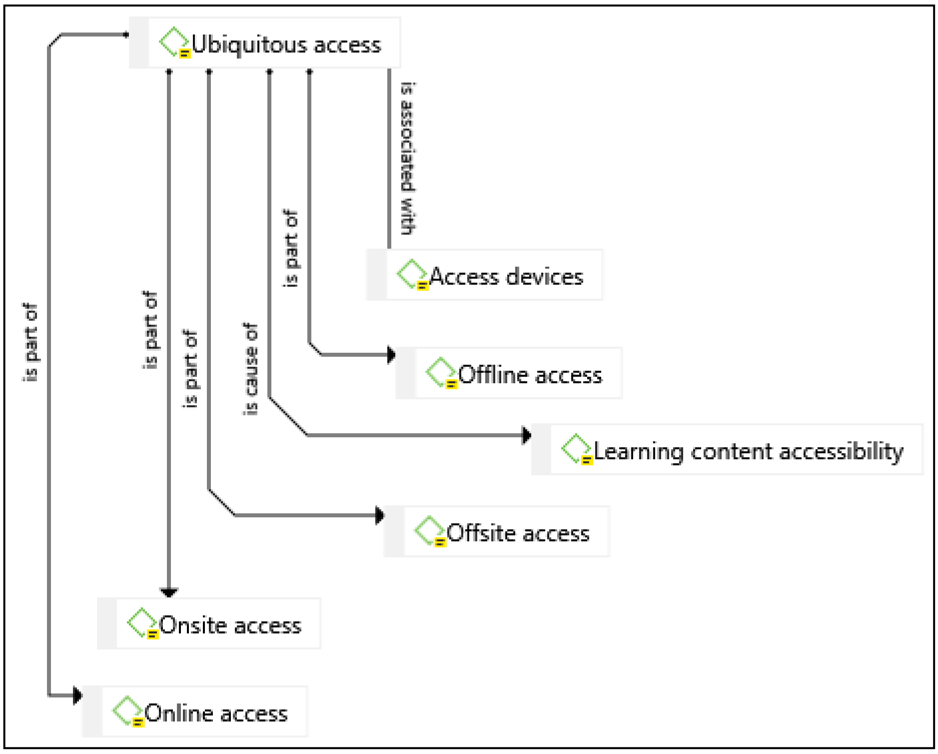

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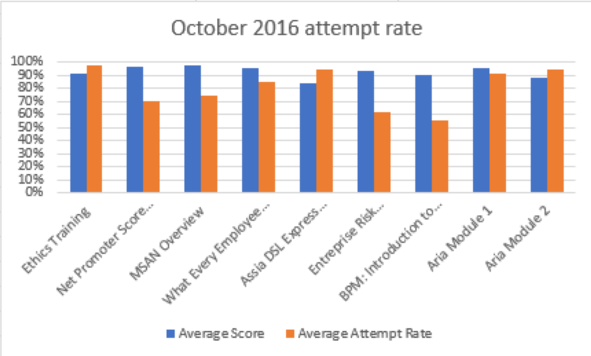
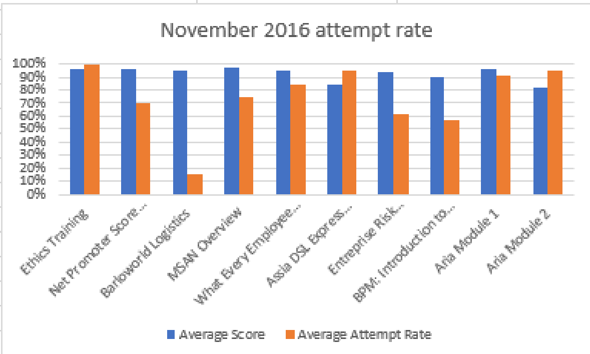
APPENDIX 5: DOCUMENT DATA (SNAPSHOT)

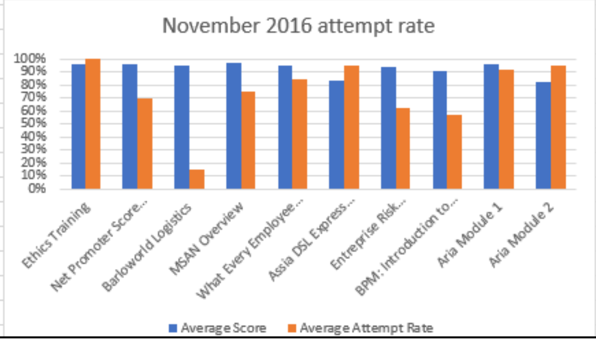
Assessment Name	Average Score	Average Attempt Rate	Asessment Importance
Ethics Training	90,58%	97,74%	Compliance
Net Promoter Score Basics	96,25%	69,55%	Compliance
MSAN Overview	97,22%	74,59%	Training
What Every Employee Should Know About Health and Safety in the Workplace	94,79%	84,25%	Compliance
Assia DSL Express ClearView	83,73%	94,53%	Training
Entreprise Risk Management	93,39%	62,03%	Compliance
BPM: Introduction to the System	90,17%	55,77%	Training
Aria Module 1	95,59%	91,46%	Training
Aria Module 2	88,30%	94,63%	Training



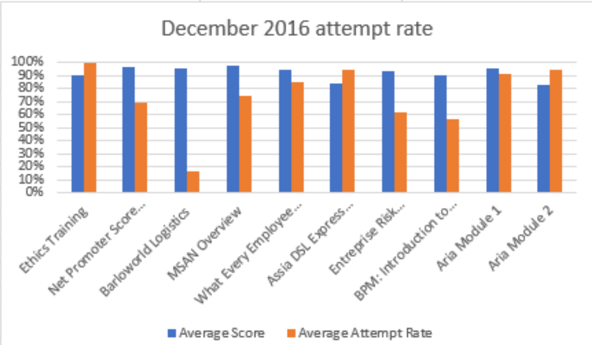
Assessment Name	Average Score	Average Attempt Rate	Asessment Importance
Ethics Training	95,76%	100,00%	Compliance
Net Promoter Score Basics	96,25%	69,56%	Compliance
Barloworld Logistics	95,17%	14,90%	Training
MSAN Overview	97,23%	74,39%	Training
What Every Employee Should Know About Health and Safety in the Workpl	94,80%	84,52%	Compliance
Assia DSL Express ClearView	83,70%	94,45%	Training
Entreprise Risk Management	93,39%	62,04%	Compliance
BPM: Introduction to the System	90,14%	56,61%	Training
Aria Module 1	95,56%	91,42%	Training
Aria Module 2	82,23%	94,34%	Training



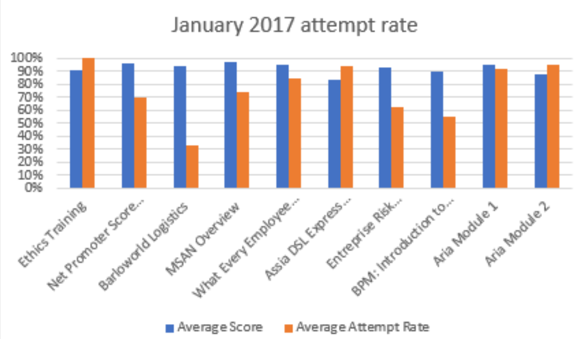
Assessment Name	Average Score	Average Attempt Rate	Asessment Importance
Ethics Training	95,76%	100,00%	Compliance
Net Promoter Score Basics	96,25%	69,56%	Compliance
Barloworld Logistics	95,17%	14,90%	Training
MSAN Overview	97,23%	74,39%	Training
What Every Employee Should Know About Health and Safety in the Workplace	94,80%	84,52%	Compliance
Assia DSL Express ClearView	83,70%	94,45%	Training
Entreprise Risk Management	93,39%	62,04%	Compliance
BPM: Introduction to the System	90,14%	56,61%	Training
Aria Module 1	95,56%	91,42%	Training
Aria Module 2	82,23%	94,34%	Training



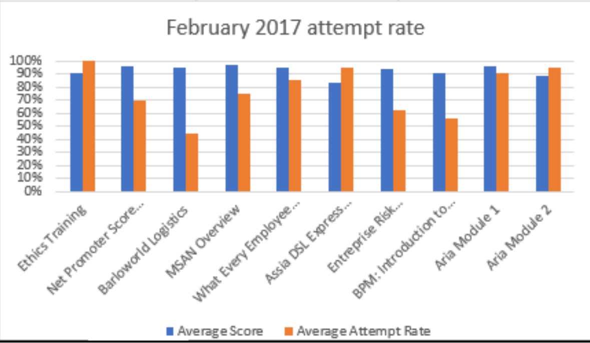
Assessment Name	Average Score	Average Attempt Rate	Asessment Importance
Ethics Training	90,58%	100,00%	Compliance
Net Promoter Score Basics	96,25%	69,56%	Compliance
Barloworld Logistics	94,96%	16,12%	Training
MSAN Overview	97,23%	74,39%	Training
What Every Employee Should Know About Health and Safety in the Workplace	94,80%	84,52%	Compliance
Assia DSL Express ClearView	83,67%	94,40%	Training
Entreprise Risk Management	93,39%	62,04%	Compliance
BPM: Introduction to the System	90,14%	56,61%	Training
Aria Module 1	95,56%	91,55%	Training
Aria Module 2	82,23%	94,34%	Training



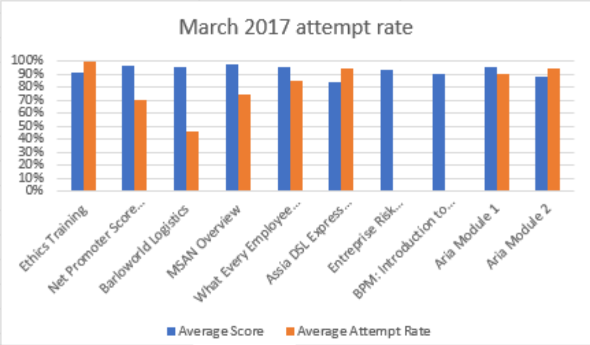
Assessment Name	Average Score	Average Attempt Rate	Asessment Importance
Ethics Training	90,57%	100,00%	Compliance
Net Promoter Score Basics	96,25%	69,58%	Compliance
Barloworld Logistics	94,13%	32,83%	Training
MSAN Overview	97,24%	74,37%	Training
What Every Employee Should Know About Health and Safety in the Workplace	94,80%	84,52%	Compliance
Assia DSL Express ClearView	83,63%	94,40%	Training
Entreprise Risk Management	93,40%	62,01%	Compliance
BPM: Introduction to the System	90,01%	55,45%	Training
Aria Module 1	95,52%	91,46%	Training
Aria Module 2	88,05%	94,75%	Training



Assessment Name	Average Score	Average Attempt Rate	Asessment Importance
Ethics Training	90,57%	100,00%	Compliance
Net Promoter Score Basics	96,25%	69,59%	Compliance
Barloworld Logistics	94,85%	44,08%	Training
MSAN Overview	97,24%	74,39%	Training
What Every Employee Should Know About Health and Safety in the Workplace	94,83%	84,92%	Compliance
Assia DSL Express ClearView	83,65%	94,35%	Training
Entreprise Risk Management	93,40%	61,98%	Compliance
BPM: Introduction to the System	90,04%	55,83%	Training
Aria Module 1	95,57%	90,27%	Training
Aria Module 2	87,97%	94,58%	Training



Assessment Name	Average Score	Average Attempt Rate	Asessment Importance
Ethics Training	90,57%	100,00%	Compliance
Net Promoter Score Basics	96,25%	69,60%	Compliance
Barloworld Logistics	94,95%	45,96%	Training
MSAN Overview	97,24%	74,39%	Training
What Every Employee Should Know About Health and Safety in the Workplace	94,83%	84,91%	Compliance
Assia DSL Express ClearView	83,63%	94,33%	Training
Entreprise Risk Management	93,34%	61.96%%	Compliance
BPM: Introduction to the System	90,12%	59.29%%	Training
Aria Module 1	95,49%	90,11%	Training
Aria Module 2	88,00%	94,27%	Training



APPENDIX 6: INTERVIEW QUESTIONS AND FEEDBACK

Interview Questions

1. What LMS systems are available in the organization to facilitate eLearning?
2. Why is the organization having more than one LMS system?
3. Which one works better?
4. Why is it perceived to be the better one?
5. Does this LMS produce results?
6. Do you perhaps see an improvement in the usage rate of learners in this system as compared to other available systems?
7. Did the pass rate of learners improve since the introduction of this system? And with what approximate percentage did it improve?
8. Was there any architectural assessments done for acquiring both LMS software?
9. Does the organization have architectural processes to follow in terms of acquiring services or software? 10
10. What was the process followed in acquiring the software?
11. Does the organization have a standard process for acquiring software and services from external providers?
12. Is this process always followed in acquiring/outsourcing necessary services?
13. Which additional software was used to compare feasibility of other software offering better results than the available ones?
14. Any FRI, RFP, and RFS documents completed?
15. Does the organization have any content management systems?
16. Which components constitute or makeup the eLearning environment in the organization?
17. Do you think it costs a lot to implement an eLearning environment? What costs may be involved?
18. What is the generic problem perceived in the eLearning environment?
    - system problems
    - process problems
    - user problems
19. What do you think about cloud computing?

20. If you were offered an eLearning system on the cloud at a lessor cost and with same efficiency would you go for it?

Transcribed Interview Response Data

ELearning software's used at ComTek were Moodle and SumTotal. Both LMSs were implemented around the same time and ran in parallel since their implementation. Moodle was implemented internally due to budget constraints, as it was open source software. While Moodle was implemented for internal purposes, SumTotal on the other hand was implemented for external users like customer facing users, franchisers, dealers, and agile workers. Moodle housed all courses and assessments compulsory to the organization like ethics courses, Governance courses, products courses, health and safety requirements courses, business continuity management courses and governance courses. SumTotal did not run on the organizations premises and did not integrate with ComTek's infrastructure, while Moodle ran 100% on customer premises. SumTotal was a licence software whereby ComTek payed fixed annual fees for it, while Moodle was an open source software which the organization did not pay for licensing but would however pay for support from third parties if was necessary. SumTotal was licensed for 2700 users initially at the time of its implementation and was later expanded to 10000 users. SumTotal was better than Moodle in terms of functionality, specifications, compatibility, reports, rich graphics, template designs, and also producing better learning results.

The interviewed manager-respondents said they were happy with Sumtotal as an LMS system of choice. They also said they were in plans to roll out the Sumtotal LMS to ComTek's sales departments and probably other departments. According to the respondents, it was quite difficult to compare Moodle and SumTotal in terms of improvements in learning outcomes as both LMSs catered for different audiences, and the learners' frequency of accessing assessments and learning depended on where they were physically located at the time, what content was currently accessed, and what launches were currently hosted.

ComTek did not really have a content management system but used a document management system called eDox to store learning content. In terms of software acquisition processes followed, the respondents indicated that they followed procurement processes, whereby a tender was organised, followed by an RFP (request for proposal), and an RFQ (request for quotation) which a known vendor responded to. This process was followed because ComTek already knew what they were looking for, so there was no need for assessments and RFIs (request for information). The vendor who responded to the RFP and RFQ happened to be using SumTotal, hence ComTek ended up using SumTotal as their other LMS system.

When buying an eLearning system or any other information system, there must be some sort of architectural assessment, however respondents said that with SumTotal, there were no architectural assessments done as they did not have the luxury of time, and they only had two months to offer training online. They did not do any analysis or comparison with other possible software. In any organization, the information technology department has to be aware or be involved in any software deal by the organization, however with SumTotal, the respondents said that the IT department did not have any interest in assisting them through the process of attaining the software. They indicated that the IT department rather had their own priorities and obligations.

There were advantages perceived with eLearning, and these are: reduced cost, less training facilities needed, less travelling, learning anywhere and anytime, and facilitate learning anytime anywhere. ELearning is an investment than a cost. At first simulation software like Articulate and Captivate needed to be deployed and licensed, for LMS platforms to be put in place, enough budgets for licensing must also be in place.

Apart from all positive feedback about eLearning, there were also system problems encountered daily, and these were: software implementation time was always longer than time set for content delivery, the training environment was not conducive, eLearning prioritization took a back sit in the organization, culture is a problem between the old and younger learners, system and behavioural issues, and process problems. Users usually had issues with system interaction caused by password problems, and communication about system down times. To improve the eLearning, we wanted to introduce cloud computing. Thus, we had to ask the respondents a few questions about cloud computing. Some respondents did not know much about cloud computing and did not have much to say.

