A BEST PRACTICE E-LEARNING ENVIRONMENT FOR SOFTWARE TRAINING

By

Maxine Pier Esterhuyse

Submitted in fulfilment of the requirements for the degree of Magister Commercii (Computer Science and Information Systems) to be awarded at the Nelson Mandela Metropolitan University

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Supervisor: Dr Brenda Scholtz

Nelson Mandela Metropolitan University

for tomorrow

A Best Practice e-Learning Environment for Software Training

Author: Maxine Pier Esterhuyse (211054984)

Supervisor: Dr Brenda Scholtz

Masters Dissertation

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Acknowledgements

Looking back at the last two years of my life is quite daunting, but I would like to think that this journey has strengthened me and prepared me for the years to come, both professionally and from a personal standpoint. I remember the feeling of writing the acknowledgements for my Honours treatise and I have to admit, it has not become any easier.

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Abstract

The incorporation of best practice in e-learning environments can increase the probability of success for companies and learners alike. By identifying and understanding the barriers that potential learners may face when interacting with e-learning products, the potential for e-learning failure may be alleviated. There are a variety of benefits that may be realised by companies incorporating e-learning opportunities into their management strategies. However, certain pedagogical principles, metrics and components need to be investigated and implemented in order for a corporate e-learning environment to be successful.

The aim of this research is to prototype and evaluate a practical e-learning environment for software training ($eLEST_P$) with e-learning components consisting of interactive learning objects that can guide the development and management of online training in the corporate context. The $eLEST_P$ is based on a theoretical contribution that is conceptualised in the form of an e-learning environment for software training ($eLEST_T$). Hence, this study followed a research methodology that is appropriate for educational technologies, namely the Design-Based Research (DBR) methodology, which was applied in iterative cycles. Quantitative and qualitative data was collected by means of a case study, interviews, a focus group and survey. The proposed $eLEST_P$ underwent several iterations of feedback and improvement and the result is a real-world solution to the problem at hand.

With the purpose of determining the success of corporate e-learning, the barriers and critical success factors for e-learning as well as evaluation criteria were explored. Interviews, a focus group and a survey were conducted in order to validate the investigated literature in a real-world context. Informal interviews enabled a better understanding of the organisational context of this study. The focus group was conducted with customers who were undergoing face-to-face training using conveyancing software developed by Korbitec. Many of the issues faced by learners identified in literature regarding e-learning in developing countries were identified by the participants from the case study. An e-learning survey was used to gather information regarding the intention of Korbitec's customers to use e-learning as well as their satisfaction with using e-learning. From the survey, it was found that respondents were positive regarding intention to use and satisfaction toward e-learning usage.

DBR Cycle 1: *Problem Investigation and Proposal* entailed the initial problem investigation by conducting a literature review, focus group and survey. DBR Cycle 2: *Design Alternative 1* of this

study involved a design alternative for eLEST$_P$, namely Prototype 1. DBR Cycle 3: *Design and Evaluate Alternative 2* involved the design and prototyping of Prototype 2 for eLEST$_P$ as well as the improvement of Prototype 2 through sub-cycles of testing and refinement. The suggestions for improvement were obtained from the relevant stakeholders at Korbitec who are content developers and subject-matter experts.

The criteria used to evaluate the success of eLEST$_P$, including its e-learning components, were synthesised and adapted from literature and a new set of evaluation criteria for e-learning environments in software training contexts was proposed. The evaluated eLEST$_P$ consists of the technology basis of the Modular Object Oriented Dynamic Learning Environment (Moodle), design guidelines for e-learning components, certification and competency-based training, pedagogical principles and best practice. Overall, eLEST$_P$ was positively received by various evaluator groups in formative and summative evaluations. The research results indicate that the use of an e-learning environment for software training purposes was useful and necessary.

In support of this Masters dissertation, the following three conference papers have been published and presented at one local conference and two international conferences. In addition, an article has been published in an accredited journal:

1. IDIA 2015, Conference Paper – Zanzibar (Tanzania);
2. Conf-IRM 2016, Conference Paper – Cape Town (South Africa);
3. MCIS 2016, Conference Paper – Cyprus (Europe); and
4. IJIKM 2016, Journal Article.

Keywords: e-learning, online training, software training, e-learning barriers, critical success factors, learning components, interactive learning objects (ILOs), evaluation criteria.

Declaration of Own Work

I, Maxine Pier Esterhuyse (211054984), hereby certify that the Masters dissertation – "*A Best Practice e-Learning Environment for Software Training*" is my own independent work. All sources used or quoted have been indicated and acknowledged by means of complete references. This dissertation has not previously been submitted for assessment or for the purposes of another qualification.

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Miss Maxine Pier Esterhuyse

MARCH 2017

The views and opinions expressed in this dissertation are those of the author and do not necessarily reflect the official views of Korbitec Pty Ltd.

For publication purposes written consent must be obtained from Korbitec Pty Ltd.

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Glossary

In alphabetical order

ADL	Advanced Distributed Learning
CBT	Competency-Based Training
CPT	Content, Pedagogy and Technology
CSFs	Critical Success Factors
DBR	Design-Based Research
DSR	Design Science Research
DSRM	Design Science Research Methodology
F2F	Face-to-Face
ICT	Information and Communication Technology
ILOs	Interactive Learning Objects
IS	Information System
KOTW	Korbitec Online Training Website
LOM	Learning Object Metadata
LOs	Learning Objects
Moodle	Modular Object Oriented Dynamic Learning Environment
MRT	Media Richness Theory
PDILO	Process for Designing and Developing Interactive Learning Objects
SCORM	Shareable Content Object Reference Model
SMEs	Small and Medium-sized Enterprises
TAM	Technology Acceptance Model
TELEs	Technology-Enhanced Learning Environments
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action

UI	User Interface
UX	User Experience
VET	Vocational and Education Training

Chapter 1. Introduction

1.1 Background

With the continuing enhancement of software, new features are often implemented in new versions and thus, software applications are becoming more complex and feature-rich (Chi, Olfman, & Lin, 2014). This complexity, inherent in feature-rich software, makes it challenging for software instructors to train novice users in a face-to-face (F2F) learning environment, considering the number of features to be learnt and the limited time frame of training. Software instructors are often unable to assist many users at once which can cause frustration amongst the users training to use the software and decreases their motivation to continue training.

1.1.1 Learning and Training

Education is more about providing effective learning opportunities as well as encouraging questioning and less about teaching (Ginzberg & Reilley, 1957; Kolb, 1984; Lloyd, 1990; Revans, 1982). When referring to educational contexts, training and learning cannot be used interchangeably as there are notable differences between the two terms. One of the fundamental differences between training and learning is that the former focuses on the control and conditioning of individuals' understanding whilst the latter relates to broadening and liberating understanding (Antonacopoulou, 2001). Another difference to note is that training is considered a learning event and learning is an ongoing process.

The most noticeable difference between tertiary education and workplace learning, which is also referred to as workplace training, is that the former is considered formal, whilst the latter has traditionally been mostly informal and incidental (Eraut, Alderton, Cole, & Senker, 1998; Marsick & Watkins, 1990; Tynjälä & Häkkinen, 2005). When learning in the workplace is functioning at optimal levels, tacit skills and intuition related to expertise can be produced when embedded in unintentional and informal learning (Tynjälä & Häkkinen, 2005). At its worst, the same tacit skills are produced but may be contaminated with unwanted bad habits or inflexible practices that cannot adapt to changing corporate requirements. Another difference to note is that tertiary education has traditionally been abstract in nature and separated from the context in which the learnt knowledge and skills are to be used.

Conversely, learning in the workplace is concerned with the context of use and application of what has been learnt, in a way that makes it embedded in everyday problem-solving. An innovative way to provide education and learning opportunities has been established, namely e-learning.

1.1.2 Technology for Learning and Training

There has been a transformation in the field of education and learning due to the introduction of the Internet (Akaslan, Law, & Taşkin, 2012). Information and Communication Technology (ICT) has been a prominent driving force behind economic, commercial and socio-political industry changes (Alias, Zakariah, Ismail, & Aziz, 2012). ICT has also influenced the educational industry substantially by the way in which learning is facilitated. The teaching and training methods of institutions have changed from formal lectures to the use of the Internet for learning content delivery (Akaslan *et al.,* 2012). The introduction of e-learning has created a new paradigm for modern education in a fluctuating technological environment (Alias *et al.,* 2012).

e-Learning can be defined as the implementation of Internet technologies in order to deliver an extensive array of solutions to enhance knowledge acquisition and learner performance (Haron & Suriyani, 2010). An e-learning environment can assist learners in developing skills and knowledge that could also be attained in traditional learning, but in a more efficient and structured manner (Chang *et al*., 2015). Various types of organisations such as companies, schools and universities are making use of e-learning as a training, learning and professional development tool (Chikh & Berkani, 2010). The increasing adoption of e-learning in such organisations is due to the Internet offering new opportunities to restructure the learning and knowledge transfer environment (Abbad, 2012). e-Learning also offers organisations the opportunity to leverage the various advantages that e-learning provides (Hani, Hooshmand, & Mirafzal, 2013). e-Learning can encourage active learning where meaningful learning outcomes are achieved due to the level of learner activity during the learning process (Mayer, 2014). Corporations are increasingly recognising the benefits of implementing e-learning systems to provide cost-effective training for employees and customers (Chen, 2010). The corporate e-learning field was predicted several years ago to undergo a paradigm shift from an emerging market with substantial potential to an established industry (Barron, 2002).

There is a changing perception of e-learning in companies in that it was once seen as a recurring cost and is now seen as an investment.

Online learning differs from e-learning in that it is a subset of blended learning that can be paired with traditional learning, but is similar to e-learning in that it provides access to learning experiences through the use of technology (Deschacht & Goeman, 2015; Moore, Dickson-Deane, & Galyen, 2011). The greatest difference between e-learning and online learning is the context in which the terms are used, depending on whether learning is conducted solely through a technological source or if it is paired with traditional learning in a blended learning environment (Dickson-Deane *et al.,* 2011).