Manager-respondent #2 had the following to say when interviewed:

She said SumTotal could handle great volumes and is accessible anytime anywhere. The technical support was good; the LMS produces results, and had great reports and learning parts. The organization had seen a 50% increase in access rate, and there had been low failure rate at 3% when using SumTotal. Moodle was used organization-wide, and for internal assessments. Moodle was free open source software, while SumTotal was licensed software used by the contracted vendor during the time of implementation. The process followed to acquire SumTotal was a procurement process whereby a feasibility study was done, and a comparison was done between SABA LMS and SumTotal, and other LMSs the respondent could not remember.

For contentment management the organization used inhouse developed software called e-dox and bookshelf, and also the SumTotal repository. For the organization to have a viable eLearning system, the following aspects were to be considered: in terms of access, there would have to be reliable connectivity in terms of course offerings, tutorials, and assessments, there would have to be voice recording such that there is a properly simulated virtual facilitation, and in terms of social cohesion, learners would have to be ready to use the system or the technology, and labour unions would have to be involved in order for a broader coverage of employee relation aspect. ELearning at ComTek was not viewed as a cost as it was viewed to save the organization money in the long run, it was rather viewed as an investment.

While the respondents understood the investment in eLearning, they also perceived problems with their eLearning environment. System problems perceived included system stability, network issues, escalating network and internet down times, coverage issues, connectivity issues, network cable theft which affects external access. Process problems perceived included red tapes in implementation processes, less adherence to store processes, and course preparation time during working hours consuming time. User problems perceived were users not being able to adopt technology, different age groups respond differently to the adoption of technology, the young users were easier to deal with in eLearning acceptance, while the older users were not technology savvy and wanted to stick to traditional ways of learning.

In terms of cloud computing, the response received here was the view that cloud computing reduces maintenance costs and risks as the service provider is responsible for this, and a penalty fee would be charged if the SLA (service level agreement) was not met for whatever reason. Next in the tables below, we extract codes from analysis the interview data.

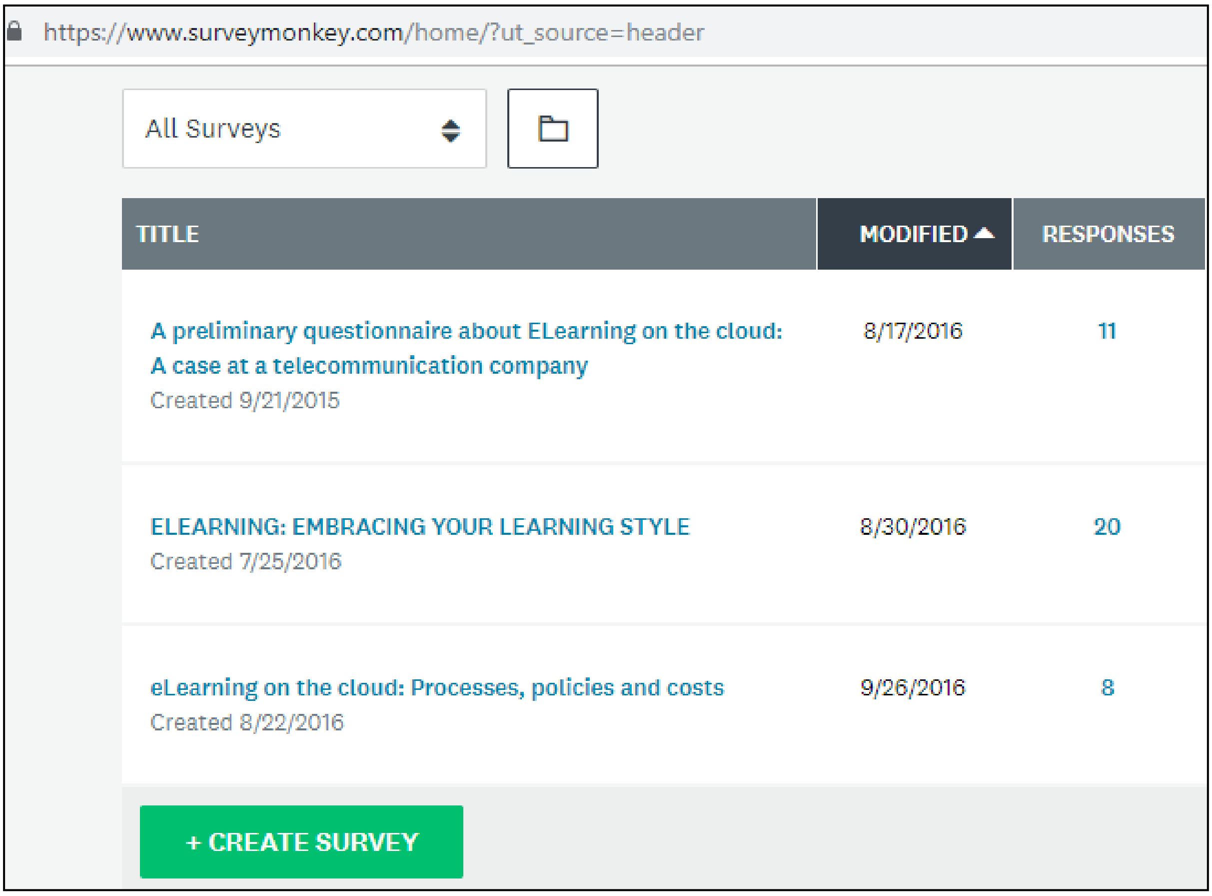
APPENDIX 2: QUESTIONNAIRES AND FEEDBACK

Survey monkey was used as a platform for hosting the questionnaires. The questions were posted in three batches with three different titles at different times asking different questions related to the required feedback as an intention to get better feedback.

The titles of the questionnaire surveys were:

1. Survey 1: A Preliminary Questionnaire about ELearning on the Cloud: A Case at a Telecommunication Organization
2. Survey 2: ELearning: Embracing your Learning Style
3. Survey 3: eLearning on the cloud: Processes, policies and costs

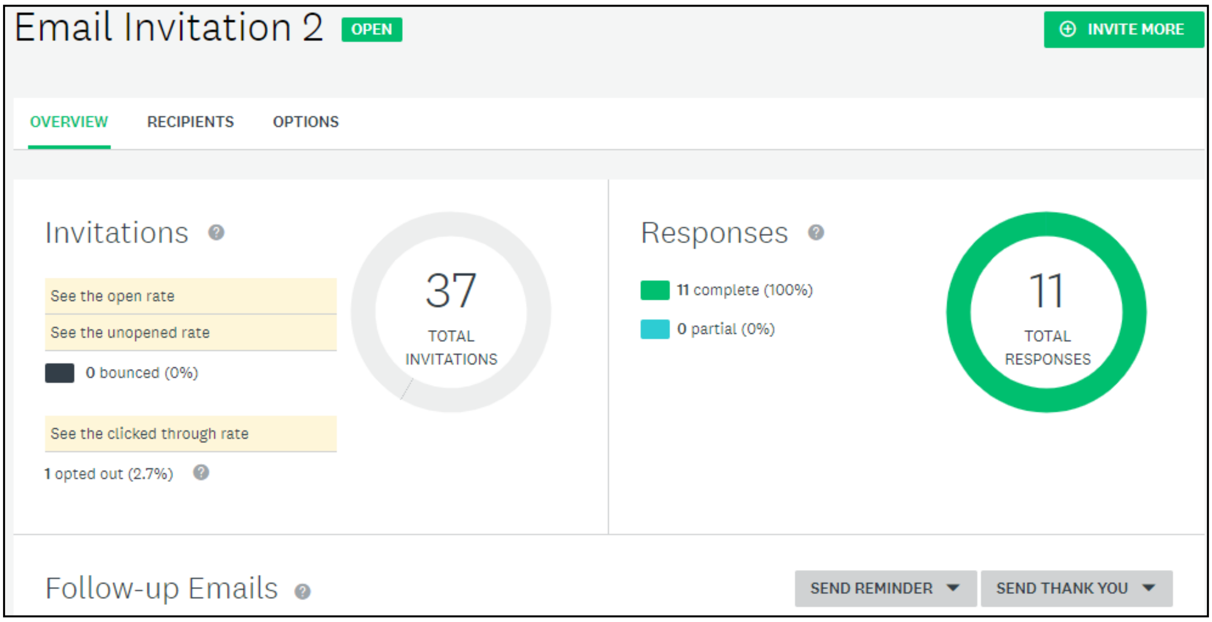
The screen dump below is taken from the Survey Monkey website where our questionnaires were hosted.



Survey Monkey uses emails to invites participants. The figure screen dumps in this appendix show the birds-eye view of the response statistics as shown on the Survey Monkey website.

Survey 1: A Preliminary Questionnaire about ELearning on the Cloud: A Case at a Telecommunication Organization

Survey 1: Web link: https://www.surveymonkey.com/r/S8SL6K7



Exit this survey

A preliminary questionnaire about ELearning on the cloud: A case at a telecommunication company

1. Thank you and Welcome...

Warm greetings to you colleagues,

As part of a fulfilment towards my doctoral qualification in "Philosophy in Computer Science" with UNISA, and also as an endeavour to contribute in improving our eLearning environment in the company, I would like to invite you to participate in answering a few questions posed in this qualitative questionnaire.

Take note that the company has authorised and given permission to undertake the underlying research work in your division.

Please feel free to answer all questions with an open mind and with honesty knowing that your identity is protected and the research is undertaken with high ethical concern. Your identity will only be known to me as the researcher and administrator of this questionnaire.

I am pleased to let you know that your involvement is highly needed and will contribute towards the following objectives:

1. To understanding how eLearning is practiced in the company
2. To measure your interest in completing assessments at any remote setting and on any mobile device and at your own time
3. To discover problems you perceive and improvements you would like to see in our eLearning environment
4. To present an improved eLearning environment with seamless activities between learners and experts while interacting with the cloud eLearning system

Definition of terms used in this questionnaire:

Cloud computing

…web as a space where computing has been pre-installed, and is existent as a service, data, operating systems, applications, storage, and has processing power which is ready to be shared and used on an on-demand basis (Kalagiakos & Karampelas, 2011). In short, a cloud is a network of networks with computers, servers, hardware and software and infrastructure which are stored in remote service providers' premises and not in our company, but yet we may use them as if they are our own through a rental fee.

ELearning

…the use of technology communication to improve teaching methods through standalone or distributed environments (Simões, Rodrigues, Costa, & Proença, 2012). In short this refers to us in the company enrolling for courses on Moodle, Sum Total and other learning software, online or on other removable software storage devices.

I thank you in advance for your willingness to participate in the survey.

Should you experience any technical difficulties with the survey, please contact ***55145922@mylife.unisa.ac.za or +2773 539 3328***

Please click on the button below to complete the survey...

Click to answer questions

Exit this survey

A preliminary questionnaire about ELearning on the cloud: A case at a telecommunication company

2. ELearning and cloud computing

* **1. Please state your role or designation in eLearning**

- ◯ Content Designer
- ◯ Content Developer
- ◯ Author
- ◯ Learner
- ◯ Trainer
- ◯ Facilitator
- ◯ Scheduler
- ◯ System Administrator
- ◯ IT Administrator
- ◯ Architect
- ◯ Business Analyst
- ◯ Team Manager

* **2. Please state the names of all possible systems you use when accessing study material, completing online assessments and drawing reports for your completed assessments.**

* 3. Please state the names of all possible systems you use when accessing study material, completing online assessments and drawing reports for your completed assessments.

* 4. Please give not more than 5 types of assessments you have completed in the past financial year. One example could be SHE knowledge reviews, or BPM assessments etc.

* 5. Do you access online assessments inside company premises or outside company premise? Using which device?, and how easy or difficult do you feel it is to access these assessments? Please explain.

* 6. Do you read study material before completing an assessment, and how do access the study material? Please explain.

* 7. Would you like to access assessments and study material from any remote place at your own time?

◯ Yes

◯ No

* 8. Please state problems you usually come across when completing assessments or accessing study material. Also state the name of the system giving this problem.

* 9. What is your overall feeling about learning online?

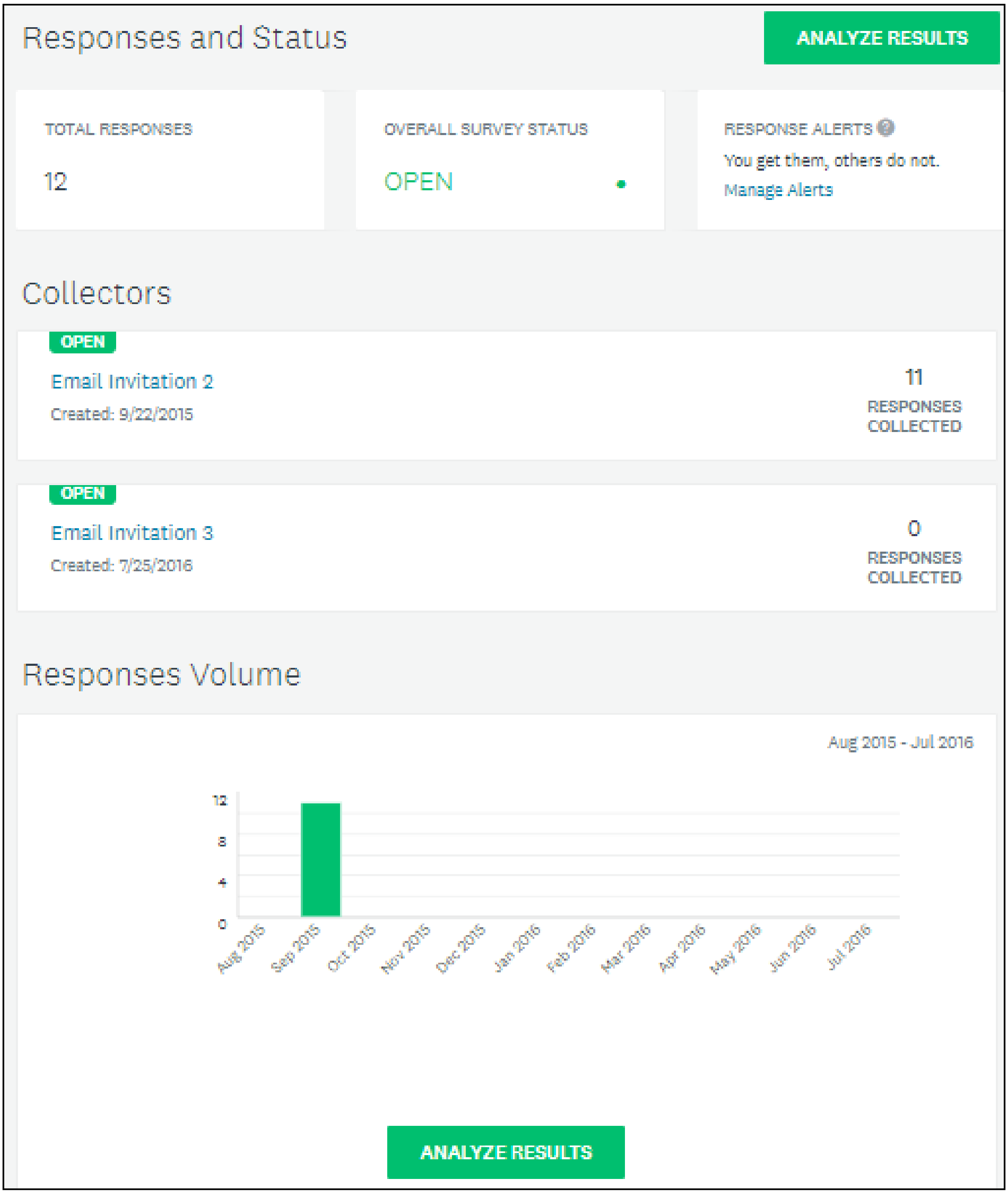
10. What are your preferred methods of learning work specific lessons?

- ◯ CD's or learning software at home
- ◯ In a classroom
- ◯ Computer or mobile device on the Internet/ online
- ◯ In the office
- ◯ Online at an internet café
- ◯ Anytime anywhere

* **11. Do you think online study material and online assessments has an impact in improving your work related skills and also plays a vital role in keeping you informed and alert? Please explain.**

Home | Save

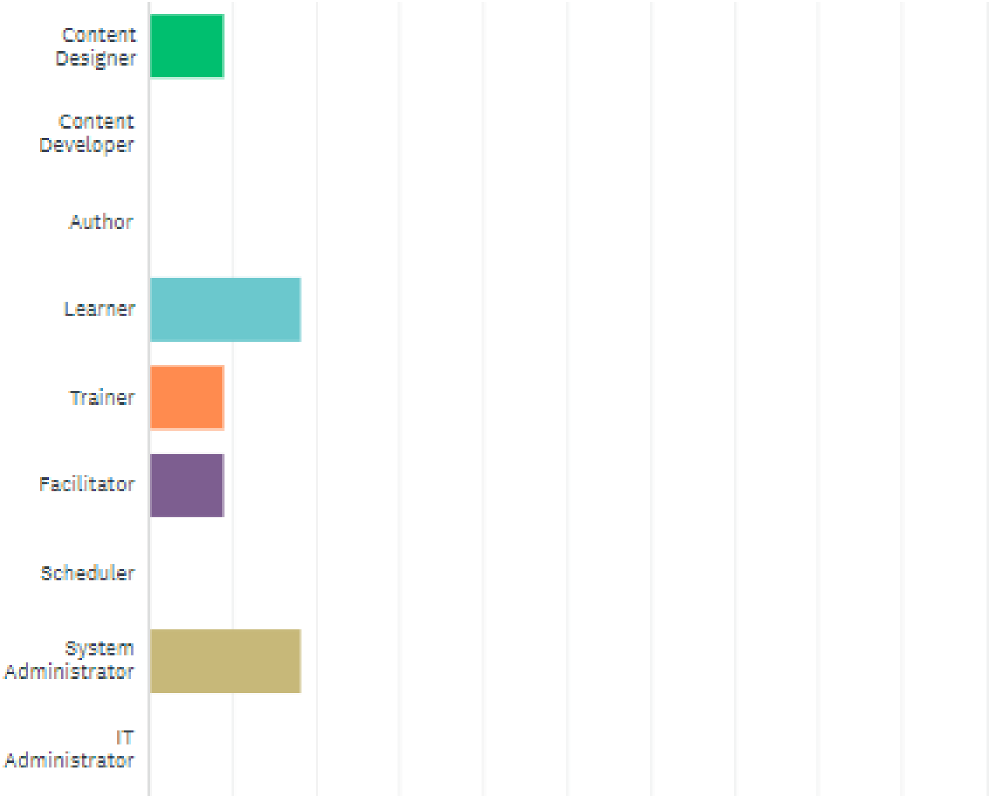
Survey 1: Collective Response Data

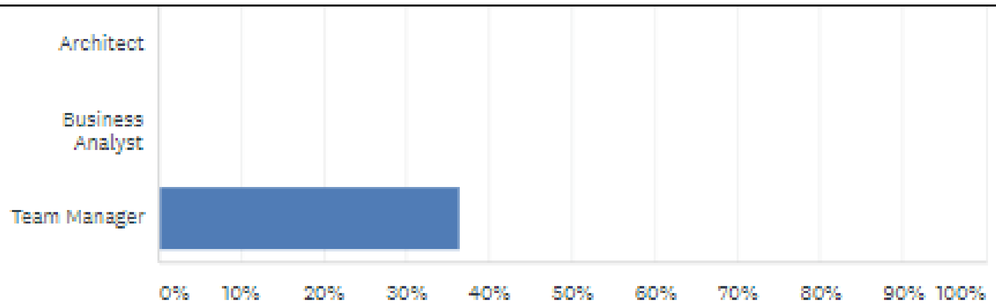


Q1

Please state your role or designation in eLearning

Answered: 11 Skipped: 1





ANSWER CHOICES	RESPONSES	
Content Designer	9.09%	1
Content Developer	0.00%	0
Author	0.00%	0
Learner	18.18%	2
Trainer	9.09%	1
Facilitator	9.09%	1
Scheduler	0.00%	0
System Administrator	18.18%	2
IT Administrator	0.00%	0
Architect	0.00%	0
Business Analyst	0.00%	0
Team Manager	36.36%	4
TOTAL		11

Q2

Please state the names of all possible systems you use when accessing study material, completing online assessments and drawing reports for your completed assessments.

Answered: 11 Skipped: 1

Q3

Please state the names of all possible systems you use when accessing study material, completing online assessments and drawing reports for your completed assessments.

Answered: 0 Skipped: 12

Q4

Please give not more than 5 types of assessments you have completed in the past financial year. One example could be SHE knowledge reviews, or BPM assessments etc.

Answered: 11 Skipped: 1

Q5

Do you access online assessments inside company premises or outside company premise? Using which device?, and how easy or difficult do you feel it is to access these assessments? Please explain.

Answered: 11 Skipped: 1

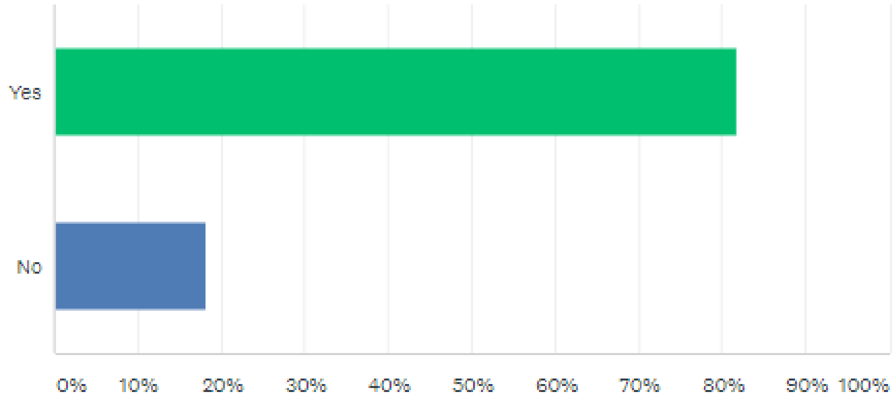
Q6

Do you read study material before completing an assessment, and how do access the study material? Please explain.

Answered: 11 Skipped: 1

Would you like to access assessments and study material from any remote place at your own time?

Answered: 11   Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	81.82%	9
No	18.18%	2
TOTAL		11

Q8

Please state problems you usually come across when completing assessments or accessing study material. Also state the name of the system giving this problem.

Answered: 11   Skipped: 1

Q9

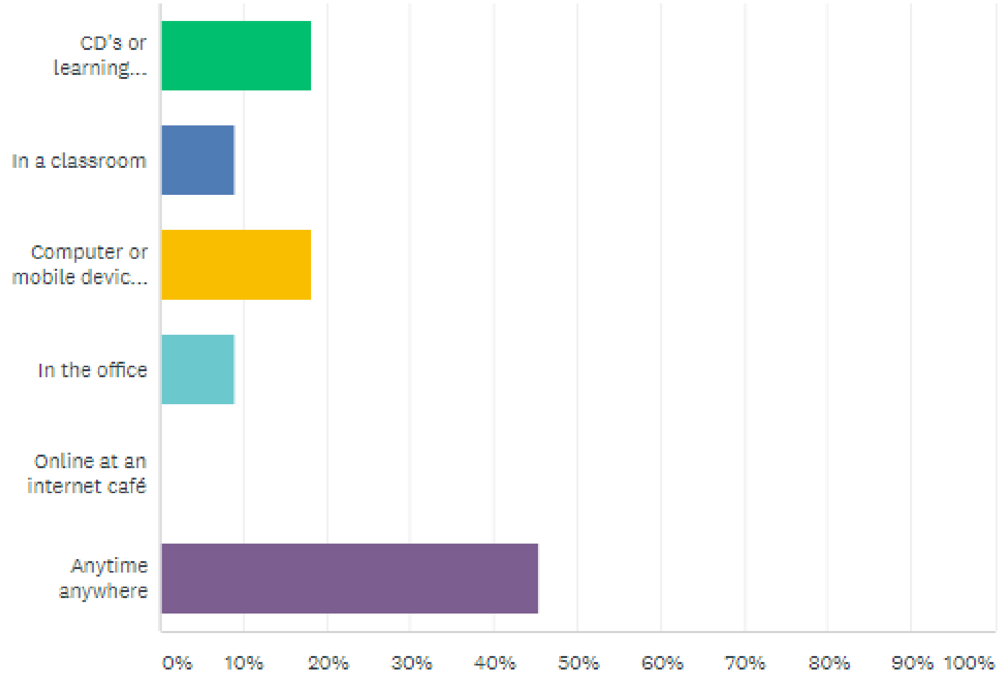
What is your overall feeling about learning online?

Answered: 11   Skipped: 1

Q10

What are your preferred methods of learning work specific lessons?

Answered: 11 Skipped: 1



ANSWER CHOICES	RESPONSES	
CD's or learning software at home	18.18%	2
In a classroom	9.09%	1
Computer or mobile device on the Internet/ online	18.18%	2
In the office	9.09%	1
Online at an internet café	0.00%	0
Anytime anywhere	45.45%	5
TOTAL		11

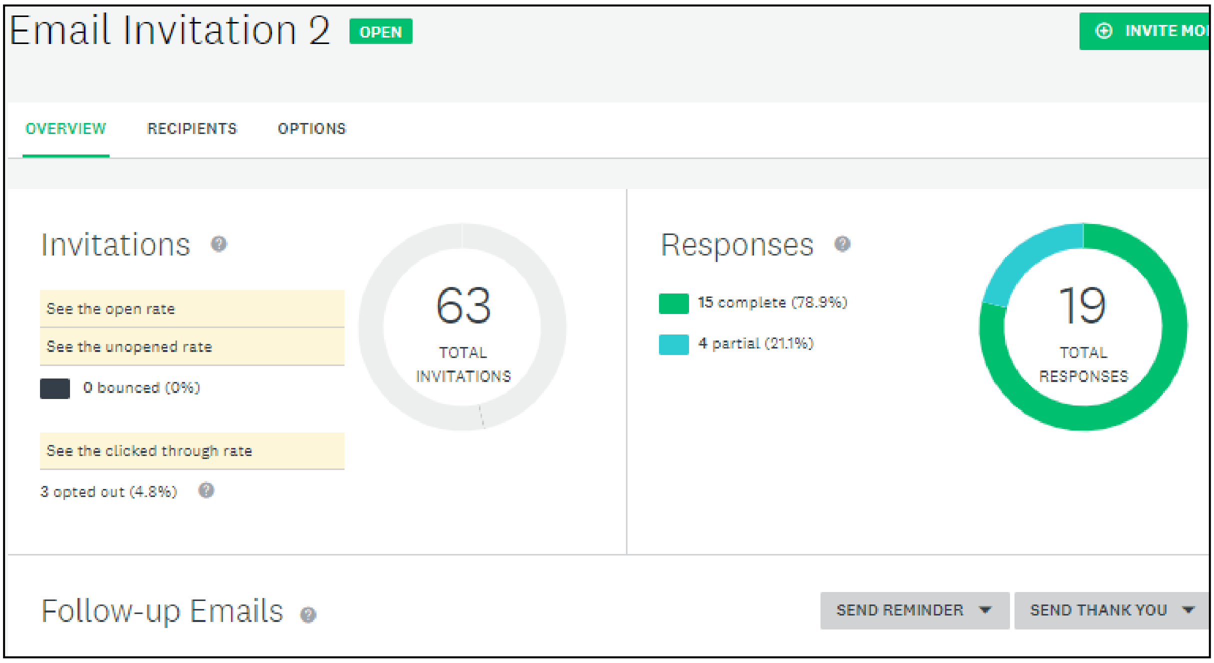
Q11

Do you think online study material and online assessments has an impact in improving your work related skills and also plays a vital role in keeping you informed and alert? Please explain.

Answered: 11   Skipped: 1

Survey 2: ELearning - Embracing your Learning Style

Survey 1: Web link: https://www.surveymonkey.com/r/S8P6H6D



Exit

ELEARNING: EMBRACING YOUR LEARNING STYLE

1. Thank you and Welcome...

As part of a fulfilment towards my doctoral qualification in "Philosophy in Computer Science" with UNISA, and also as an endeavour to contribute in improving eLearning in the organisation, I would like to invite you to participate in answering a few questions posed in this qualitative questionnaire.

Please take note that the company has authorised and given permission to undertake the underlying research work in your division. So feel free to fearlessly participate.

Feel free to answer all questions with an open mind and with honesty knowing that your identity is protected and the research is undertaken with high ethical concern. Your identity will only be known to me as the researcher and administrator of this questionnaire.

I am pleased to let you know that your involvement is highly needed and will contribute towards the following objectives:

1. To learn what your understanding is about learning styles.
2. To realise the organisation's view about creating learning content based on learning styles.
3. To learn what your view is about using learning styles when creating eLearning content

Definition of terms used in this questionnaire:

Learning style

A style in the context of learning is the way a person expresses himself or herself characterized by all features differentiating him or her from others

ELearning

This is the use of technology communication to improve learning and teaching methods through the use of standalone or distributed environments. This refers to employees in the organisation enrolling for courses on Moodle, Sum Total and other learning software, online or on other removable software storage devices in order to learn.

I thank you in advance for your willingness to participate in the survey.

Should you experience any technical difficulties with the survey, please contact: *fibimere@gmail.com, 55145922@mylife.unisa.ac.za or +2773 539 3328*

Please click on the button below to complete the survey...

33%

Next

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Exit

ELEARNING: EMBRACING YOUR LEARNING STYLE

2. Please tell us about yourself

Demographics

* 1. Are you male or female?

- Male
- Female

* 2. What is your age?

- 17 or younger
- 18-20
- 21-29
- 30-39
- 40-49
- 50-59
- 60 or older

* 3. What is the highest level of school you have completed or the highest degree you have received ?

- High school or lower
- Grade 12 or equivalent
- Diploma or College degree
- Bachelors or Honors degree
- Masters degree
- Doctoral degree

* 4. What is your eLearning role or responsibility?

- Content Designer / Author / Content Developer
- Trainer / Facilitator
- Scheduler / System Administrator
- IT partner / System Architect
- Team Manager / Strategic Partner
- Business Analyst / Subject Expert
- Vendor / Service Provider
- Business owner / Customer
- Learner / Trainee

67%

Prev Next

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ELEARNING: EMBRACING YOUR LEARNING STYLE

3. Please help us refine your learning style

Learning styles

* 5. In your own words describe your understanding of learning styles

* 6. Do you think learning styles are important in eLearning?

- ◯ Yes
- ◯ No

* 7. Do you think eLearning can be better and improved when your own learning style is applied to it?

- ◯ Definitely
- ◯ Perhaps
- ◯ Not at all

* 8. Are you familiar with free online tools for assessing learning style?

- ◯ Yes
- ◯ No

* 9. Have you ever done a learning style assessment?

- ◯ Yes
- ◯ No

10. If yes, what was the result of your learning style? auditory, visual, Tactile or other (please explain if other)?

- ◯ Auditory
- ◯ Visual
- ◯ Tactile
- ◯ Other (please specify)

* 11. What is your view about learning style surveys?

* 12. According to yourself, does your company take into account a learner's learning style when creating eLearning content?

- ◯ Yes
- ◯ No

* 13. How likely are you to recommend for the company to consider learning styles when creating learning content?

- ◯ To a Great Extent
- ◯ Somewhat
- ◯ Very Little
- ◯ Not at All

* 14. When learning, which of the following do you prefer doing?

- ◯ Listening and discussing content
- ◯ Reading content and looking at pictures about the content
- ◯ Draw models and diagrams about the content

* 15. When assembling newly bought furniture, which of the below would you prefer?

- ◯ Read instructions
- ◯ Listen to someone else telling how to do it
- ◯ Just put together the pieces hoping to get it right

* 16. When receiving directions from a friend, what do you usually prefer the person to do?

- ◯ He/she must draw a map
- ◯ He/she must tell you verbally how to get there
- ◯ He/she must accompany you there or find a person to take you there

* 17. When you meet people at an event, what do you remember about them?

- ◯ Their faces and how they looked
- ◯ Their action and what they were doing at the event
- ◯ What they were saying at the event

* 18. When in an English class and learning vocabulary, you would prefer to:

- ◯ Spell words out loud
- ◯ Picture the words in your mind while doing something or walking around
- ◯ Literally write words alone or in sentences

* 19. What is it that you enjoy doing most as a hobby?

- Reading novels, magazines or any other reading material
- Playing any games like play stations, or involved sports like soccer, cricket, rugby or just building hand made products
- Listening to music

* 20. The last time you watched a movie on TV or at the cinema, what do you remember?