1.1.3 Best Practice for e-Learning Environments

Identifying and documenting the essential features of an e-learning environment is crucial and can be considered "best practice" as some features originate from learning theories that incorporate important aspects of learning that must be considered. By explicitly making the factors influencing the success or failure of e-learning systems known, an e-learning environment of higher quality can be provided for the users (Hani *et al.,* 2013). According to Chang *et al*. (2015) and De Kock, Sleegers and Voeten (2004), there are aspects of traditional learning environments that apply to e-learning environments. According to Anderson (1989), Joyce and Weil (1996) and Reigeluth (1983), the aspects of traditional learning environments are:

- The physical context where learning and instruction occurs;
- The roles of teachers and learners;
- The roles of learners in relation to each other;
- Learning goals and objectives;
- The teacher's instruction methods;
- The tasks to be performed by learners; and
- The content used and the role it plays.

The competitive and ever-changing environments in which companies operate are driving them to make modifications in strategies such as complying with industry best practice (Holt & Singh, 2013). Best practice can be defined as the ideas that have shown at least a slight superiority to other ideas and have been adopted and implemented by esteemed

practitioners in the applicable field (Resnick & Vaughan, 2006). According to Esteves (2014), best practice refers to contemporary jargon commonly used by business and Information Systems (IS) professionals and describes procedures that are accepted as most effective in reducing error and increasing improvements (Esteves, 2014). The identification, dissemination and application of best practice can reduce error and dysfunction and may provide business improvements. According to a study undertaken by Holt and Singh (2013), an idea was considered a best practice in online learning forum participation if it allowed for problem solving, increased the knowledge base for all, allowed for learning and improvement and lastly, enabled users to achieve their personal goals for participation timeously. D'Agustino (2012) identified best practice related to e-learning environments from literature as the following:

- Having a design team;
- Performing a context analysis;
- Identifying objectives and learning outcomes;
- Taking a modular approach to content organisation;
- Rapid prototyping;
- Student-centeredness;
- Accommodating multiple learning modalities;
- Effective uses of media and technology; and
- Providing alternative assessment opportunities.

1.1.4 E-Learning Critical Success Factors and Barriers

Studies show that there are a number of e-learning implementation issues which can lead to e-learning failure (Akaslan *et al*., 2012; Alias *et al*., 2012; May, Fessakis, Dimitracopoulou, & George, 2012). e-Learning initiatives are subject to the rapid pace of technology change and this contributes to the risk of e-learning and the need for implementing organisations to be flexible with regards to staying up to date with the latest technologies. In the process of e-learning adoption, users will go through a series of cognitive processes involving conviction, decision-making and confirmation before readiness is established (Alias *et al.*, 2012).

The adoption of e-learning initiatives has become one of the most researched topics in the literature (Haron & Suriyani, 2010; Islam, 2013; Zhang, Wen, Li, Fu, & Cui, 2010). However,

most studies that are related to the adoption of e-learning are conducted in university contexts. Although organisations implementing e-learning systems have the ability to benefit from the advantages e-learning has to offer, there may also be disadvantages and barriers linked to the use thereof (Hani *et al.,* 2013). It is therefore imperative that the factors affecting the success and failure of e-learning users be identified before embarking on such implementations.

User satisfaction has been included as a predictor of IS success in many studies and therefore supports the focus on end-users (DeLone & McLean, 2003; Melone, 1990; Raymond, 1987). The focus on end-users has also been supported in studies that aim to anticipate a system user's behaviour, also known as the intention to use a system (Gelderman, 1998; Lin, Wu, & Tsai, 2005; Lin & Wang, 2006). If organisations wish to benefit from e-learning, the importance of understanding the user's intention to use e-learning as well as the satisfaction thereof is paramount.

A gap in research of barriers to e-learning faced by learners may obstruct the use of e-learning to its full potential (Akaslan *et al*., 2012). The excessive costs associated with e-learning failures and education system processes, including time wasted, may be eliminated by being aware of the factors for success or failure of e-learning (Akaslan *et al.*, 2012). Organisations need to be aware of the issues involved with e-learning and need to develop a coherent strategy that will address these issues. There is a strong correlation between a lack of e-learning user adoption research, in terms of planning, by the implementing organisation and failure of e-learning environments (Akaslan *et al.,* 2012).

1.2 Problem Description and Problem Statement

The problem to be addressed in this study is the lack of understanding concerning what is best practice and what makes e-learning successful in a corporate software training context. There is a gap between the *expected* success rate and usage of e-learning systems, and the *actual* success and usage thereof which is affected by the barriers to e-learning (Akaslan *et al*., 2012).

The real-world problem of this study was identified at Korbitec. Korbitec is a technology-based software development company that has implemented the Korbitec Online Training Website (KOTW) which is an e-learning environment designed to provide users and

employees with online learning material. The online learning material provided in the KOTW provides resources for training related to the software that the company develops; however, at the commencement of this study, the KOTW was underutilised. One of the strategic aims of Korbitec is to improve the usage of the KOTW due to the low usage figures and statistics (Joanne Jones & Peter Raine, personal communication, 25 February 2015).

The identification and application of best practice can enable a reduction in errors and provide improvements within a company (Esteves, 2014). No link has been identified in the prior research reviewed of the incorporation of best practice into an e-learning environment to increase usage. An e-learning environment that complies with e-learning best practice may alleviate the costs of formal F2F training for companies in developed countries. This cost saving may also be realised for companies in developing countries, such as Korbitec, where customers are spread across Southern Africa and face challenges such as poor Internet access and a lack of computer ownership and availability. Despite the popularity of e-learning in organisations, the usage rate of e-learning is not increasing as fast as expected (Wu & Chen, 2012).

Some researchers have argued that there are higher dropout rates in e-learning courses compared to F2F learning courses (Bauman, 2002; Wu & Chen, 2012). The effectiveness of e-learning has been questioned as it sometimes fails to meet learning objectives (Xu & Wang, 2006). A substantial number of e-learning initiatives still suffer from a lack of perceived acceptability; however, when the systems are designed and implemented effectively, they may have similar or better outcomes to those achieved in F2F settings (D'Agustino, 2012). A lack of research by implementing organisations on the factors influencing e-learning adoption by learners may be hindering the use of e-learning to its full potential (Akaslan *et al.,* 2012). The problem to be addressed by this study extends to a lack of guidance available to companies for designing, developing and utilising e-learning environments for training. There are too few articles researching learning satisfaction and learning intention within the corporate space (Wu, Hsieh, & Lu, 2015).

The problem statement of this study is therefore as follows:

> ***There are several e-learning systems implemented in the corporate context for software training. However, the usage and success rate of these systems are often not as high as they should be due to several barriers to e-learning and a lack in understanding as to what constitutes best practice in e-learning for software training.***

1.3 Aim and Relevance of the Study

This study aims to determine the best practice that can be used in e-learning environments for software training to promote the usage and satisfaction with e-learning. A secondary aim of this study is to propose an e-learning environment for a real-world context that complies with the best practice identified from literature and problem investigation and to design, implement and evaluate a proposed best practice e-learning artefact.

If the best practice related to e-learning environments is identified and implemented, companies may increase the successful adoption of e-learning by users (D'Agustino, 2012). The success of an e-learning environment can be determined by the intention to use e-learning and the satisfaction with the use thereof (Mohammadi, 2015). The intention to use e-learning involves a person's subjective perception of the probability of performing an action such as using the e-learning environment (Chatzoglou, Sarigiannidis, Vraimaki, & Diamantidis, 2009; Mohammadi, 2015). The satisfaction with the use of e-learning is the extent to which the e-learning instance meets or exceeds user expectations.

According to Chatzoglou *et al.* (2009), the intention to use and the satisfaction with e-learning may also be determined by measuring the computer anxiety and self-efficacy of learners and the enjoyment of e-learning (Figure 1-1). Computer anxiety is the tendency of users to feel anxious, hesitant or fearful about current or future use of computers. Self-efficacy involves the belief one has in one's own capabilities to activate the motivation, cognitive assets and actions needed to meet certain situations. Enjoyment is perceived as the extent to which an activity brings pleasure to the person involved.

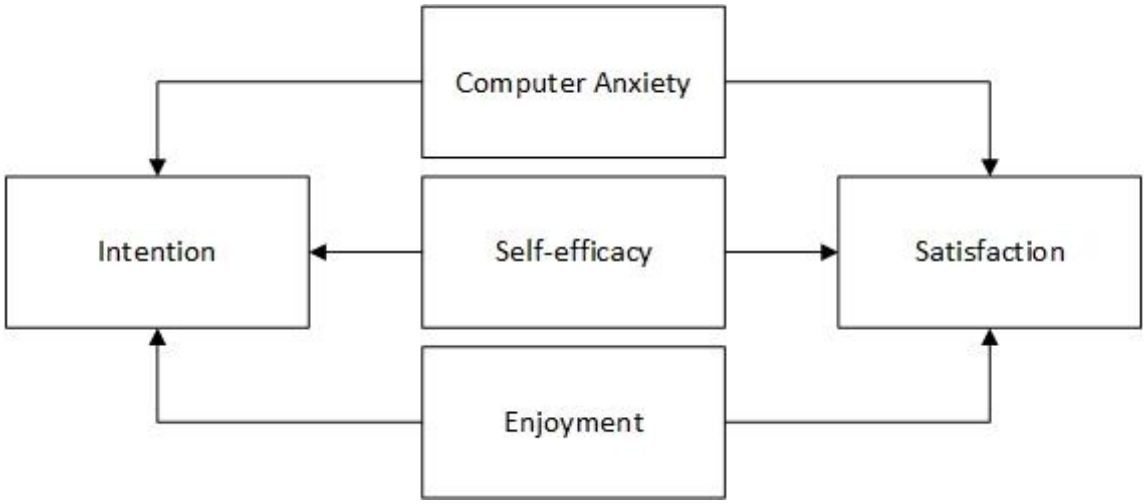

Figure 1-1: Intention and Satisfaction Metrics (Adapted from Chatzoglou *et al*., 2009, p. 879)

The main deliverable of this study is a best practice e-learning environment for software training ($eLEST_T$) consisting of a process and activities for e-learning design; and e-learning barrier framework; a model for e-learning success; and e-learning design considerations and guidelines. From a review of literature as well as from interviews, a survey and a focus group, an e-learning environment to be used for software training ($eLEST_P$) will be derived from literature that can be used by other researchers and practitioners. This environment will be applied at Korbitec for the Transfers course.