- The faces of the actors and actresses and how they looked
- The scenes and what was said in those scenes
- What the characters were doing in the movie

* 21. What distracts you most when trying to concentrate?

- Objects you may see around your space
- Destructive activities happening in your vicinity
- Some squeaky sound in your vicinity

* 22. In order to not forget things, I prefer to

- Write notes in a memo
- Do something to simulate the what is at hand
- Record what was said for later referral

* 23. To show you understand a lesson, you would rather

- Present your understanding
- Write an essay
- Demonstrate your understanding

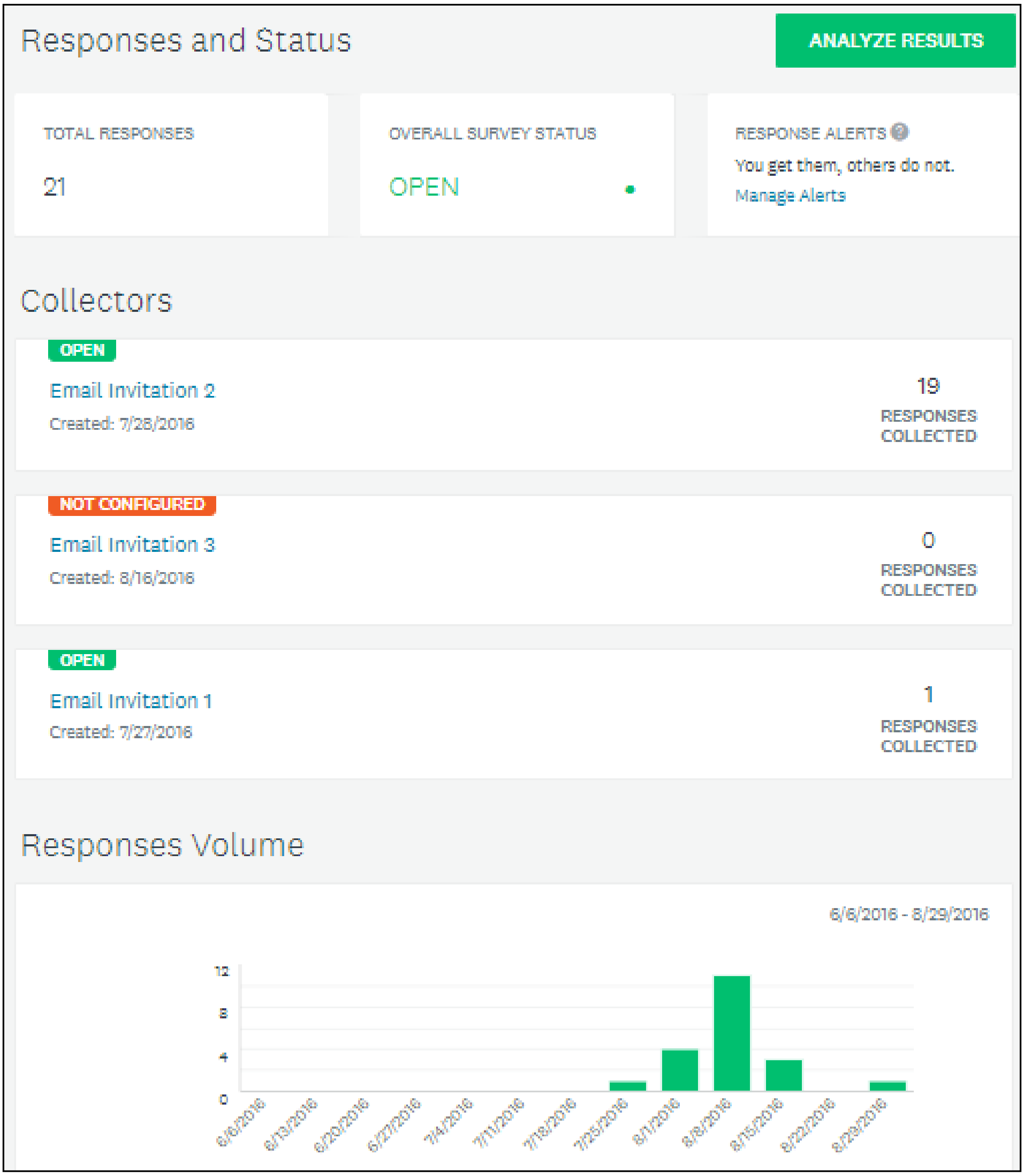
* 24. You are a good…

- Artist or Author
- Dancer or Soccer player
- Musician or public speaker

100%

Prev Done

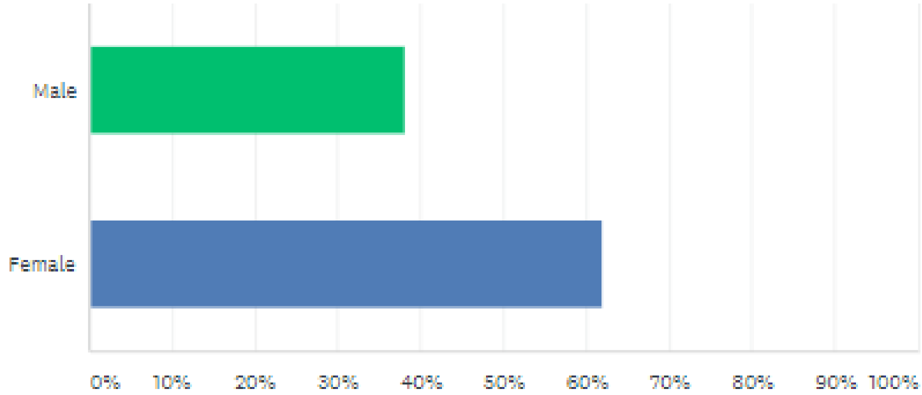
Survey 2: Collective Response Data



Q1

Are you male or female?

Answered: 21   Skipped: 1

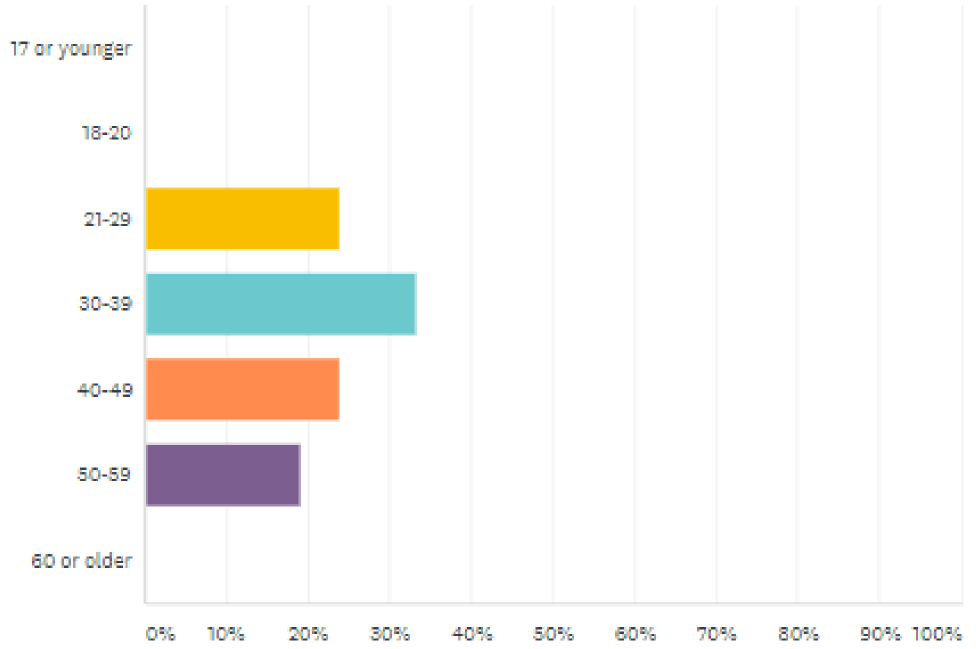


ANSWER CHOICES	RESPONSES	
Male	38.10%	8
Female	61.90%	13
TOTAL		21

Q2

What is your age?

Answered: 21 Skipped: 1

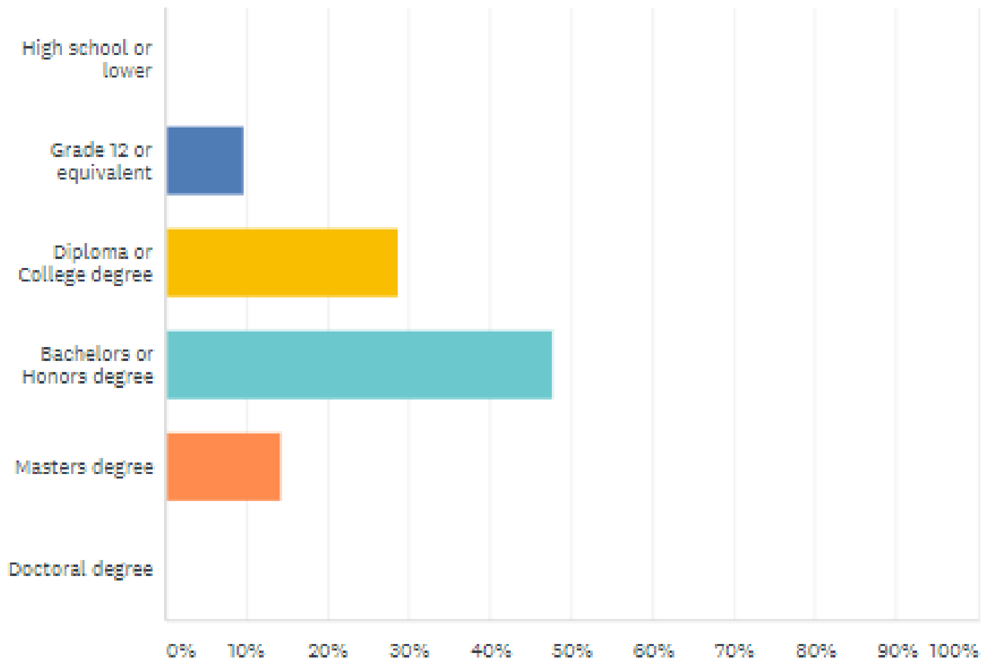


ANSWER CHOICES	RESPONSES	
17 or younger	0.00%	0
18-20	0.00%	0
21-29	23.81%	5
30-39	33.33%	7
40-49	23.81%	5
50-59	19.05%	4
60 or older	0.00%	0
TOTAL		21

Q3

What is the highest level of school you have completed or the highest degree you have received ?

Answered: 21   Skipped: 1

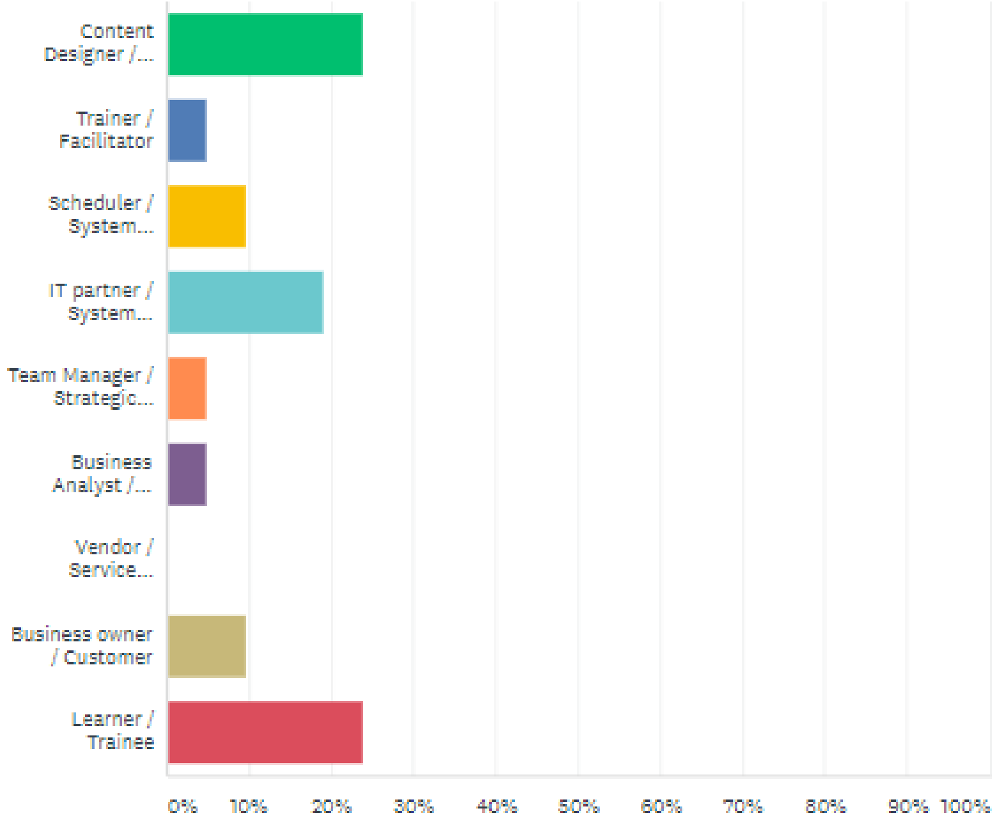


ANSWER CHOICES	RESPONSES	
High school or lower	0.00%	0
Grade 12 or equivalent	9.52%	2
Diploma or College degree	28.57%	6
Bachelors or Honors degree	47.62%	10
Masters degree	14.29%	3
Doctoral degree	0.00%	0
TOTAL		21

Q4

What is your eLearning role or responsibility?

Answered: 21 Skipped: 1



ANSWER CHOICES	RESPONSES	
Content Designer / Author / Content Developer	23.81%	5
Trainer / Facilitator	4.76%	1
Scheduler / System Administrator	9.52%	2
IT partner / System Architect	19.05%	4
Team Manager / Strategic Partner	4.76%	1
Business Analyst / Subject Expert	4.76%	1
Vendor / Service Provider	0.00%	0
Business owner / Customer	9.52%	2
Learner / Trainee	23.81%	5
TOTAL		21

Q5

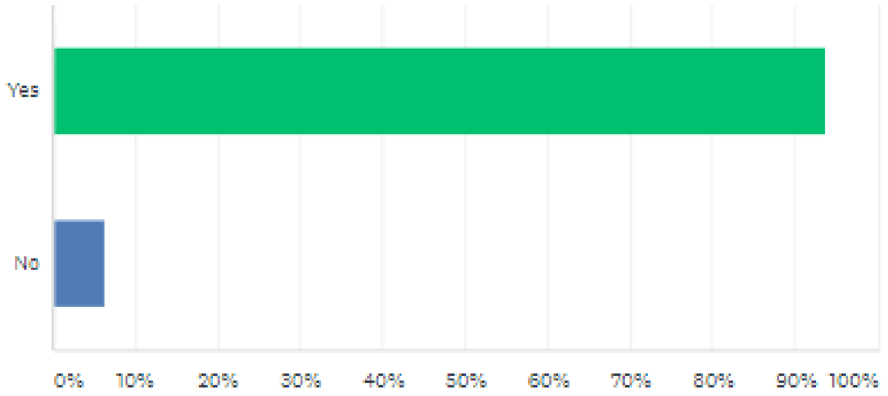
In your own words describe your understanding of learning styles

Answered: 16 Skipped: 6

Q6

Do you think learning styles are important in eLearning?

Answered: 16 Skipped: 6

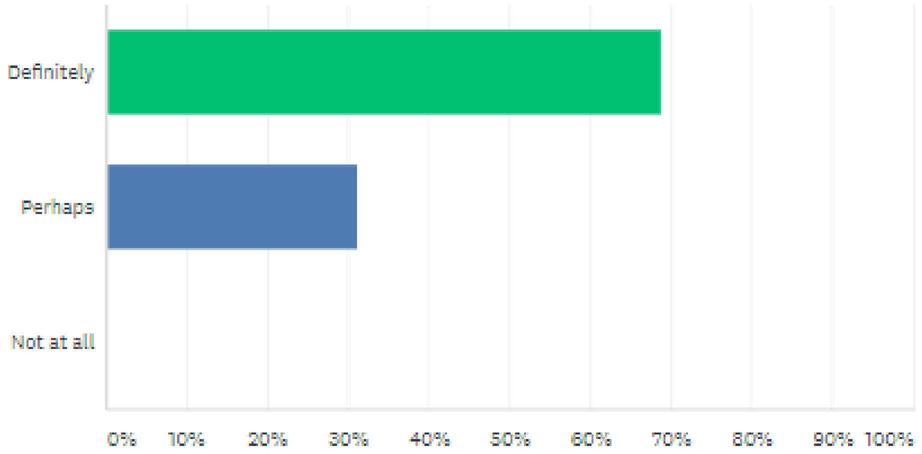


ANSWER CHOICES	RESPONSES	
Yes	93.75%	15
No	6.25%	1
TOTAL		16

Q7

Do you think eLearning can be better and improved when your own learning style is applied to it?