The e-learning components of the proposed e-learning environment will be evaluated by the researcher as well as the relevant stakeholders at Korbitec, namely the content developers and the subject matter expert. The e-learning environment for software training will be evaluated by the national training manager.

1.4 Research Questions

After careful consideration of the aim and relevance of this study, the main research question (RQ_M) is: ***What is a best practice e-learning environment for corporate organisations that train users to use software?***

In order to successfully answer the main research question of this study, several secondary research questions have been identified:

RQ_1: What are the critical success factors for e-learning environments?

RQ_2: What are the barriers affecting the adoption of e-learning?

RQ_3: What are the metrics affecting the intention to use and the satisfaction with using e-learning environments?

RQ_4: Which e-learning process can be used for developing a best practice e-learning environment for software training?

RQ_5: What design guidelines can be used for e-learning environments in a software training context?

RQ_6: What is the predicted success of the proposed environment at Korbitec for the Transfers course?

1.5 Research Objectives

The main research objective (RO_M) for this study is: ***To determine best practice for organisations implementing e-learning in a corporate software training context.***

In order for this study to meet the main research objective, several secondary research objectives have been identified:

RO_1: Identify the factors that determine the success of e-learning environments.

RO_2: Determine the barriers that affect the adoption of e-learning.

$RO_{3.1}$: Identify the metrics influencing the intention to use e-learning environments.

$RO_{3.2}$: Identify the metrics that affect the satisfaction with using e-learning environments.

RO_4: Establish an e-learning process that can be followed when developing a best practice e-learning environment for software training.

RO_5: Identify the design guidelines that are applicable to Korbitec and aligned with best practice.

RO_6: Determine and evaluate the success of the proposed e-learning environment at Korbitec.

1.6 Scope and Limitations

The scope of the real-world context of this study is limited to one organisation. The KOTW consists of several training courses related to the software developed by Korbitec, and there are some F2F courses that have not yet been converted to be accessed electronically by

means of the KOTW. Korbitec also aims to introduce new online certification courses where users can be certified in a variety of courses offered by the company. The scope of this study will be limited to one of the courses, namely the GhostConvey Transfers course, and its transformation from a F2F course to an online certified training course, will be the focus of this study. The e-learning components that are proposed as part of the corporate e-learning environment will be of an interactive nature. This study will be limited to corporates and will be conducted in the geographical region of South Africa.

1.7 Ethical Clearance and Considerations

There will be three main groups of participants for this study. The first group of participants are customers of Korbitec who have never used an e-learning system before. The second group of participants are customers of Korbitec who have had previous experience with using an e-learning system, which could have been the KOTW prior to the initiation of this research project or another e-learning system. The third group of participants are employees in the training division at Korbitec and their job titles are either: national training manager, content developer or subject matter expert. The participation of all groups of participants in this study is voluntary. The ethical procedures and policies specific to NMMU will be adhered to throughout this study. The ethics reference number granted for the purposes of this study is H15-SCI-CSS-007 which has an official letter of approval (Appendix A).

1.8 Research Methodology and Dissertation Structure

According to March and Smith (1995), design science was implemented under the name design science research (DSR) in the IS domain. Design-based research (DBR) resulted from the application of DSR in educational settings, so that learning artefacts could be developed that were aligned with design theory (Collins, 1992). DBR can be considered to be the educational technology revision of DSR and is therefore the preferred research methodology for e-learning (De Villiers & Harpur, 2013). DBR is recognised for its guidance in producing dual outcomes for research and entails the introduction of an artefact aimed to create an intervention as well as a set of guidelines and design principles (Van Wyk & De Villiers, 2014). According to Amiel and Reeves (2008), a DBR cycle can consist of iterative sub-cycles of testing and refinement in order to make improvements to the artefact and the design principles

proposed, based on feedback obtained. For the purposes of this study, the DBR process consists of three cycles involving all of the DBR phases.

In this study, the DBR methodology will be followed and implemented in an iterative manner that will focus on the elucidation of the problem at hand and the design and development of an artefact, which will be the proposed e-learning environment. The DBR methodology and a description of how it will be applied are discussed in more detail in Chapter 2.

Since DBR will be followed throughout this study, the research phases and cycles of DBR will dictate the structure of this project. The three cycles of this study are Cycle 1: *Problem Investigation and Proposal*, Cycle 2: *Design Alternative 1* and Cycle 3: *Design and Evaluate Alternative 2*. This chapter reports on the phases and cycles even though each cycle has activities from all phases, due to the iterative nature of DBR. More detail of the three cycles in this study can be found in Chapter 2. DBR, along with its characteristics, ethos and principles influence the arrangement of chapters in this study and how the research activities are executed. The five phases of DBR are as follows (Van Wyk & De Villiers, 2014):

- **Phase 1:** Problem analysis in a real-world context;
- **Phase 2:** Design solution;
- **Phase 3:** Develop solution;
- **Phase 4:** Evaluate in practice; and
- **Phase 5**: Reflection, leading to dual outcomes.

The structure of this study consists of seven chapters (Figure 1-2) which are:

Chapter 1: Introduction

The first chapter provides an introduction to the topic of the study as well as the relevance, purpose and importance of the research. The chapter focuses on Phase 1 of DBR where the problem surrounding the study is identified, analysed and contextualised in literature and in the real world. An initial understanding and exploration of the problem at hand is documented in this chapter.

Chapter 2: Research Design and Methodology

The second chapter also focuses on the first phase of DBR and entails the identification and motivation of the choice of the research methodology to be followed throughout

this study as well as explains how DBR is applied. An alternative research methodology that is considered for this study is described and compared with DBR.

Chapter 3: A Theoretical Review of e-Learning as an Environment for Software Training

The main focus of Chapter 3 is the first phase of DBR where the problem surrounding the study is explored, which in this chapter is the literature research that is conducted to analyse the initial problem in more detail. The pedagogical principles related to e-learning in the workplace are explained and then the barriers to e-learning and factors for e-learning success are discussed. There are a number of e-learning components that could be considered in e-learning environments and there are criteria available for designing and evaluating these components. The findings of the literature review enable a process for designing interactive learning objects to be proposed. A theoretical best practice e-learning environment for corporate software training is presented which is derived from the literature investigated.

Chapter 4: e-Learning Problem Analysis and Planning: A Real-World Context

Chapter 4 focuses on the second phase of DBR where the solution to the stated problem is analysed in more detail in a real-world context. In order to do this, a single case study research strategy is used. Three data collection techniques are deployed in the form of interviews, a focus group and a survey in order to gain a deeper understanding of the problem and derive possible solutions to the problem. An introduction to the KOTW and the Transfers course, which is the case study of the real-world problem to be solved, is provided. The quantitative and qualitative results collected from the investigation of the real-world problem will be discussed in this chapter.

Chapter 5: Design and Prototyping of an e-Learning Environment for Korbitec

The main focus of Chapter 5 is on the second and third phases of DBR and documents the design and prototyping of the solution in the form of a functional artefact. The proposed e-learning environment and e-learning components are designed and developed for the Transfers course. The design considerations and guidelines, design of interactive learning objects and the requirements of a corporate learning environment for the case study are stated. Three DBR cycles are applied rigorously in

order to construct an e-learning environment using the most suitable content, pedagogy and technology to promote effective and efficient education, training and learning of Korbitec software.

Chapter 6: e-Learning Environment Evaluation

Chapter 6 focuses on the fourth DBR phase which is to evaluate the e-learning environment in a real-world context in order to produce research findings. The functional artefact, which is the e-learning environment including e-learning components, is evaluated by the relevant employees at Korbitec who are experts within the context of this study. The results of the formative and summative evaluation results are discussed in this chapter.

Chapter 7: Reflection, Conclusions and Recommendations for Future Work

The final chapter focuses on the fifth and final DBR phase of reflection, producing dual outcomes in the form of a documented theoretical contribution ($eLEST_T$) and an implemented solution to a real-world problem ($eLEST_P$). The findings of this study are reflected on and then discussed explicitly in this chapter. The problems experienced or limitations of the study are conveyed. Future work that could be conducted related to the study are suggested and the final, evaluated e-learning environment is presented.

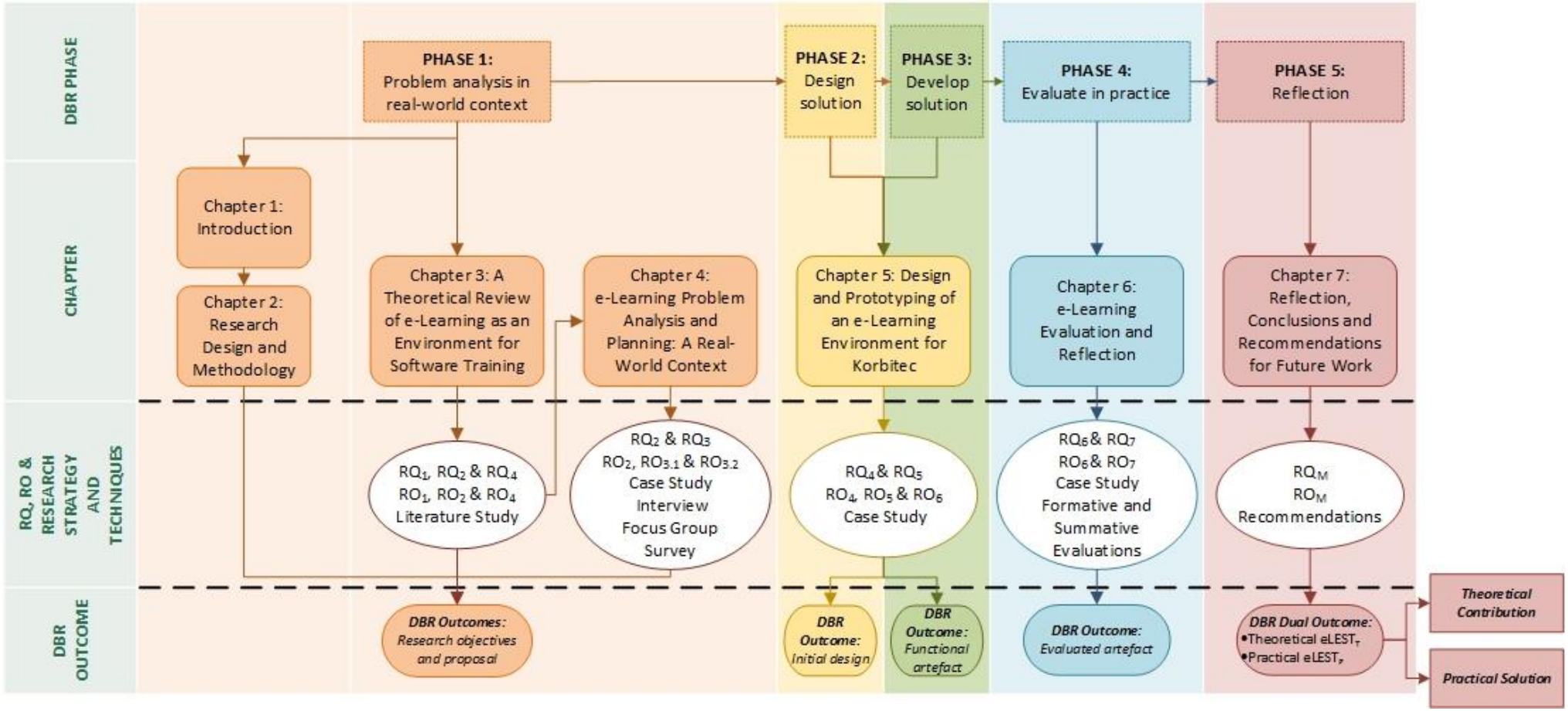

Figure 1-2: Chapter Layout Mapped to DBR

Chapter 2. Research Design and Methodology

2.1 Introduction

The problem that this study is addressing was identified in Chapter 1. In order to solve this problem, a suitable research methodology must be followed. This chapter explores and motivates the reasoning behind the selected research methodology. DBR is considered a suitable alternative to Design Science Research (DSR) in the field of educational technology (Section 2.2). In order to justify the selection of DBR instead of DSR, the two options are compared (Section 2.3). Based on the proposal of using technology to alternate training methods in the workplace, DBR is motivated as a suitable choice for this research study (Section 2.4). There are a number of different approaches to DBR as well as several DBR characteristics (Section 2.5). For the full duration of this project, DBR will be applied and followed in the execution of the five DBR phases (Section 2.6). A layout of Chapter 2 illustrating the deliverables from this chapter is presented (Figure 2-1).

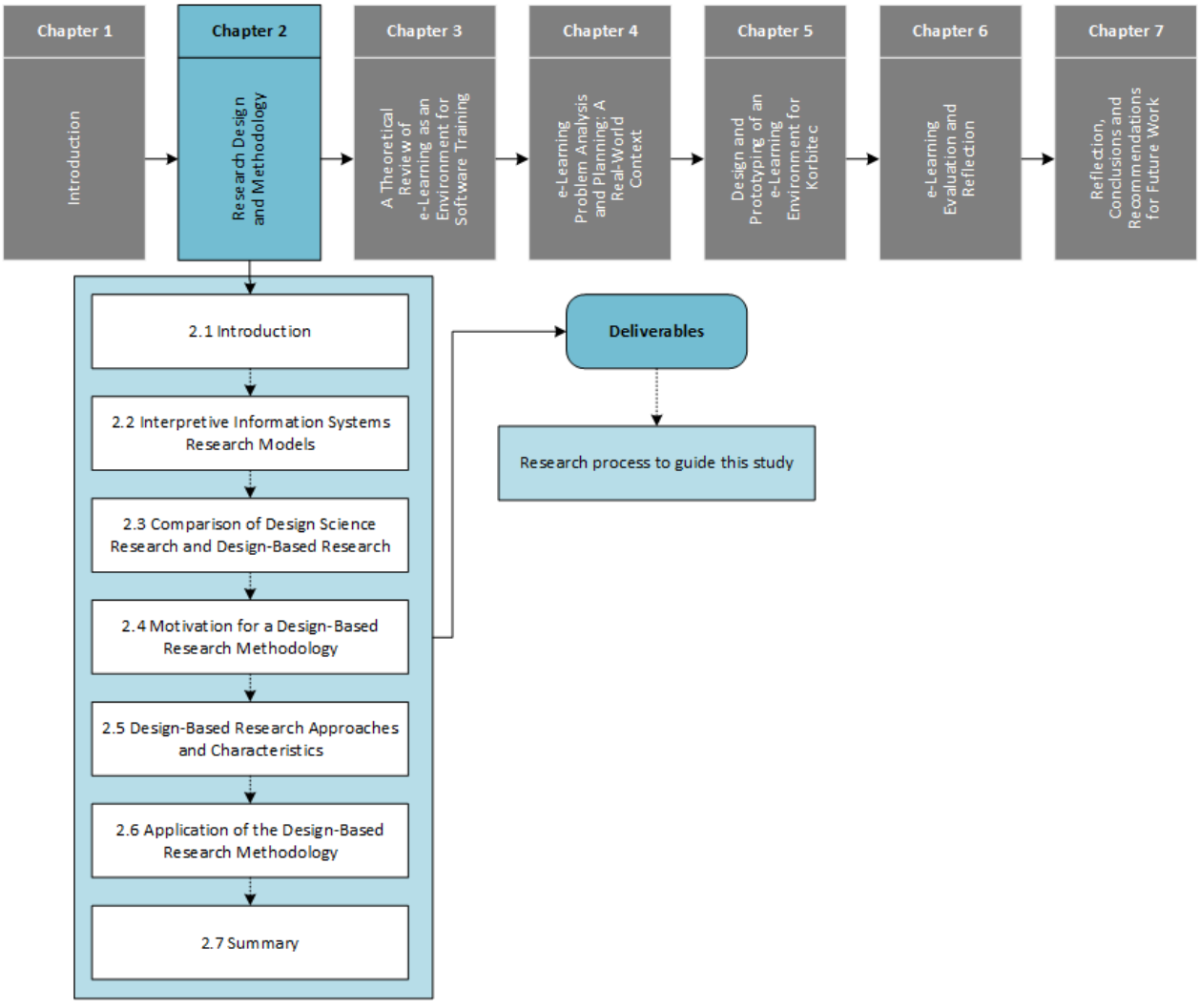

Figure 2-1: Chapter 2 Layout and Deliverables

2.2 Interpretive Information Systems Research Models

Research paradigms and models used in the field of IS are generating interest (Baskerville, 1999; Cibangu, 2010; De Villiers, 2005, 2012; Myers, 2004; Tsang, 2014). IS emphasises the social aspect of computing and therefore researchers and practitioners must account for human factors and behavioural influences (De Villiers, 2012). Interpretive research is becoming more prominent in IS research and was shown to be the second most commonly used philosophical perspective in the field after positivism (Orlikowski & Baroudi, 1991; Klein & Myers, 2011; Tsang, 2014; Williams & Wynn, 2012). Interpretivism seeks to understand the underlying meaning attached to intentional phenomena by their actors in order to generate knowledge (Berger & Luckmann, 1966). Intentional phenomena are given meaning according to the interpretation of those involved making it context-specific. On the contrary, positivism assumes that reality is stable and can be described by measurable properties that are independent of the researcher and instruments (Levin, 1988). Interpretivists view reality as being socially constructed and therefore believe that varied meanings of phenomena exist which determines how people behave in the objective world (Schutz, 1970). Klein and Myers (1999) motivate the suitability of interpretive studies to the field of IS due to its ability to assist in gaining detailed insight into human behaviour and cognition in various contexts. A family of design and development research methodologies follows the interpretivist research paradigm and consists of development research, design science research and design-based research. Design-based research evolved from other research methodologies (Section 2.2.1), including design science research and it is important to understand the underlying concepts of design science research (Section 2.2.2).

2.2.1 Evolution of Design-Based Research

Simon (1981) coined the term design science where the natural sciences and artificial sciences were distinguished. The natural sciences, such as astronomy, chemistry and physics use theories and formulae to interpret and explain why natural phenomena occur. Fields such as artificial intelligence, engineering and information technology use theories and models to explore intentional phenomena with the assistance of guidelines set out by prescriptive laws. Design science encompasses the iterative development and evaluation of innovative artefacts and interventions in specific contexts that solve real-life problems (Van Wyk & De Villiers, 2014). It was proposed by March and Smith (1995) that design science be implemented in the

IS domain under the name design science research (DSR). DSR is a research methodology used to define, understand and improve aspects of IS by creating new knowledge by designing or innovating artefacts (Hevner, March, Park, & Ram, 2004). The DSR methodology addresses the problems facing people within the IS domain and is applied by undertaking a thorough investigation of the problem (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007).

DBR originated from the combined work of Brown (1992) and Collins (1992) and emerged as a research methodology. Brown (1992) referred to DBR as design experiments and described it as a way to link learning studies with instructional interventions within complex environments. Collins (1992) focused on developing a systematic methodology that could be used to conduct design experiments in a way that guides the development of artefacts, aligning them with a design theory. The term design experiments is often used interchangeably with development research (Van Wyk & De Villiers, 2014; Reeves, 2000) but to avoid confusion with experimental design and trial teaching methods, The Design-Based Research Collective (2003) chose to use the term DBR. DSR and DBR have evolved into mature research methodologies within the design science research paradigm (Figure 2-2).