Answered: 16 Skipped: 6

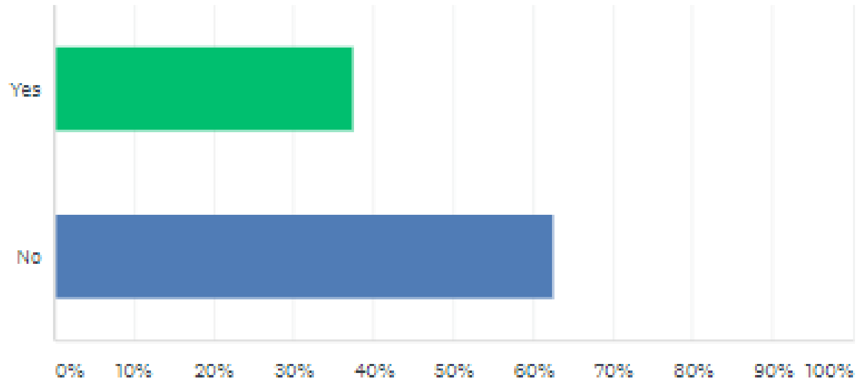


ANSWER CHOICES	RESPONSES	
Definitely	68.75%	11
Perhaps	31.25%	5
Not at all	0.00%	0
TOTAL		**16**

Q8

Are you familiar with free online tools for assessing learning style?

Answered: 16   Skipped: 6

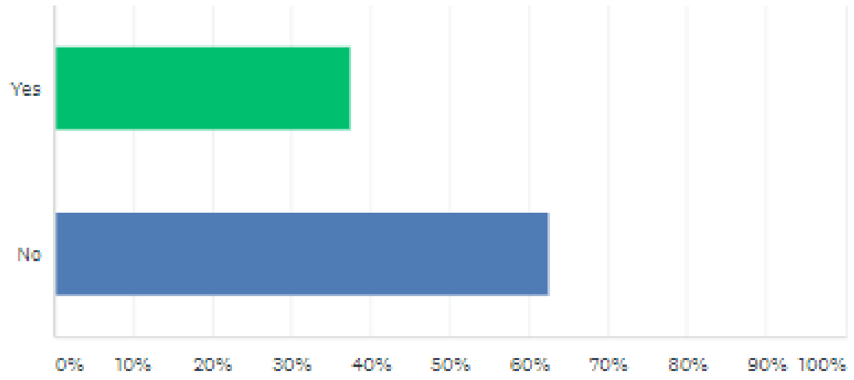


ANSWER CHOICES	RESPONSES	
Yes	37.50%	6
No	62.50%	10
TOTAL		16

Q9

Have you ever done a learning style assessment?

Answered: 16 Skipped: 6

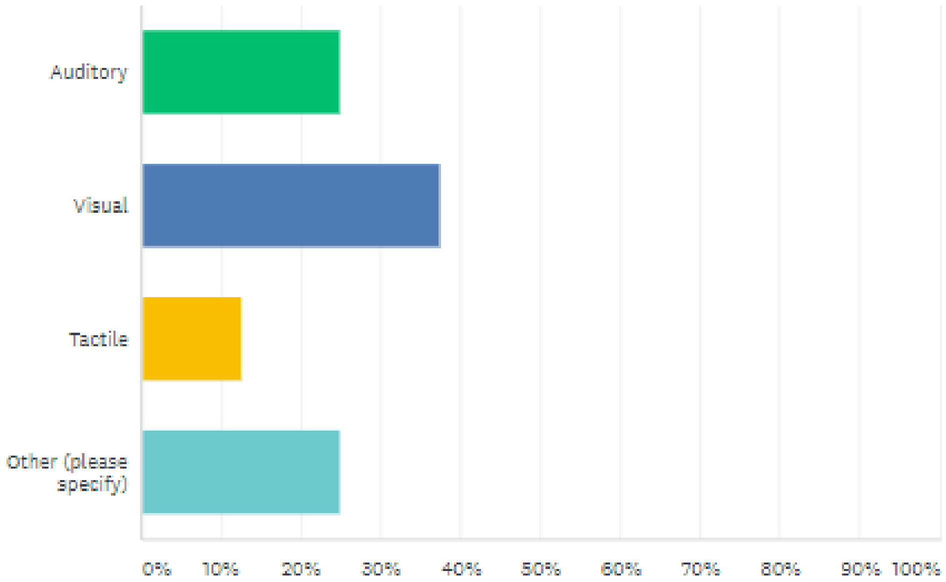


ANSWER CHOICES	RESPONSES	
Yes	37.50%	6
No	62.50%	10
TOTAL		**16**

Q10

If yes, what was the result of your learning style? auditory, visual, Tactile or other (please explain if other)?

Answered: 8   Skipped: 14



ANSWER CHOICES	RESPONSES	
Auditory	25.00%	2
Visual	37.50%	3
Tactile	12.50%	1
Other (please specify)	25.00%	2
TOTAL		8

Q11

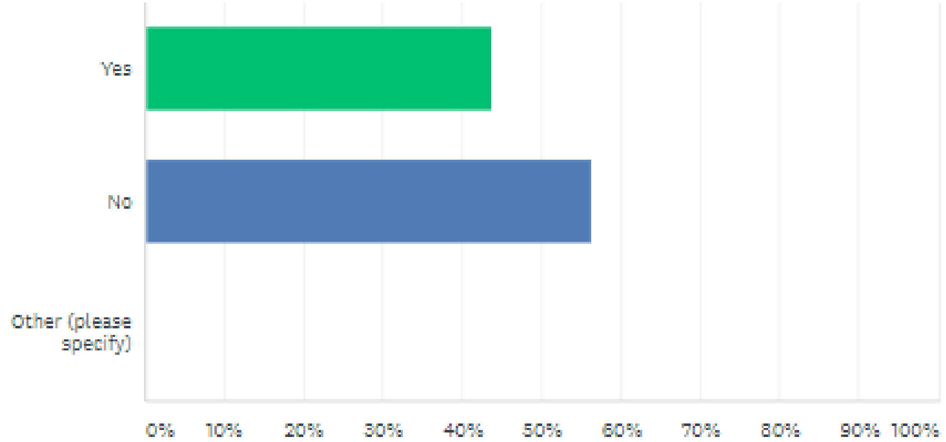
What is your view about learning style surveys?

Answered: 16 Skipped: 6

Q12

According to yourself, does your company take into account a learner's learning style when creating eLearning content?

Answered: 16 Skipped: 6

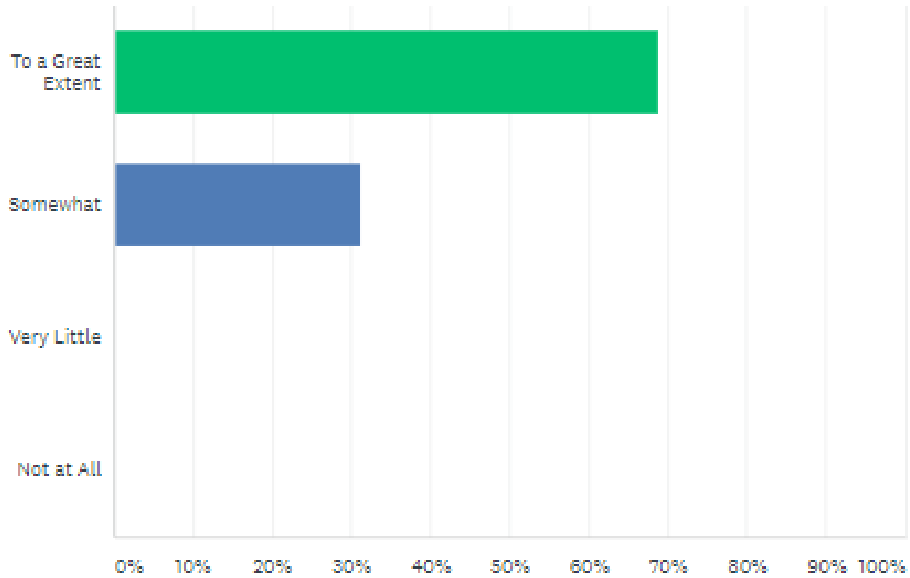


ANSWER CHOICES	RESPONSES	
Yes	43.75%	7
No	56.25%	9
Other (please specify)	0.00%	0
TOTAL		16

Q13

How likely are you to recommend for the company to consider learning styles when creating learning content?

Answered: 16 Skipped: 6

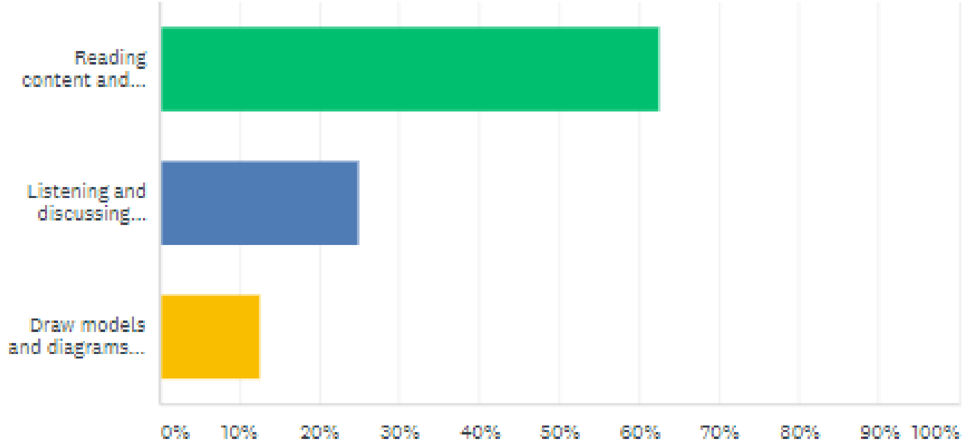


ANSWER CHOICES	RESPONSES	
To a Great Extent	68.75%	11
Somewhat	31.25%	5
Very Little	0.00%	0
Not at All	0.00%	0
TOTAL		16

Q14

When learning, which of the following do you prefer doing?

Answered: 16 Skipped: 6

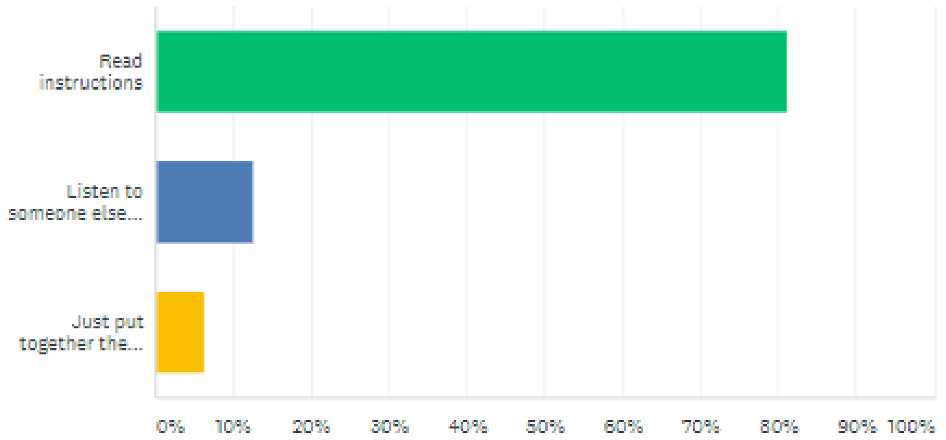


ANSWER CHOICES	RESPONSES	
Reading content and looking at pictures about the content	62.50%	10
Listening and discussing content	25.00%	4
Draw models and diagrams about the content	12.50%	2
TOTAL		16

Q15

When assembling newly bought furniture, which of the below would you prefer?

Answered: 16 Skipped: 6

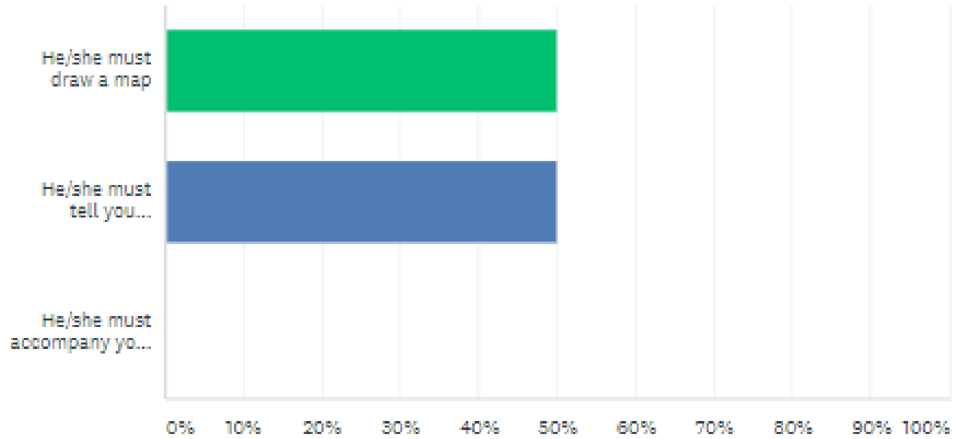


ANSWER CHOICES	RESPONSES	
Read instructions	81.25%	13
Listen to someone else telling how to do it	12.50%	2
Just put together the pieces hoping to get it right	6.25%	1
TOTAL		16

Q16

When receiving directions from a friend, what do you usually prefer the person to do?

Answered: 16   Skipped: 6

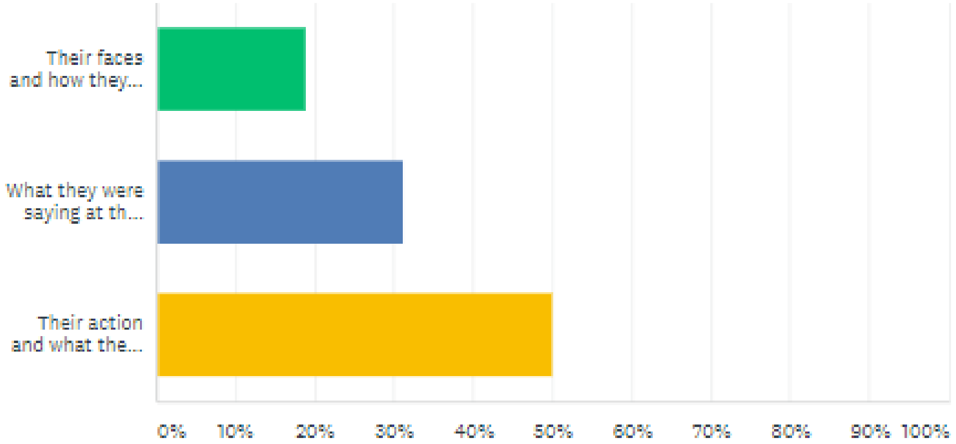


ANSWER CHOICES	RESPONSES	
He/she must draw a map	50.00%	8
He/she must tell you verbally how to get there	50.00%	8
He/she must accompany you there or find a person to take you there	0.00%	0
TOTAL		16

Q17

When you meet people at an event, what do you remember about them?