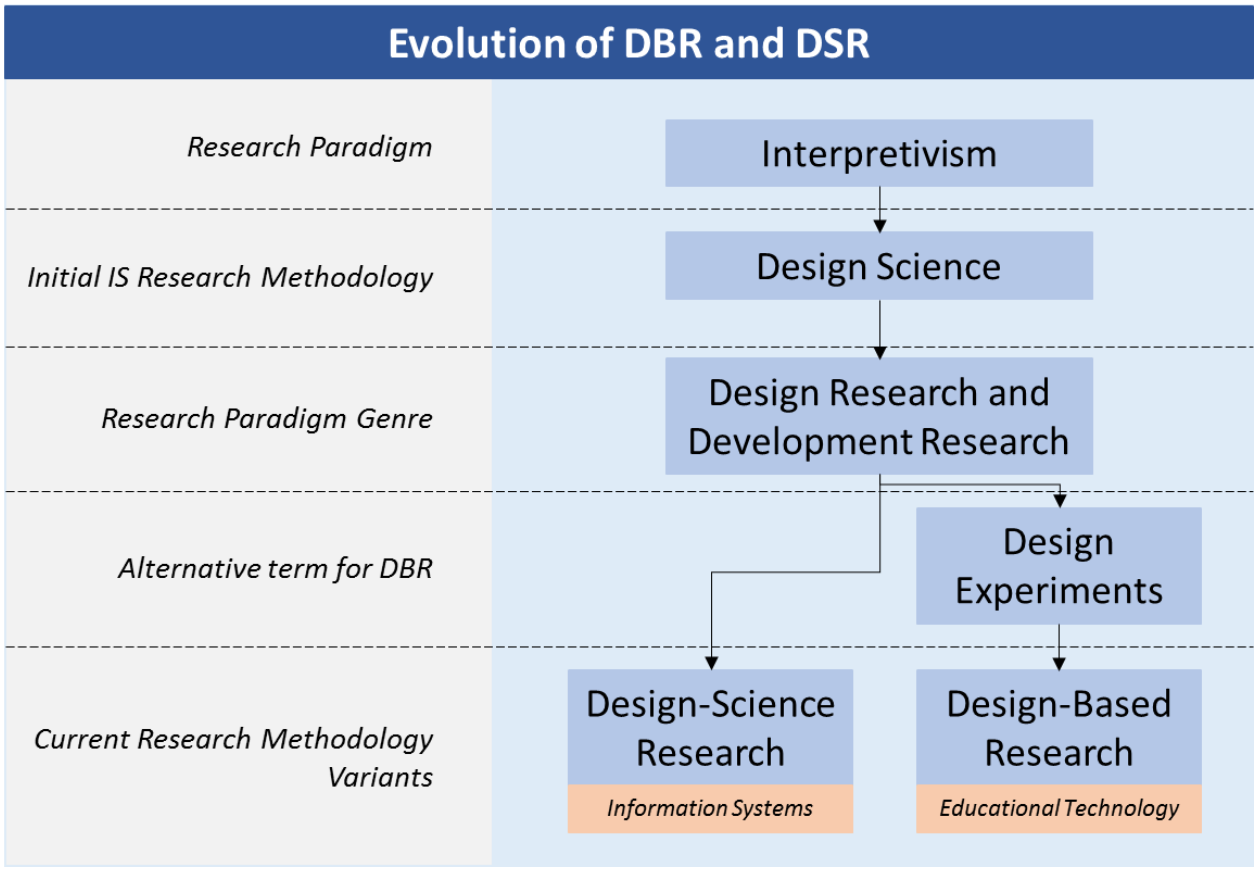

Figure 2-2: The Evolution of DSR and DBR

DSR and DBR are both suitable research methodologies for the purposes of this study due to their origins in IS and IT as well as being derived from interpretivist philosophical theories (Van Wyk & De Villiers, 2014). The nuances of both research methodologies will be explored in order to determine which is most suitable. Positivism, along with experimental research strategies, is not suitable for this research as it assumes a stable environment where data is collected by quantitative means to ensure that the researcher remains detached from respondents (Levin, 1988). The nature of this research requires rich data to be collected by quantitative and qualitative means, where the preliminary problem may be investigated by means of interviews, focus groups and surveys, and the involvement of the researcher may be required.

2.2.2 Design Science Research

DSR was first coined by March and Smith (1995) as they saw the need for real-life problems to be addressed and solved by identifying and using appropriate techniques and then evaluating them using suitable criteria. In their seminal paper, they proposed applying design science in the fields of IT and IS using the term DSR. According to March and Smith (1995), the general types of outputs produced by DSR are constructs, models, methods and instantiations. Constructs are the outputs requiring a fundamental language of concepts which are used to attach meaning to phenomena. When constructs are combined with abstract constructions used to describe tasks, situations or artefacts, the term models is used. Methods describe and represent the manner in which goal-oriented activities are accomplished. Lastly, instantiation refers to the implementation of constructs, models and methods in order to perform a certain task.

Peffers *et al.* (2007) propose that the combination of a DSR process model and prior design science research would provide a complete design science research methodology (DSRM) along with a set of DSR activities (Figure 2-3). There are six activities of DSR which are executed iteratively in a defined sequence and the outputs of some activities serve as inputs to other activities. The six DSR activities focus on theoretical components as well as applied problems:

- **Activity 1: Problem identification and motivation:** Conceptually define the problem to be addressed by the study and justify the value of a solution so that the reasoning of pursuing the solution can be motivated.
- **Activity 2: Define the objectives for a solution:** From the analysis of the problem and the proposed solution, the goals related to the solution to the problem should be conveyed based on what is probable and viable.
- **Activity 3: Design and development:** The artefacts, such as constructs, models, methods and instantiations, are created. The artefact is conceptualised in the form of a design in which a research contribution is embedded and then the physical artefact is developed.
- **Activity 4: Demonstration:** The developed artefact is shown to solve one or more instances of the specified problem in context. This activity requires the knowledge of how to use the artefact to solve the problem at hand.
- **Activity 5: Evaluation:** The extent to which the artefact supports the solution to the problem is observed and measured in this activity. The objectives for the solution stated in Activity 2 are compared to the measured results of testing the use of the artefact in Activity 4. The evaluation can take many forms, depending on the nature of the study and the artefact. Once this activity has been completed, the researcher can choose whether or not it is necessary to iterate back to Activity 3 in order to improve the artefact or to progress to the final activity.
- **Activity 6. Communication:** A reflection of the process is discussed based on the problem, its importance, the artefact's utility and novelty, the rigor of its design and lastly, its effectiveness and usefulness to others. The resulting knowledge gained from this process is conveyed in scholarly journals and professional vehicles.

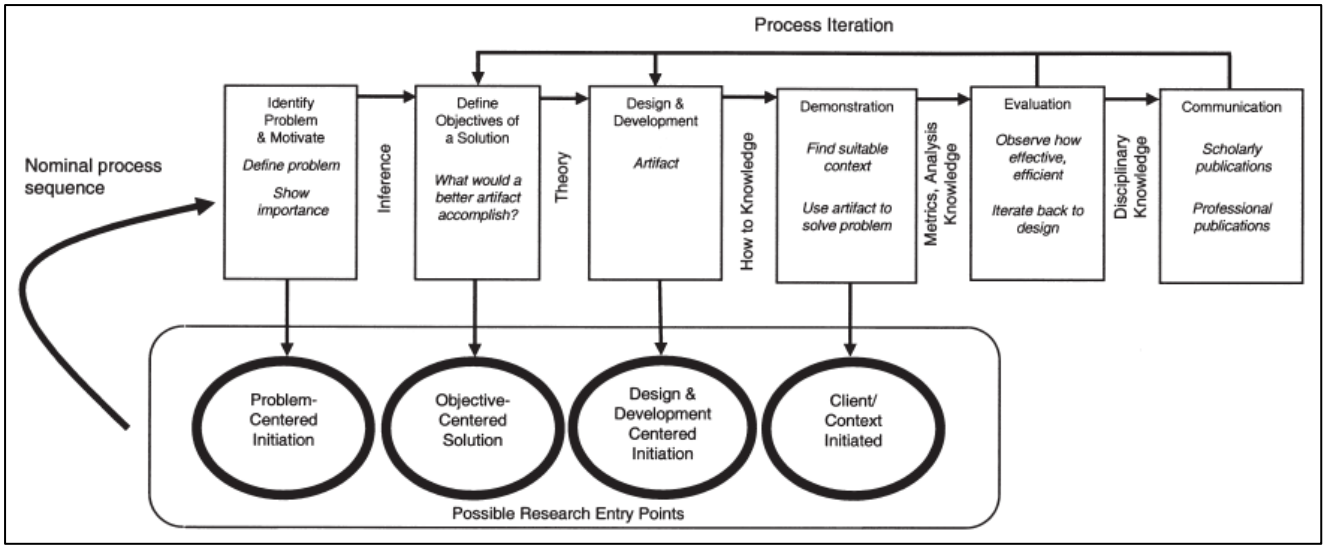

Figure 2-3: Six Activities of DSRM Process Model (Peffers *et al*., 2007, p. 54)

The main focus of DSR is to construct and evaluate new and improved artefacts as solutions for real-world problems and to generate new knowledge for the body of scientific evidence (Adikari, Campbell, & McDonald, 2011). DSR can lead to the development of theory but there is no consensus as to whether theory is a required output (Van Wyk & De Villiers, 2014).

2.3 Comparison of Design Science Research and Design-Based Research

DBR is considered to be more process-oriented and context-sensitive compared with other research methodologies (Jen, Moon, & Samarapungavan, 2015). DBR and DSR are both practical research methodologies and recognise the need to reflect on the nature and role of theory (De Villiers & Harpur, 2013). The two research methodologies also embody iteration and rigour in cycles of design, evaluation and testing for refinement. However, there are noticeable differences in these two methodologies concerning their goals, features and processes (Table 2-1). DSR was founded in the engineering discipline and focuses on the design and development of innovative artefacts that solve complex problems. Alternatively, DBR has roots in various disciplines and requires dual outcomes consisting of a practical and theoretical contribution. DSR is suitable for studies in the IS field whereas DBR instils the need for practical application within educational institutions such as universities and companies with training facilities.

Table 2-1: The Comparison and Summary of DBR and DSR (De Villiers & Harpur, 2013, p. 259)

	Design science research (DSR) in IS	Design-based research (DBR) in educational technology
Goals and ethos	Design of new man-made artefacts to solve complex problems: constructs, models, methods, instantiations. Problem-solving via invention, evaluation, measurement, and impact studies. Work based on existing design theories. Generic process models and methodologies are proposed. Communication to academics and professionals.	*Dual outcomes of each study* *Practical outcome:* Implementation of novel educational-technology solutions in complex situations. New products and practices in real-world settings. *Theoretical/scientific outcome:* Development/extension of models and contextual design theories/design principles. Design principles shared with practitioners and designers.
	Both are pragmatic, approaching design from a practical perspective. DBR does so as a primary consideration. Both contribute to knowledge, but it is not an integral requirement that each DSR study should make a theoretical contribution. Both reflect on the nature and role of theory.	
Distinct features	Rooted in engineering approaches. Problems in ill-defined, complex areas, approached by creativity and teamwork. Solutions appropriate to the environment. Use of novel artefacts to change real-world states. 'Satisficing' findings, obtaining satisfactory solutions but sacrificing exhaustive search.	Rigorous and reflective analysis of real problems in education or training. Multi-disciplinary expertise. 'Design experiments' that result in innovative designs and prototypes, as well as theoretical outputs. Contextually-sensitive approach.
Processes	'Design' relating to both products and processes. *Products:* complete systems and building blocks, i.e. constructs, models, methods and instantiations. *Processes:* complementary activities of construction-in-context and cyclic evaluation in which criteria and metrics are developed in context.	Convergence of research, design and feedback. Continuous cycles of analysis, design, development, enactment, evaluation and redesign. Pragmatic inquiry, evidence-based claims, validation by use. Interpretive paradigm, qualitative studies and mixed methods.
	NB Both have iterative cycles of design, rigorous evaluation/testing and refinement	
	IS traditionally took positivist stances, but is tending to employ interpretive paradigms as well.	DBR methodologies and frameworks apply interpretive paradigms, qualitative studies and mixed methods research.

2.4 Motivation for a Design-Based Research Methodology

Although DSR could be a viable choice for this study, DBR is deemed more appropriate because of its mandatory production of dual-based outcomes which are theory and solutions to problems that are contextualised (Amiel & Reeves, 2008; Wang & Hannafin, 2005). Educational technology is considered a subset of IS and DBR is increasingly used for studies in educational technology, making it a more appropriate fit for this study. In this study, the DBR methodology will be applied and followed. DBR is being used more often in recent studies revolving around educational technology, especially in the fields of e-learning and online training (De Villiers, 2012). DBR was chosen as the most suitable research methodology for

this study because it requires the production of theory and solutions to problems in real-life contexts (Van Wyk & De Villiers, 2014). DBR allows researchers to focus on solving intricate problems, producing genuine artefacts and generating dual outcomes which is another motivation for adopting DBR in this study.

The ethos of DBR is for researchers to work in collaboration with participants to manage research activities and to design and implement interventions so that initial designs can be refined and improved where pragmatic and theoretical factors affecting practice are controlled (Wang & Hannafin, 2005). DBR can be considered a hybrid of methodologies as it requires researchers to take the roles of both designer and researcher where methods and standards are drawn from both fields. The distinctions between the roles of designer, researcher and participant may be blurred in DBR (Bannan-Ritland, 2003) but when following this research methodology, the researcher 1) manages and controls the design phase, 2) nourishes the relationship with practitioners so that results are pragmatically aligned as well as theoretical and 3) their understanding of the research context is developed (Cobb, Confrey, DiSessa, Lehrer, & Schauble, 2003). Observable, scalable and concurrent improvements in research, theory and practice are evident when applying DBR to research studies.

Wang and Hannafin (2005) claim that DBR is a suitable fit for the research and design of Technology-Enhanced Learning Environments (TELEs) because it can guide designers of these environments whilst simultaneously producing practical and sharable knowledge. TELEs are technologically-oriented learning and instructional systems where students have access to the support of teachers, learning-support tools and technological learning resources. DBR has been utilised successfully in various TELEs and aims to intensify the impact, knowledge transfer and interpretation of education research for enhanced practices.

2.5 Design-Based Research Approaches and Characteristics

A generic DBR process model, synthesised from literature by De Villiers and Harpur (2013), illustrates the iterative nature of the research methodology and how the progression is made from the complex problem on the left to the proposed solution on the right (Figure 2-4). An early DBR process model incorporates features of the classic ADDIE model which are: analyse, design, develop, implement and evaluate (Molenda, 2003). The need for rigour is emphasised in the DBR process as well as the contextualisation of all components. Innovation is used in a practical approach to solving the unique problem identified. A synergy between practice and theory and between design and research should be evident.

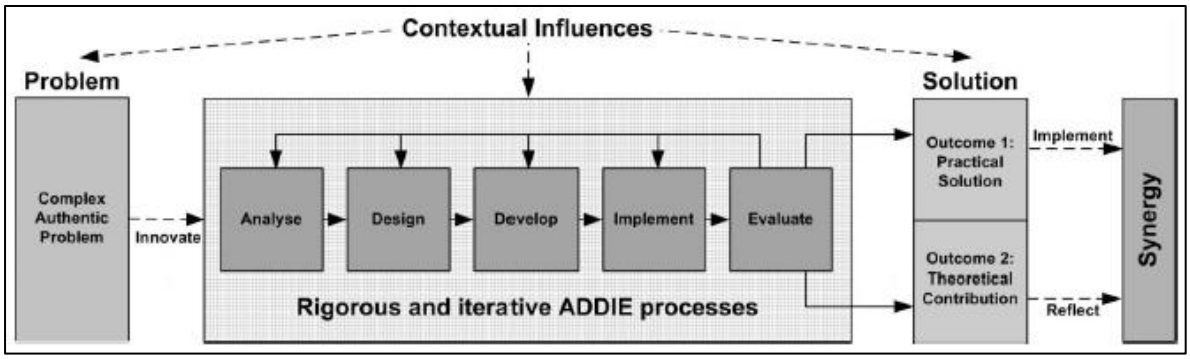

Figure 2-4: Generic Model of DBR (De Villiers & Harpur, 2013, p. 256)

DBR systematically refines the artefact in iterations whilst also producing a set of design principles that can be used by researchers involved in similar studies (Amiel & Reeves, 2008). It is suggested that in order to maintain strong ties with industry practice, researchers negotiate research goals with practitioners in the beginning of DBR. Amiel and Reeves (2008) describe DBR as comprising of the following:

- Practical, real-life problems are analysed by researchers in collaboration with practitioners;
- Solutions are developed in line with existing design principles and technological innovations;
- Testing and the refinement of solutions in practice are conducted in the form of iterative cycles; and
- Reflection on the entire DBR process to produce generic design principles and to enhance the implementation of the solution.

There are a number of characteristics of DBR that have been identified by various authors (Amiel & Reeves, 2008; Barab & Squire, 2004; De Villiers, 2012; Wang & Hannafin, 2005). The characteristics of DBR can be summarised as:

- **Artefacts** – Genuine artefacts are developed to pragmatically intervene in a functioning environment;
- **Contextualisation** – The setting of the artefact should be documented, regardless of its success or failure and the artefact should be responsive to emergent features of its setting;
- **Dual outcomes** – Both a practical and a theoretical contribution is made in the form of an innovative artefact or intervention and a set of design principles or guidelines;
- **Grounding and intricate problems** – Significant results are generated in complex learning environments in real-world contexts based on learning theories;
- **Innovative** – Unique methods in the form of existing design methods and technological advances are used to generate solutions to intricate problems;
- **Integration** – DBR utilises hybrid research methods, data from several sources and an integration of design principles with modern technology;
- **Iteration, reflection and flexibility** – The continuous refinement of design interventions is conducted by revisiting the DBR phases;
- **Pragmatic and theoretical approaches** – DBR is challenged with improving practices by extending existing theories and refining design principles;
- **Solution-based and problem-focused** – DBR addresses problems in tangible contexts by using designs based on theory and new technology;
- **Synergy** – Design and research work hand-in-hand to advance concurrently and theory and practice work in the same way;
- **Transferability** – DBR aims to produce solutions to real-world problems that can be applied to and reused in a different setting; and
- **Collaborative and transparent communication** – Designers, practitioners, participants and researchers work together in a communication-oriented setting to collectively impact decision-making in the DBR phases.

DBR has been critiqued in various publications but most notable is the challenge identified by Barab and Squire (2004) involving the questionable viability of assertions made by researchers

who are intimately involved in a pedagogical approach. It has been argued that such inside knowledge adds as much as it detracts from the research validity (Anderson & Shattuck, 2012). It is also the responsibility of the researcher to convince readers of the credibility of the claims being made (Barab & Squire, 2004).

2.6 Application of the Design-Based Research Methodology

Van Wyk and De Villiers' (2014) DBR process model improves upon Amiel and Reeves' (2008) original process model of DBR and emphasises the outcomes of each phase (Figure 2-5). The classic DBR process model is extended by giving researchers more flexibility by not making it obligatory for solutions to be based on existing knowledge bases (Van Wyk & De Villiers, 2014). The amended DBR process model explicitly specifies the outcomes associated with each phase. Provision is made in the new process model for the extension of novel theoretical contributions that inform future design and evaluation phases in pragmatic real-life settings. The DBR process model proposed by Van Wyk and De Villiers (2014) is adopted in this study (Figure 2-6).