Answered: 16 Skipped: 6

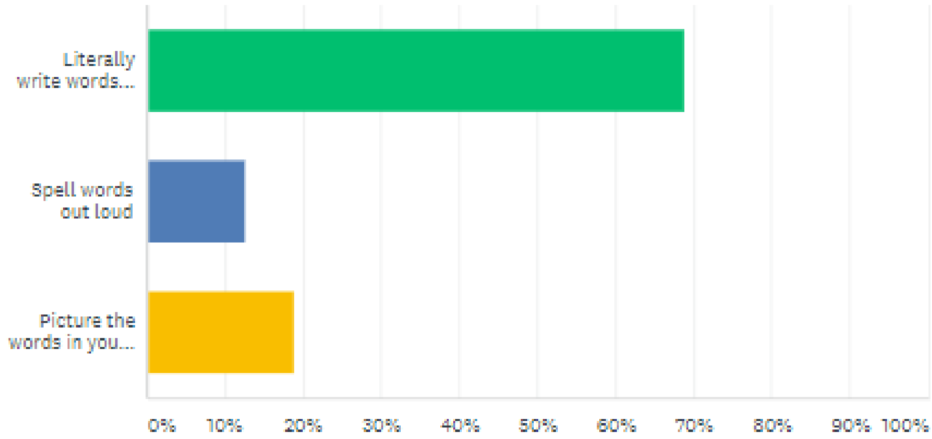


ANSWER CHOICES	RESPONSES	
Their faces and how they looked	18.75%	3
What they were saying at the event	31.25%	5
Their action and what they were doing at the event	50.00%	8
TOTAL		16

Q18

When in an English class and learning vocabulary, you would prefer to:

Answered: 16   Skipped: 6

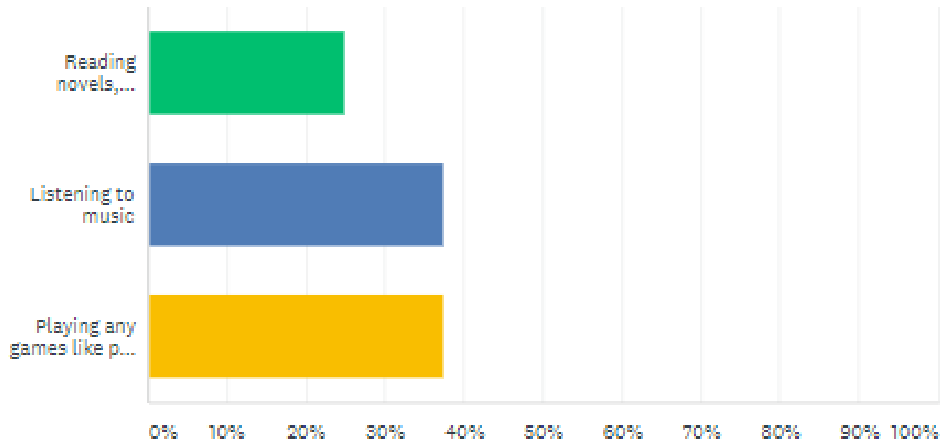


ANSWER CHOICES	RESPONSES	
Literally write words alone or in sentences	68.75%	11
Spell words out loud	12.50%	2
Picture the words in your mind while doing something or walking around	18.75%	3
TOTAL		16

Q19

What is it that you enjoy doing most as a hobby?

Answered: 16   Skipped: 6

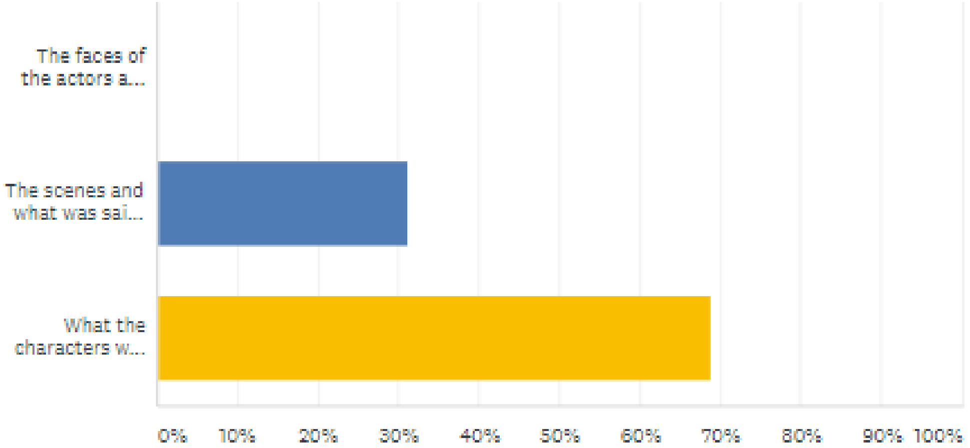


ANSWER CHOICES	RESPONSES	
Reading novels, magazines or any other reading material	25.00%	4
Listening to music	37.50%	6
Playing any games like play stations, or involved sports like soccer, cricket, rugby or just building hand made products	37.50%	6
TOTAL		16

Q20

The last time you watched a movie on TV or at the cinema, what do you remember?

Answered: 16 Skipped: 6

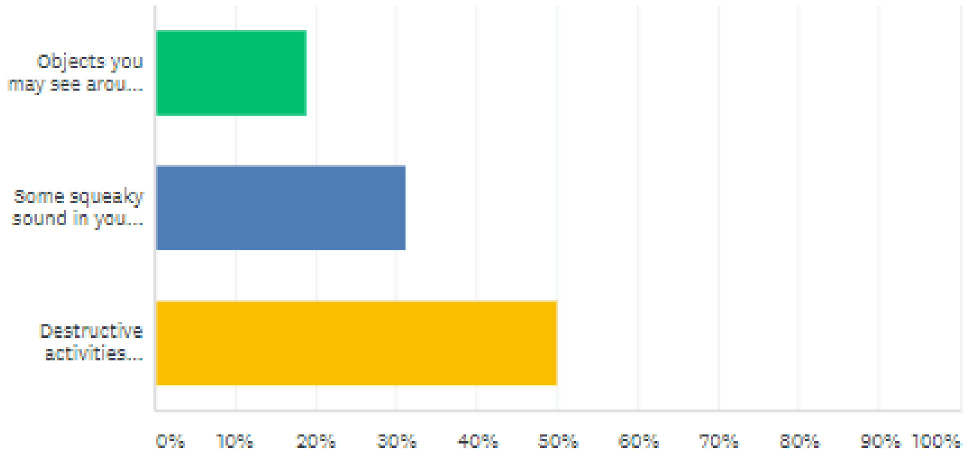


ANSWER CHOICES	RESPONSES	
The faces of the actors and actresses and how they looked	0.00%	0
The scenes and what was said in those scenes	31.25%	5
What the characters were doing in the movie	68.75%	11
TOTAL		**16**

Q21

What distracts you most when trying to concentrate?

Answered: 16 Skipped: 6

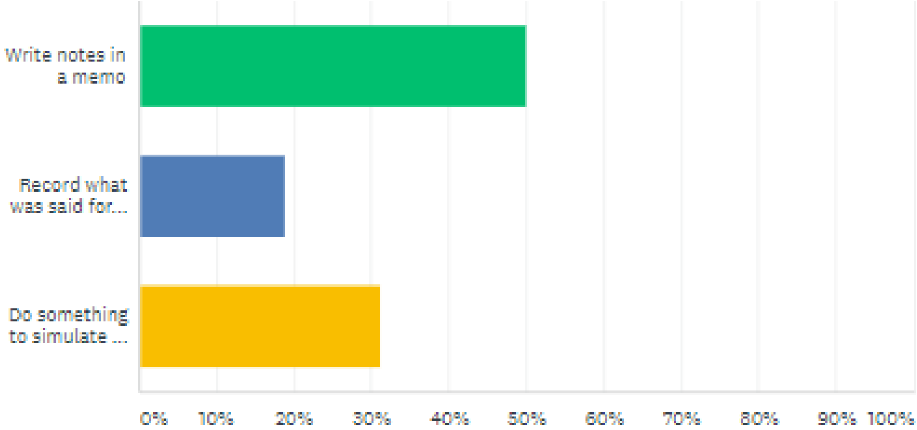


ANSWER CHOICES	RESPONSES	
Objects you may see around your space	18.75%	3
Some squeaky sound in your vicinity	31.25%	5
Destructive activities happening in your vicinity	50.00%	8
TOTAL		16

Q22

In order to not forget things, I prefer to

Answered: 16 Skipped: 6

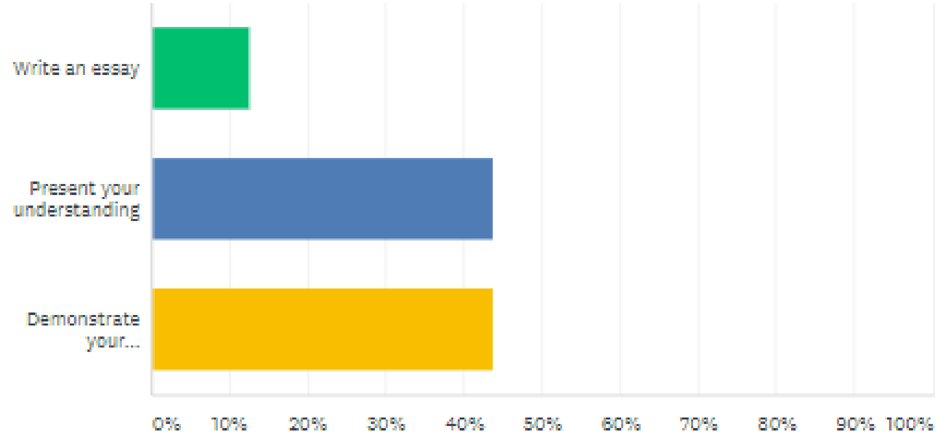


ANSWER CHOICES	RESPONSES	
Write notes in a memo	50.00%	8
Record what was said for later referral	18.75%	3
Do something to simulate the what is at hand	31.25%	5
TOTAL		16

Q23

To show you understand a lesson, you would rather

Answered: 16 Skipped: 6

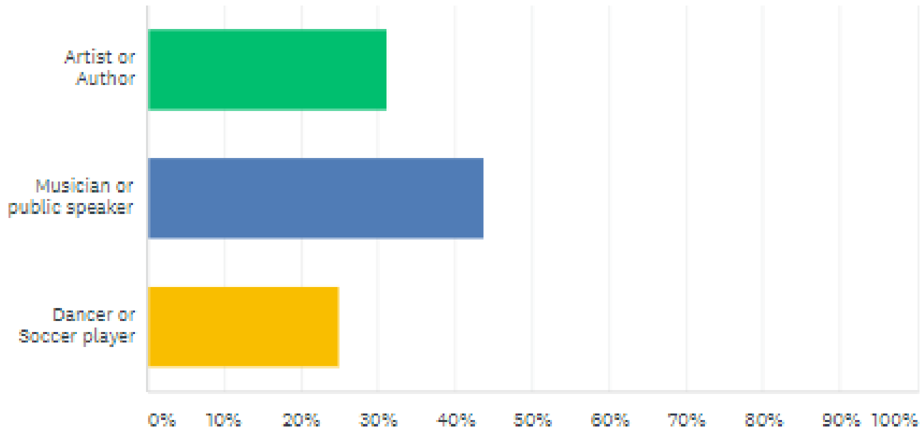


ANSWER CHOICES	RESPONSES	
Write an essay	12.50%	2
Present your understanding	43.75%	7
Demonstrate your understanding	43.75%	7
TOTAL		16

Q24

You are a good...

Answered: 16 Skipped: 6



ANSWER CHOICES	RESPONSES	
Artist or Author	31.25%	5
Musician or public speaker	43.75%	7
Dancer or Soccer player	25.00%	4
TOTAL		16

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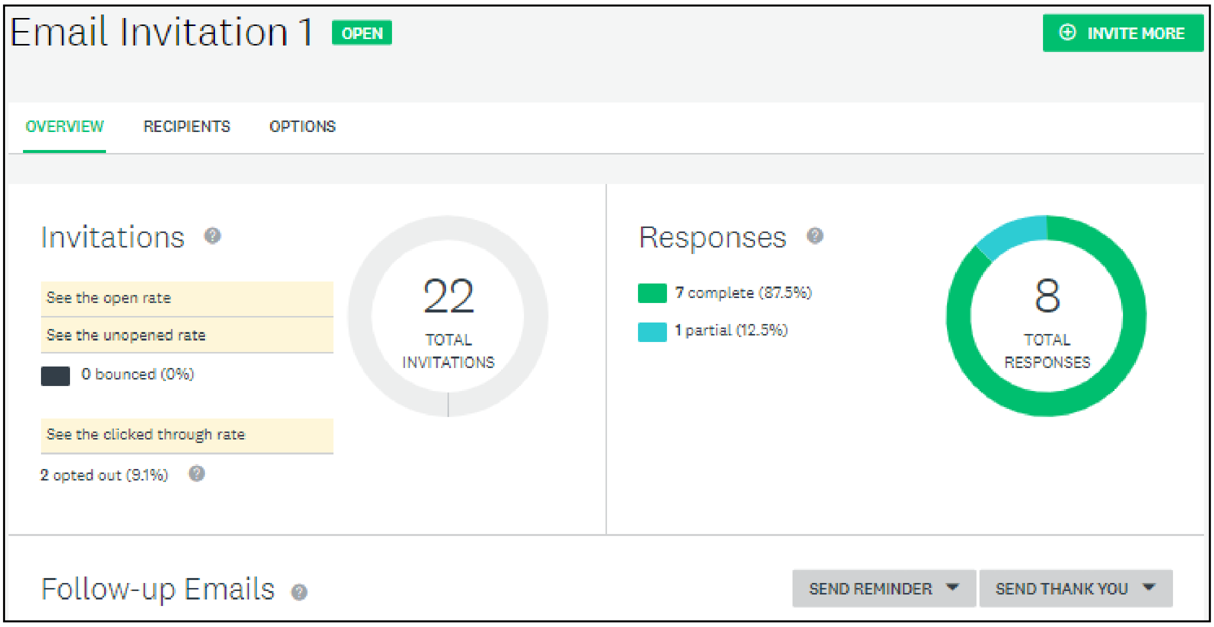
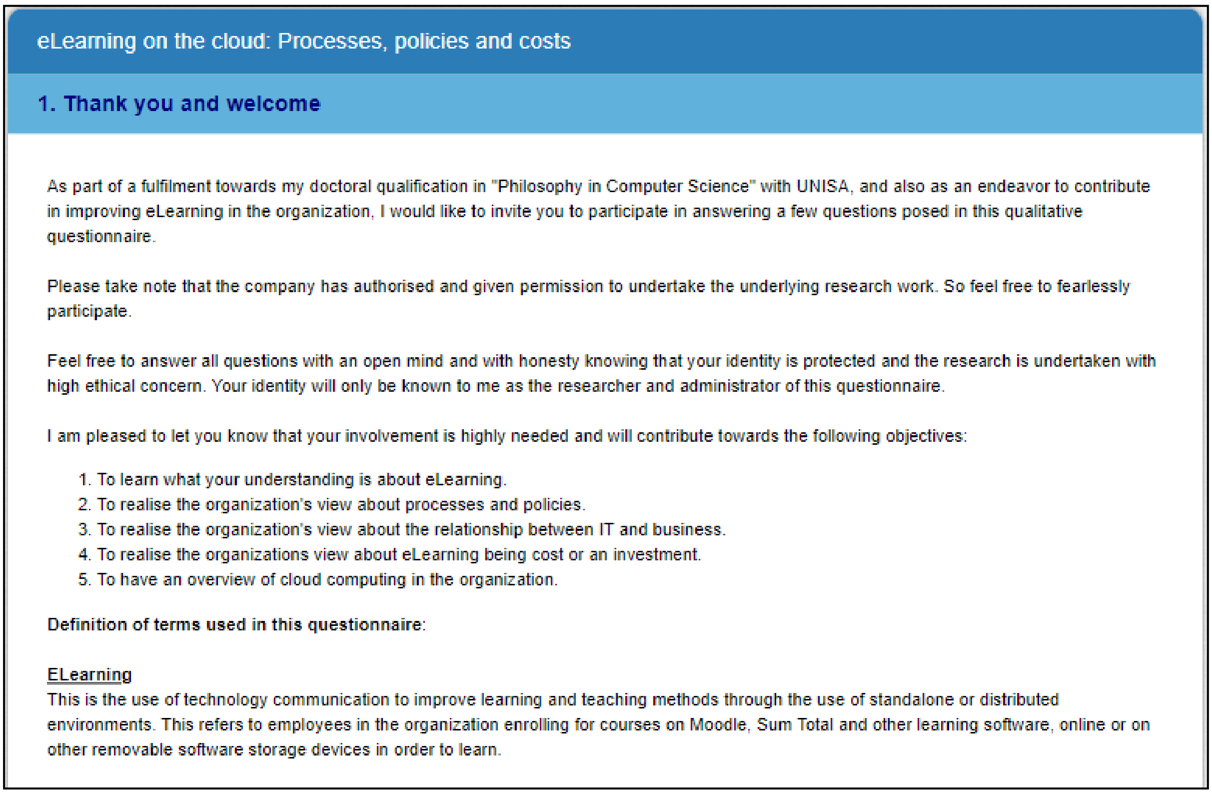
Survey 3: eLearning on the cloud: Processes, policies and costs

Survey 3: Web link: https://www.surveymonkey.com/r/SLJ98HH





eLearning on the cloud: Processes, policies and costs

1. Thank you and welcome

As part of a fulfilment towards my doctoral qualification in "Philosophy in Computer Science" with UNISA, and also as an endeavor to contribute in improving eLearning in the organization, I would like to invite you to participate in answering a few questions posed in this qualitative questionnaire.