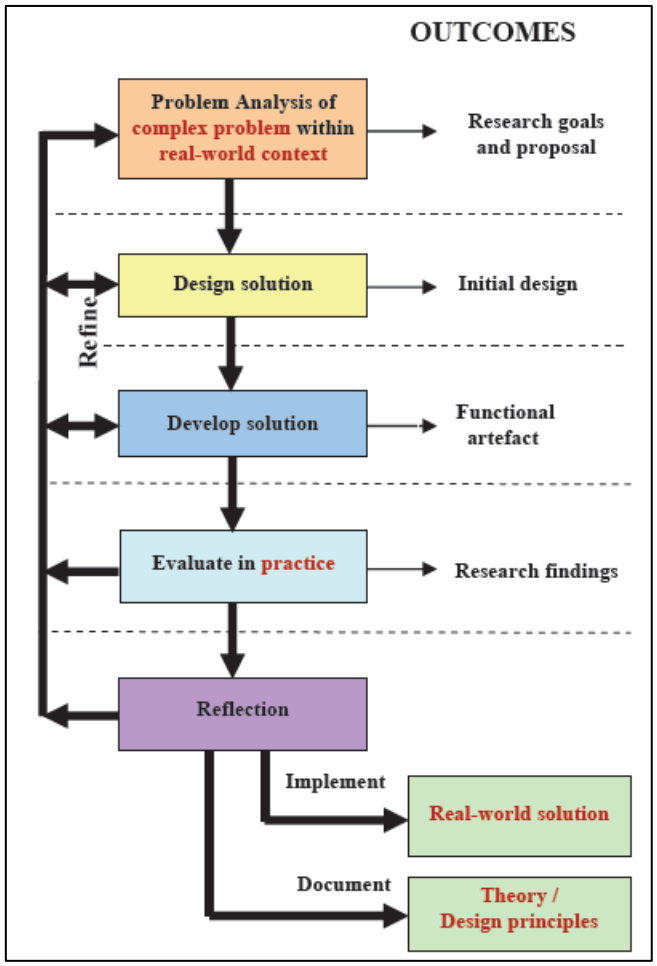

Figure 2-5: The new DBR Process Model (Van Wyk & De Villiers, 2014, p. 74)

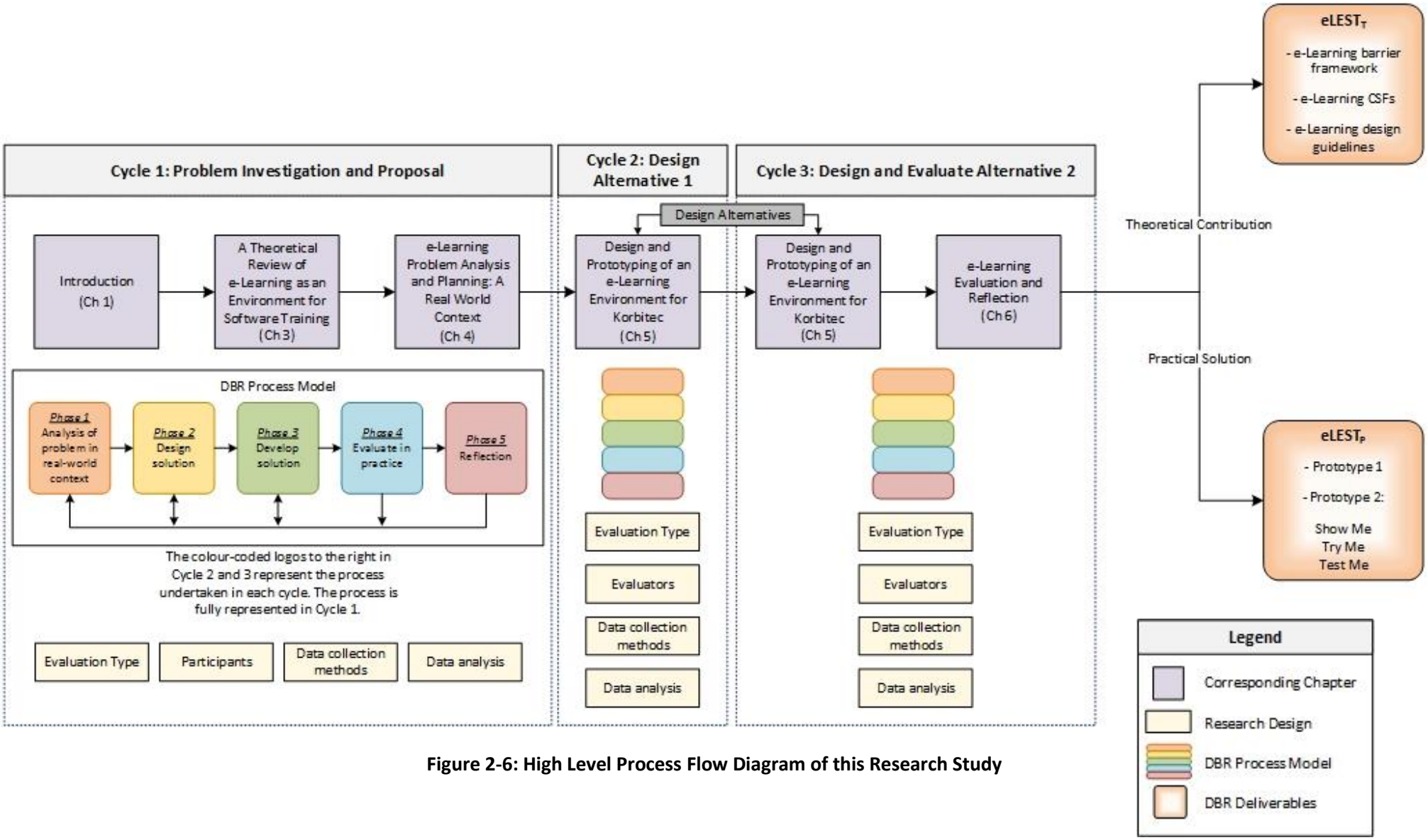

Figure 2-6: High Level Process Flow Diagram of this Research Study

An initial plan for DBR in this study identified the DBR outcomes (Figure 1-2). DBR Cycle 1 of this study entails the literature review as well as the focus group and survey research strategies and is referred to as *Problem Investigation and Proposal* for the purposes of this study. DBR Cycle 2 is the analysis of the first design alternative for the Practical e-Learning Environment for Software Training ($eLEST_P$), namely Prototype 1 and is referred to as *Design Alternative 1*. It was decided that the pre-existing version of the KOTW before the commencement of this study would be used as Prototype 1 in order to determine the flaws in the existing environment.

DBR Cycle 3 involves the design and prototyping of Prototype 2, which is the e-learning components for the Practical e-Learning Environment for Software Training ($eLEST_P$), as well as the evaluation of Prototype 2. Cycle 3 is referred to as *Design and Evaluate Alternative 2.* The improvement of Prototype 2 for $eLEST_P$ involves testing and refinement sub-cycles. The first main theoretical contribution of this study is an e-learning environment for software training and the second main practical contribution of this study is a real-world e-learning solution for software training. DBR Cycles 1, 2 and 3 contain all five phases (Figure 2-6). The DBR phases will be applied in this study as follows:

- **Phase 1:** Problem analysis in real-world context (Section 2.6.1);
- **Phase 2:** Design solution (Section 2.6.2);
- **Phase 3:** Develop solution (Section 2.6.3);
- **Phase 4:** Evaluate in practice (Section 2.6.4); and
- **Phase 5**: Reflection, leading to dual outcomes (Section 2.6.5).

2.6.1 Phase 1: Problem Analysis in Real-World Context

The ***problem analysis in a real-world context*** phase entails defining a realistic problem in a specific environment and then finding related and current literature to describe the context of the problem further and to determine the significance thereof (Van Wyk & De Villiers, 2014). Collaboration is required between the researcher and practitioner when the problem is elicited and research goals are established. In Phase 1 of this study, a comprehensive literature review will be conducted where the pedagogical principles that apply to corporate e-learning will be identified and described. A number of barriers that may hinder the use of e-learning will be examined along with the critical success factors for e-learning. The metrics that apply to the planning and measuring of e-learning project success will be investigated

and described. The requirements of e-learning components related to design will be investigated, leading to the exploration of the design, prototyping and evaluation of e-learning components in this phase.

In Phase 1, the problem will be motivated and explored in a given context by making use of a case study research strategy in conjunction with DBR. Data collection will take place from conducting interviews (Section 4.2.1), a focus group (Section 4.4) and a survey (Section 4.5). The data gathered in this phase will provide an understanding of the case-specific considerations and guidelines for an e-learning environment. This strategy can be described as contextualising a phenomenon which is usually based on inductive reasoning and highlights the reader's understanding of the phenomenon being focused on (White, Drew, & Hay, 2009; Willis, 2007). According to Willis (2007), a case study research strategy can be used to gather detailed data in authentic settings. Case study research also enables the understanding of human behaviour which can be interpreted contextually as lived experience. In line with DBR, the outcome of the first phase will be a comprehensive research proposal in which the research questions and objectives will be detailed.

2.6.2 Phase 2: Design Solution

The phase of ***designing a solution*** uses the output of the previous DBR phase as the input to an initial design to solve the specified problem within the scope and constraints of the real-world setting according to Van Wyk and De Villiers (2014). The context of the problem identified from the literature explored in Phase 1 will provide scope limitations and requirements for the design of the solution in Phase 2.

As a part of ***Phase 2***, a case study strategy will be employed in order to contextualise the problem in a real-world setting (Willis, 2007). The case study used for this research is a single case, the KOTW (Section 4.2). The KOTW, which is the current e-learning system used by the case study before the commencement of this study, is considered to be Prototype 1. Using only one case study can be seen as a limitation but it can also be argued that a single case is sufficient (Halinen & Törnroos, 2005). In this study, the single case at Korbitec can provide detailed insight into the case study, qualitative data regarding user behaviour and the relationship between the literature and real-world context. A combination of the findings from the literature review, interviews, the focus group and survey conducted in Phase 1 will be used as the foundation upon which the *theoretical e-learning environment for software*

training ($eLEST_T$) will be designed. The design guidelines included in $eLEST_T$ will be used to design the functional artefact, which will be the practical e-learning environment for the case study.

2.6.3 Phase 3: Develop Solution

The phase of ***developing a solution*** entails the generation of an innovative and functional artefact in line with existing design principles and the research objectives specified in the initial phase (Van Wyk & De Villiers, 2014). An innovative and functional artefact, specifically the e-learning components of the *practical e-learning environment for software training* ($eLEST_P$), is developed in this phase as Prototype 2 based on the requirements of the case study. The content construction and standards, practice tasks and assessment mechanisms of Prototype 2 are described in this phase.

The software tools available to support the content authoring for software training are explored in this phase and the evaluation of the developed artefact is planned. From the investigation of relevant literature and findings that are empirically derived, the artefact is developed and described to solve the real-world problem at hand.