Please take note that the company has authorised and given permission to undertake the underlying research work. So feel free to fearlessly participate.

Feel free to answer all questions with an open mind and with honesty knowing that your identity is protected and the research is undertaken with high ethical concern. Your identity will only be known to me as the researcher and administrator of this questionnaire.

I am pleased to let you know that your involvement is highly needed and will contribute towards the following objectives:

1. To learn what your understanding is about eLearning.
2. To realise the organization's view about processes and policies.
3. To realise the organization's view about the relationship between IT and business.
4. To realise the organizations view about eLearning being cost or an investment.
5. To have an overview of cloud computing in the organization.

Definition of terms used in this questionnaire:

ELearning
This is the use of technology communication to improve learning and teaching methods through the use of standalone or distributed environments. This refers to employees in the organization enrolling for courses on Moodle, Sum Total and other learning software, online or on other removable software storage devices in order to learn.

Cloud Computing

This refers to the usage of computing services from a provider on a remote platform. This includes Software as a Service (SaaS), Platform as a Service (PaaS), Hardware as a Service (HaaS) and Infrastructure as a Service (IaaS).

I thank you in advance for your willingness to participate in the survey.

Should you experience any technical difficulties with the survey, please ***contact: fibimere@gmail.com, 55145922@mylife.unisa.ac.za or +2773 539 3328***

Please click on the button below to complete the survey...

Next

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eLearning on the cloud: Processes, policies and costs

Demographics

Please tell us about yourself

* 1. Are you male or female?

- Male
- Female

* 2. What is your age?

- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 to 74
- 75 or older

* 3. What is the highest level of school you have completed or the highest degree you have received ?

- ◯ High school or lower
- ◯ Grade 12 or equivalent
- ◯ Diploma or College degree
- ◯ Bachelors or Honors degree
- ◯ Masters degree
- ◯ Doctoral degree

* 4. What is your eLearning role or responsibility?

- ◯ Content Designer / Author / Content Developer
- ◯ Trainer / Facilitator
- ◯ Scheduler / System Administrator
- ◯ IT partner / System Architect
- ◯ Team Manager / Strategic Partner
- ◯ Business Analyst / Subject Expert
- ◯ Vendor / Service Provider
- ◯ Business owner / Customer
- ◯ Learner / Trainee

Prev Next

eLearning on the cloud: Processes, policies and costs

Questions

* 5. Are you aware of any eLearning software in the company? Please give the names...

6. Do you know what processes were followed in acquiring the eLearning software? Please explain...

7. Which roles or teams are usually involved in the process of acquiring software?

* 8. Is the eLearning software mentioned above supported by the organization's IT department?

- ◯ Yes
- ◯ No

* 9. Does the company have architectural processes to follow in terms of acquiring services or software?

- ◯ Yes
- ◯ No

10. If you are aware, were there any architectural assessments done when acquiring the above learning software?

* 11. Are there any standards and policies in the organization for governing software?

- ◯ Yes
- ◯ No

12. In your own understanding, briefly explain the organization's standards and policies for ***acquiring*** software.

13. In your own understanding, briefly explain the organization's standards and policies for software ***usage***.

* 14. From your experience are any of the mentioned standards and policies adhered to at all times?

- ◯ Yes
- ◯ No

15. What is your philosophy about IT being a partner to business rather than just supporting business objectives and strategy?

16. Considering your response above would you say there is a proper relationship between business and IT in the organization? Please explain...

* 17. Do you think it costs a lot to implement an eLearning project?

- ◯ Yes
- ◯ No

18. What costs may be involved to implement an eLearning project?

19. Do you think it is maybe an investment to implement an eLearning project?

20. What do you understand about cloud computing?

* 21. Has the organization already tapped into cloud computing services at this stage?

- ◯ Yes
- ◯ No

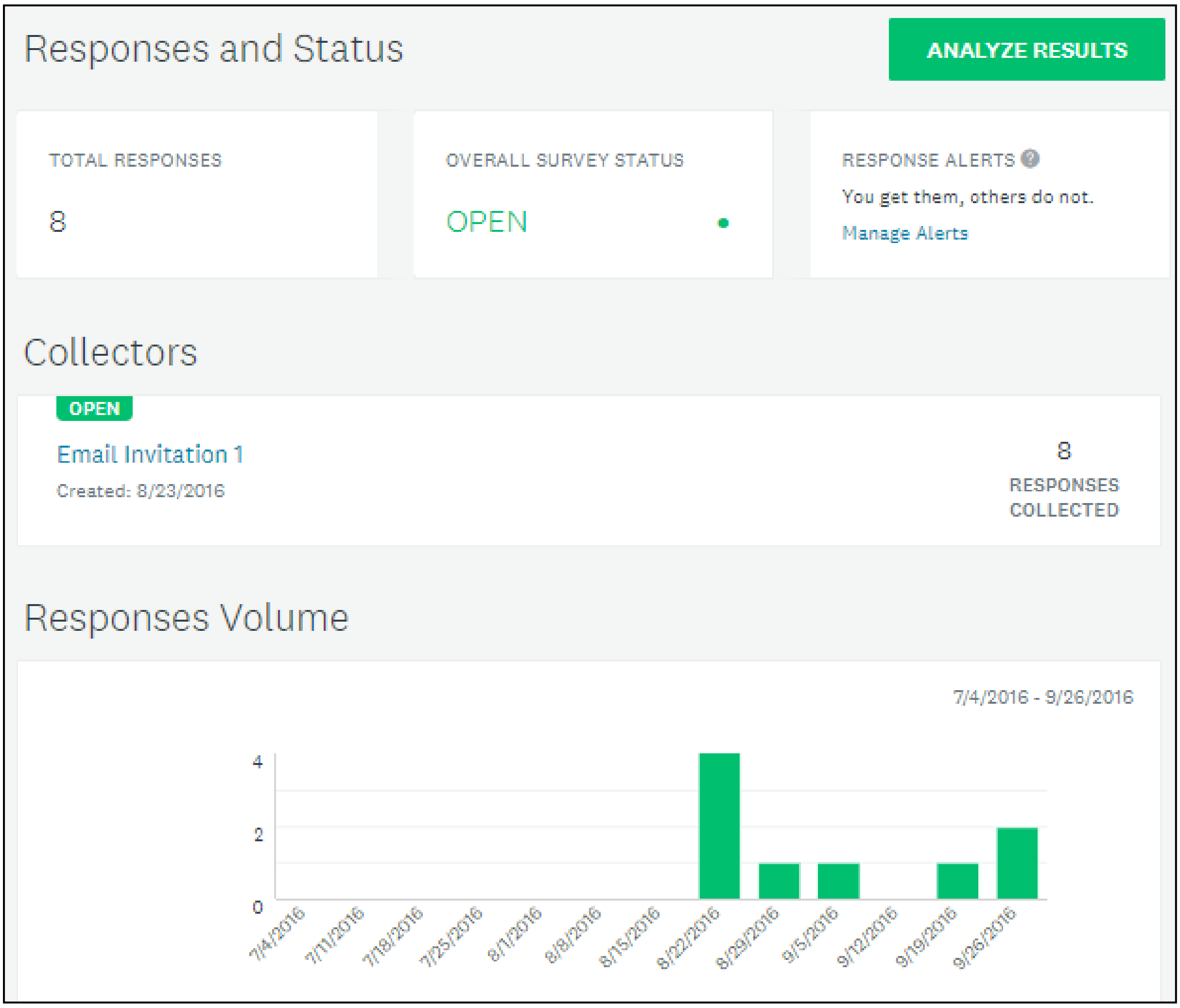
* 22. Does any of the organization's eLearning systems run on the cloud as a service?

- ◯ Yes
- ◯ No

23. If yes, how does the cloud based system work in terms of access and effectiveness?

Prev Done

Survey 3: Collective Response Data

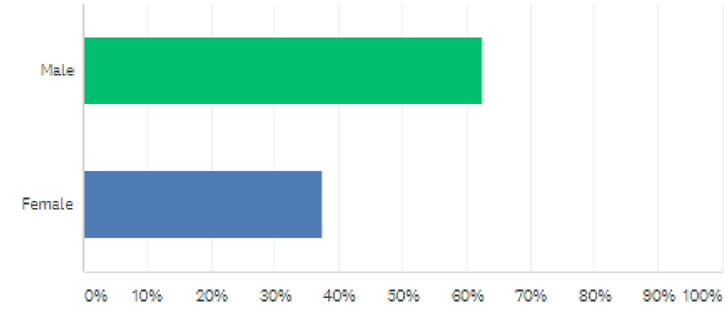


Page 2: Demographics

Q1

Are you male or female?

Answered: 8   Skipped: 0

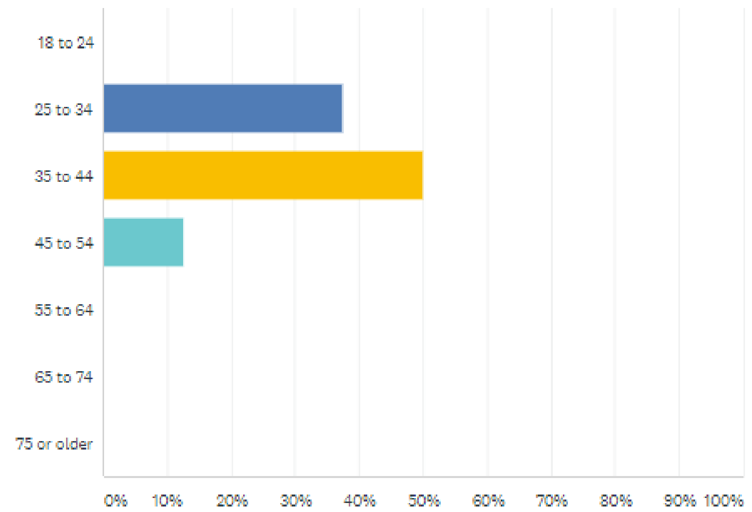


ANSWER CHOICES	RESPONSES	
Male	62.50%	5
Female	37.50%	3
TOTAL		8

Q2

What is your age?

Answered: 8   Skipped: 0



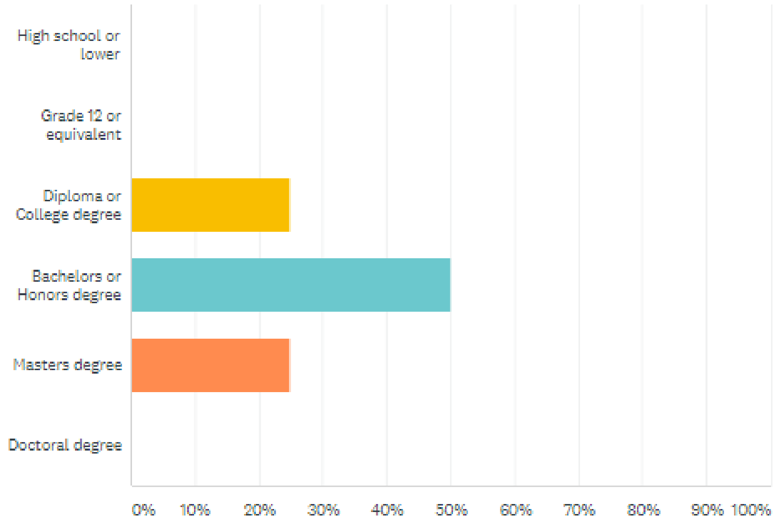
ANSWER CHOICES	RESPONSES	
18 to 24	0.00%	0
25 to 34	37.50%	3
35 to 44	50.00%	4
45 to 54	12.50%	1
55 to 64	0.00%	0
65 to 74	0.00%	0
75 or older	0.00%	0
TOTAL		8

Q3

Customize Save As

What is the highest level of school you have completed or the highest degree you have received ?

Answered: 8 Skipped: 0



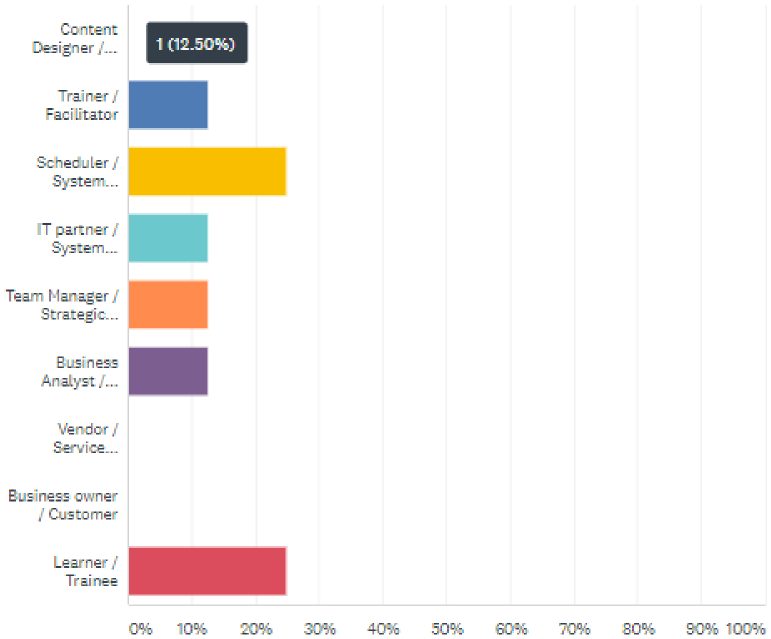
ANSWER CHOICES	RESPONSES	
High school or lower	0.00%	0
Grade 12 or equivalent	0.00%	0
Diploma or College degree	25.00%	2
Bachelors or Honors degree	50.00%	4
Masters degree	25.00%	2
Doctoral degree	0.00%	0
TOTAL		8

Q4

Customize Save As

What is your eLearning role or responsibility?

Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
Content Designer / Author / Content Developer	0.00%	0
Trainer / Facilitator	12.50%	1
Scheduler / System Administrator	25.00%	2
IT partner / System Architect	12.50%	1
Team Manager / Strategic Partner	12.50%	1
Business Analyst / Subject Expert	12.50%	1
Vendor / Service Provider	0.00%	0
Business owner / Customer	0.00%	0
Learner / Trainee	25.00%	2
TOTAL		8

Q5

Save As

Are you aware of any eLearning software in the company? Please give the names...

Answered: 7 Skipped: 1

RESPONSES (7) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing **7** responses

Yes,TLMS
9/27/2016 3:11 PM View respondent's answers

TLMS (Telkom Learning Management System
9/23/2016 11:19 AM View respondent's answers

Telkom LMS
8/31/2016 9:26 PM View respondent's answers

Yes, e learning on business ethics and POPI
8/28/2016 6:01 PM View respondent's answers

Yes, Telkom Learning Management System
8/26/2016 7:48 AM View respondent's answers

Yes, Moodle
8/25/2016 9:09 AM View respondent's answers

Yes I am. TLMS - Telkom Learning Management System
8/24/2016 8:52 AM View respondent's answers

Q6

Save As

Do you know what processes were followed in acquiring the eLearning software? Please explain...

Answered: 7 Skipped: 1

RESPONSES (7) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing **7** responses

Not sure , but it could be the normal procurement process of buying the company software

9/27/2016 3:11 PM View respondent's answers

NO

9/23/2016 11:19 AM View respondent's answers

I don't know

8/31/2016 9:26 PM View respondent's answers

No.

8/28/2016 6:01 PM View respondent's answers

No

8/26/2016 7:48 AM View respondent's answers

It sold by the vendor to the company

8/25/2016 9:09 AM View respondent's answers

No. The procurement process followed to acquire this software happen outside of my environment and knowledge.

8/24/2016 8:52 AM View respondent's answers

Q7

Save As

Which roles or teams are usually involved in the process of acquiring software?

Answered: 7 Skipped: 1

RESPONSES (7) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing **7** responses

Not sure, but in our case we make sure that we have the skills for supporting the tool

9/27/2016 3:11 PM View respondent's answers

Project Manager, Developers, System Analyst, Business Administrator

9/23/2016 11:19 AM View respondent's answers

Training manager, HR, Procurement, Finance

8/31/2016 9:26 PM View respondent's answers

IT Service providers and the content owner

8/28/2016 6:01 PM View respondent's answers

SharePoint design Team.

8/26/2016 7:48 AM View respondent's answers

Procurement

8/25/2016 9:09 AM View respondent's answers

- Procurement Managers - Digital team - Portal Development Team - Corporate Information Security Governance Team

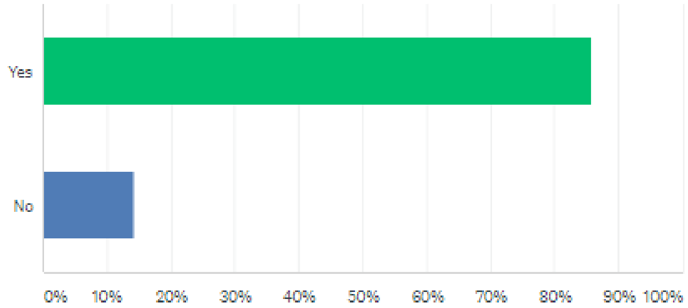
8/24/2016 8:52 AM View respondent's answers

Q8

Customize Save As

Is the eLearning software mentioned above supported by the organization’s IT department?

Answered: 7 Skipped: 1



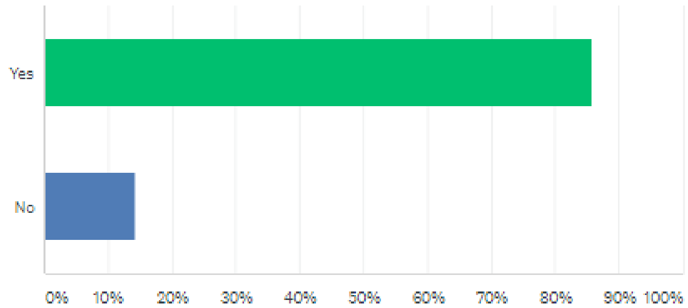
ANSWER CHOICES	RESPONSES	
Yes	85.71%	6
No	14.29%	1
TOTAL		7

Q8

Customize Save As

Is the eLearning software mentioned above supported by the organization’s IT department?

Answered: 7 Skipped: 1



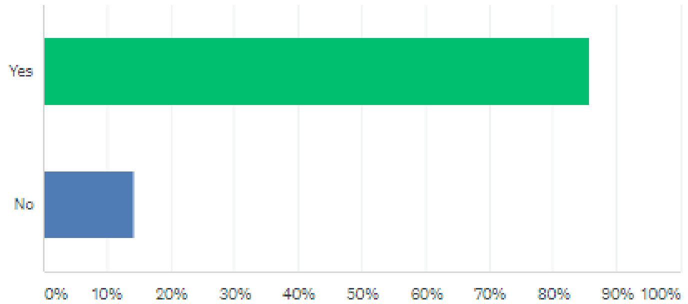
ANSWER CHOICES	RESPONSES	
Yes	85.71%	6
No	14.29%	1
TOTAL		7

Q9

Customize Save As

Does the company have architectural processes to follow in terms of acquiring services or software?

Answered: 7 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	85.71%	6
No	14.29%	1
TOTAL		7

Q10

Save As

If you are aware, were there any architectural assessments done when acquiring the above learning software?

Answered: 7 Skipped: 1

RESPONSES (7) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing **7** responses

Not aware

9/27/2016 3:11 PM View respondent's answers

Yes there was

9/23/2016 11:19 AM View respondent's answers

I am not aware

8/31/2016 9:26 PM View respondent's answers

I am not aware of ant assesment done for e-learning. In fact we are currently deriving a strategy on how it should be handles i.e principles and processes to adhere to in cloud computing

8/28/2016 6:01 PM View respondent's answers

Not sure.

8/26/2016 7:48 AM View respondent's answers

I'm not aware

8/25/2016 9:09 AM View respondent's answers

To my knowledge, it is a common practice to perform the architectural assessment when or before acquiring any piece of software.

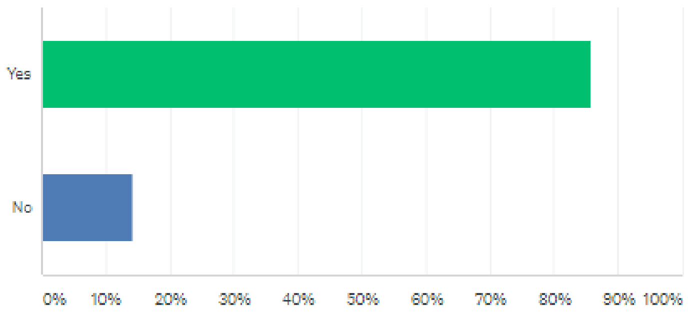
8/24/2016 8:52 AM View respondent's answers

Q11

Customize Save As

Are there any standards and policies in the organization for governing software?

Answered: 7 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	85.71%	6
No	14.29%	1
TOTAL		7

Q12

Save As

In your own understanding, briefly explain the organization’s standards and policies for acquiring software.

Answered: 7 Skipped: 1

RESPONSES (7) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing 7 responses

Analyze for architectural compatibility and Understand the requirements of the organization

9/27/2016 3:11 PM View respondent's answers

Policies are long-term, high-level management instructions and guidelines on how the organization is to be run and they should be in line with the law of the country. Standards define the process or rules that should be used to support these policies, for example system-design models or specific software

9/23/2016 11:19 AM View respondent's answers

Guidelines with standard rules and regulations to follow when acquiring software.

8/31/2016 9:26 PM View respondent's answers

At the moment they don't exists and handled on a ad-hoc basis

8/28/2016 6:01 PM View respondent's answers

Guidelines with standard rules and regulations to follow when acquiring software.

8/31/2016 9:26 PM View respondent's answers

At the moment they don't exists and handled on a ad-hoc basis

8/28/2016 6:01 PM View respondent's answers

acquisition of software licenses

8/26/2016 7:48 AM View respondent's answers

I'm not sure which standards were considered

8/25/2016 9:09 AM View respondent's answers

This can either be a closed/open tender. Depending on the choice the company takes, then specific processes will be followed. e.g. On a open tender, the company will prepare thee Request for Proposal from vendors who will be willing to provide the software to the said company.

8/24/2016 8:52 AM View respondent's answers

Q13

Save As

In your own understanding, briefly explain the organization's standards and policies for software usage.

Answered: 7 Skipped: 1

RESPONSES (7) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing 7 responses

All users must use all software inaccordance with license agreements and the (organization's) software policy. (Organization) will not tolerate theuse of any unauthorized copies of software or fonts in our organization. All software used by (organization)on (organization)-owned computers will be purchased through appropriateprocedures.

9/27/2016 3:11 PM View respondent's answers

It help to minimize using software that is not licensed and a duplication of buying software that is already been bought in other section.

9/23/2016 11:19 AM View respondent's answers

Standard rules and regulations to be followed when using company's software applications

8/31/2016 9:26 PM View respondent's answers

It help to minimize using software that is not licensed and a duplication of buying software that is already been bought in other section.

9/23/2016 11:19 AM View respondent's answers

Standard rules and regulations to be followed when using company's software applications

8/31/2016 9:26 PM View respondent's answers

Standards: TOGAF Policies and procedures: Solution value chain form user requirement to software deployment.

8/28/2016 6:01 PM View respondent's answers

compliance

8/26/2016 7:48 AM View respondent's answers

User friendly, manageable, affordable, and sustainable

8/25/2016 9:09 AM View respondent's answers

Software usage in companies isn't supposed to be open to all employees if they not using it. This will make sure that the governance of such software is performed optimally.

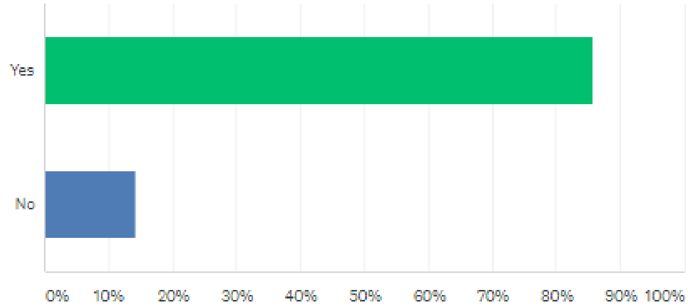
8/24/2016 8:52 AM View respondent's answers

Q14

Customize Save As

From your experience are any of the mentioned standards and policies adhered to at all times?

Answered: 7 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	85.71%	6
No	14.29%	1
TOTAL		7

Q15

Save As

What is your philosophy about IT being a partner to business rather than just supporting business objectives and strategy?

Answered: 6 Skipped: 2

RESPONSES (6) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing 6 responses

The aim is to enable both sides to gain financially.

9/27/2016 3:11 PM View respondent's answers

Being a partner gives one the idea that if he is not delivering as expected bad results will also affect him.

9/23/2016 11:19 AM View respondent's answers

This has both pros and corns

8/31/2016 9:26 PM View respondent's answers

Historically IT was a supporting function however over time, this role had to change as things don't stay the same. There is a requirement for IT to be business partner in fulling business objectives. Business strategies fail dismally without IT hence the need to be partner than a supporter.

The IT will have ownership which will drive them to push better than if they were to be supporting

8/25/2016 9:09 AM View respondent's answers

I believe IT should be a partner to business for mutual benefits. Allowing IT to live by business values will make it easier for them to provide a much support to business as possible.

8/24/2016 8:52 AM View respondent's answers

Q16

Save As

Considering your response above would you say there is a proper relationship between business and IT in the organization? Please explain...

Answered: 6 Skipped: 2

RESPONSES (6) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing **6** responses

Yes, IT has the capability to enable the organization to gain more financially.

9/27/2016 3:11 PM View respondent's answers

Not really because business and IT in most cases have different expertise in term deliverables. With budget involved it's always an issue.

9/23/2016 11:19 AM View respondent's answers

Yes, IT provides business with a lot of solutions - the relationship must improve though with IT increasing the urgency of solution delivery.

8/31/2016 9:26 PM View respondent's answers

The relationship certainly exists however can improve. There is a great opportunity to improve the relation for the success of the company. The broken relationship between IT and business hinders the ability to meet business objectives.

8/28/2016 6:01 PM View respondent's answers

Yes, both parties needs one another

8/25/2016 9:09 AM View respondent's answers

There is a proper relationship between the two entities even though business at times doesn't show that much trust in IT for various reasons. However all in all the partnership is growing to be stronger by the day.

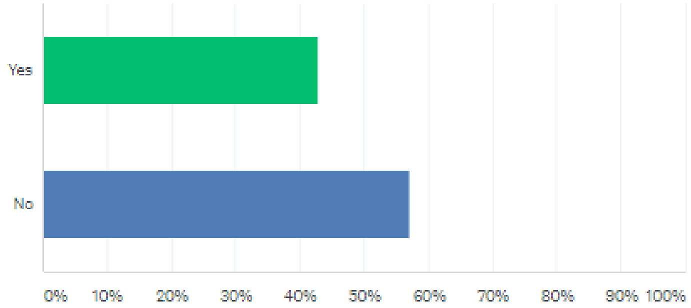
8/24/2016 8:52 AM View respondent's answers

Q17

Customize | Save As

Do you think it costs a lot to implement an eLearning project?

Answered: 7 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	42.86%	3
No	57.14%	4
TOTAL		7

Q18

Save As

What costs may be involved to implement an eLearning project?

Answered: 6 Skipped: 2

RESPONSES (6) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing 6 responses

Plus or minus 5Milllion rands. My estimation

9/27/2016 3:11 PM View respondent's answers

Buying software and hardware. Providing awareness to employees to use the system.

9/23/2016 11:19 AM View respondent's answers

IT, and mostly operational support of the system

8/31/2016 9:26 PM View respondent's answers

Variable costs i.e per user licenses

8/28/2016 6:01 PM View respondent's answers

Storage, Database, Server equipment, and people to do the actual implementation

8/25/2016 9:09 AM View respondent's answers

Honestly i have no clue as to how much it might cost to do this. But considering the fact that this eLearning will have to interface to the likes of SAP might mean higher costs.

8/24/2016 8:52 AM View respondent's answers

Q19 Save As

Do you think it is maybe an investment to implement an eLearning project?

Answered: 6 Skipped: 2

RESPONSES (6) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing 6 responses

Yes

9/27/2016 3:11 PM View respondent's answers

Yes

9/23/2016 11:19 AM View respondent's answers

Yes

8/31/2016 9:26 PM View respondent's answers yes, but the investment is for the supplier and not the client

8/28/2016 6:01 PM View respondent's answers

Yes

8/25/2016 9:09 AM View respondent's answers

Yes. eLearning comes with all sorts of advantages to organisations. No need to prepare a room for in-class learning.

8/24/2016 8:52 AM View respondent's answers

Q20

Save As

What do you understand about cloud computing?

Answered: 6 Skipped: 2

RESPONSES (6) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing 6 responses

the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.

9/27/2016 3:11 PM View respondent's answers

shared Internet-based computing using a network of remote servers to store, manage, and process data, rather than a local server or a personal computer

9/23/2016 11:19 AM View respondent's answers

Computing on the cloud...having access to the information on the cloud from anywhere at any time

8/31/2016 9:26 PM View respondent's answers

Software as a service Platform as a service Ability to fulfil the solution delivery on the cluod versus on premisis

8/28/2016 6:01 PM View respondent's answers

Running your applications on cloud/remotely other than in the servers

8/25/2016 9:09 AM View respondent's answers

Cloud computing is all about providing Software as a service, Infrastructure as a service to whoever wants to use such services.

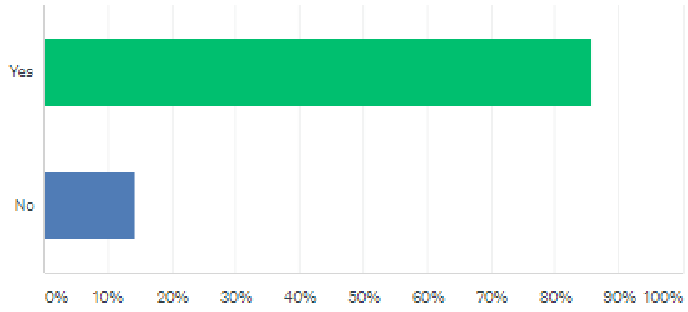
8/24/2016 8:52 AM View respondent's answers

Q21

Customize | Save As

Has the organization already tapped into cloud computing services at this stage?

Answered: 7   Skipped: 1



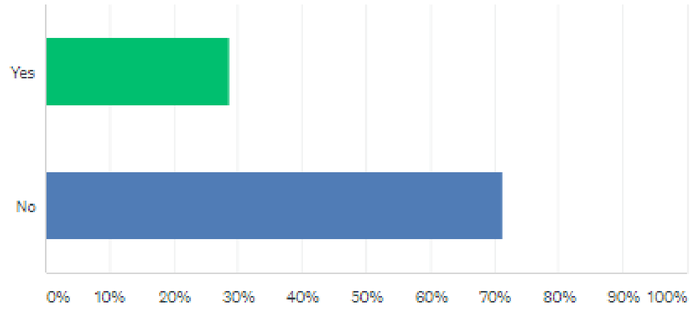
ANSWER CHOICES	RESPONSES	
Yes	85.71%	6
No	14.29%	1
TOTAL		7

Q22

Customize | Save As

Does any of the organization's eLearning systems run on the cloud as a service?

Answered: 7   Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	28.57%	2
No	71.43%	5
TOTAL		7

Q23

Save As

If yes, how does the cloud based system work in terms of access and effectiveness?

Answered: 6 Skipped: 2

RESPONSES (6) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing 6 responses

N/A

9/27/2016 3:11 PM View respondent's answers

Here we are still using a local server

9/23/2016 11:19 AM View respondent's answers

No

8/31/2016 9:26 PM View respondent's answers

To access the link, you only require internet connectivity which make it easier for the trainee.

8/28/2016 6:01 PM View respondent's answers

I'm not aware if there is anything running from cloud

8/25/2016 9:09 AM View respondent's answers

It has proven to be effective as of now and considering the fact that most organisation are undergoing the cost reduction measures, this has become a great asset

8/24/2016 8:52 AM View respondent's answers