2.6.4 Phase 4: Evaluate in Practice

The phase of ***evaluating in practice*** stresses the importance of iterative testing and refining the artefact developed in the previous phase in a real-world setting by collecting and analysing data in order to answer research questions from the initial phase and to develop design principles (Amiel & Reeves, 2008; Van Wyk & De Villiers, 2014). Formative evaluations can be conducted to identify the difference between the current artefact and the ideal artefact which assists designers in refining designs to better meet the goals of users (The Design-Based Research Collective, 2003; Van Wyk & De Villiers, 2014). Subsequently, a summative evaluation can be conducted in order to identify the outcomes of the artefact within a given context (The Design-Based Research Collective, 2003). DBR is not focused on perfecting an artefact and concerns the inquiry into the broad nature of learning in a complex system and to refine procreative or predictive theories of learning. The proposed practical artefact, namely $eLEST_P$, is analysed and evaluated by a set of participants from the case study in order to determine the success of the environment. The data that is collected is qualitative so as to ensure a rich understanding of participants' opinions of the artefact and the data is interpreted. The evaluation phase of this study adheres to DBR Phase 4 in order to produce

results related to the quality and success of $eLEST_P$, based on a real-world problem in practice at the case study of Korbitec.

2.6.5 Phase 5: Reflection, Leading to Dual Outcomes

The last phase, ***reflection and dual outcomes***, involves undertaking a practical and theoretical reflection in the form of an iterative design-reflection-design cycle and there is a focus on a dual contribution of the study (Van Wyk & De Villiers, 2014). The phase of reflection ensures the documentation of the design principles so that a knowledge transfer can be made to similar settings of research in order to generate new theories. The contribution of studies following DBR must be two-fold: 1) an artefact is implemented to solve an identified real-word problem, and 2) a set of design principles and/or theories is proposed which can be used to guide similar research and implementations. To conclude this research, the findings of this study, comprising the final $eLEST_P$ consisting of the improved e-learning components, certification procedures and best practice adherence as well as recommendations for future research, are conveyed in detail.

2.7 Summary

DBR can be deemed an appropriate and well-substantiated choice for this research study for numerous reasons. DBR not only increases the relevance of research output but it also guides the development of empirically grounded theoretical contributions and has a significant impact on design practice. A primary goal of this research methodology is to address a complex educationally-geared problem identified by the analysis of substantiated sources. Since DBR is well-suited for IS projects focused on educational technology projects, it is a fitting choice to be employed. The DBR guidelines and phases are therefore to be followed and implemented throughout this research study. The following chapter will discuss the review of literature applicable to the study. This chapter identified the three cycles of this study. Mixed methods will be used to gather data by using a survey, interviews, a focus group and usability evaluations. The data that will be collected is of a quantitative nature (survey) and a qualitative nature (interviews, focus group and usability evaluations). The nuances of software training will be described as well as the pedagogical principles that underpin corporate e-learning. Possible barriers to e-learning must be considered as well as critical success factors for e-learning. There are a variety of e-learning components that can be

designed, prototyped and evaluated in e-learning environments for software training, of which some can be of an interactive nature.

Chapter 3. A Theoretical Review of e-Learning as an Environment for Software Training

3.1 Introduction

Cycle 1: *Problem Investigation and Proposal* of this study warrants the need to conduct a literature review in order to analyse the problem within a real-world context. This chapter reports on a thorough review of literature in order to describe the background of the problem to be addressed by this study. An e-learning environment for software training ($eLEST_T$) is proposed based on the literature reviewed. The layout, research objectives and deliverables of the chapter are illustrated in Figure 3-1. The following research questions (Section 1.4) are either fully or partially answered in this chapter:

RQ_1: What are the critical success factors for e-learning environments?

RQ_2: What are the barriers affecting the adoption of e-learning?

RQ_4: Which e-learning process can be used for developing a best practice e-learning environment for software training?

Before designing an e-learning environment, it is important to investigate guidelines in literature regarding software training and corporate e-learning (Section 3.2). e-Learning in the workplace should have a strong grounding in pedagogical principles related to learning in the workplace (Section 3.3). It is imperative that organisations identify the barriers that may hinder learners from using e-learning if it is to be successful (Section 3.4). In order to increase e-learning usage, several critical success factors are investigated (Section 3.5). Planning and measuring the success of projects related to e-learning is an important part of establishing whether e-learning is useful for all of the users involved (Section 3.6). There are a variety of e-learning components that can be incorporated into e-learning projects (Section 3.7). Interaction design is important for e-learning projects that are of an iterative nature (Section 3.8). The design requirements for e-learning must be identified to ensure that all user and stakeholder expectations are met (Section 3.9). The design, prototyping and evaluating of e-learning components is completed after requirements are elicited (Section 3.10). This study proposes an e-learning environment that can be implemented in software training contexts,

based on the literature explored (Section 3.11). A number of conclusions can be made from the theory presented (Section 3.12).

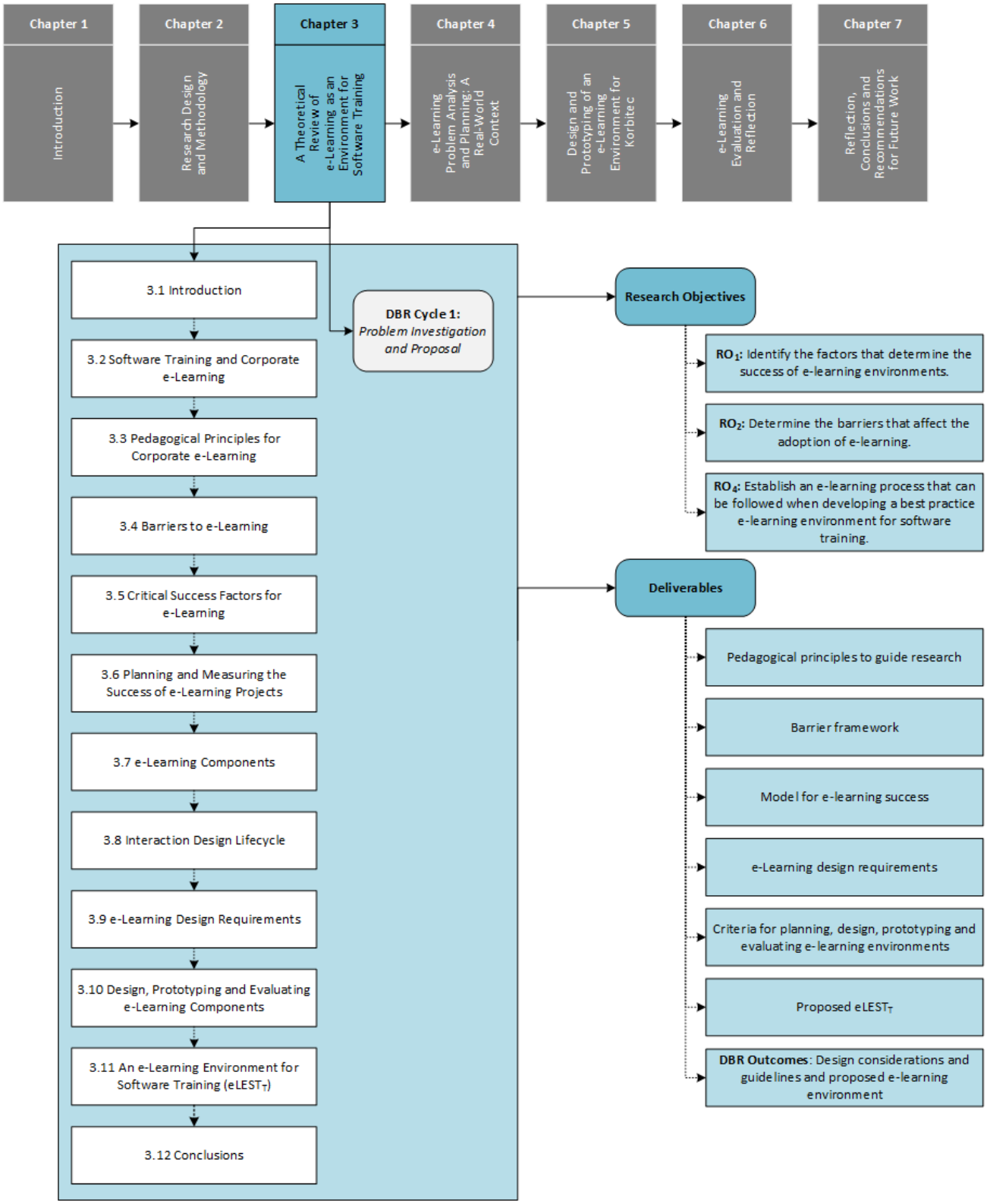

Figure 3-1: Chapter 3 Layout and Deliverables

3.2 Software Training and Corporate e-Learning

There are three modes of workplace training that have been identified and these modes can occur at different times or concurrently (Eraut *et al*., 1998; Marsick & Watkins, 1990; Tynjälä & Häkkinen, 2005). They are:

- Incidental and informal training being conducted as a result of work requirements;
- Intentional and informal training activities related to work such as mentoring or practising specific skills or tool usage; and
- Formal on-the-job and off-the-job training.

Within the three modes of workplace training, specifically training in software products, there are four types of software users identified by Chin (1986) and these are: novice users, beginner users, intermediate users and expert users. Novice users can be described as knowing very few simple facts regarding the command of computers and beginner users know most simple facts as well as a few mundane facts. Intermediate software users know all simple and most mundane facts, and also a few complex facts or commands whereas expert users know all simple, mundane and most complex facts. Barfield (1986) takes a different approach to describing user types by differentiating between experts and non-experts. The non-expert user type is made up of naïve, novice and intermediate users.

Users of e-Learning systems consider e-learning to be an attractive complement or even an alternative to traditional training methods in the workplace (Raymond, Uwizeyemungu, Bergeron, & Gauvin, 2012). The corporate environment is increasingly recognising the benefits of using e-learning to provide cost-effective online learning and training for employees (Karaali, Gumussoy, & Calisir, 2011; Chiu & Wang, 2008; Heričko, Pušnik, & Šumak, 2011). Employees can contribute to sustainable advantages for companies in terms of their skills, expertise and readiness to work (Hart, Lenihan, & McGuirk, 2014). There is a fundamental need for companies to increase the level of training and knowledge amongst employees because it is evident that education increases the capacity to innovate and fosters the adoption of new technologies (Gallié & Legros, 2012; Hart *et al*., 2014). Innovation is fostered with the implementation of e-learning because organisations can provide new ways of offering educational and training programs (Zhang *et al*., 2010).

e-Learning technologies can be made available in the workplace, however, benefits cannot be realised by companies if the adoption levels of employees are low (Yoo & Huang, 2015). The way in which e-learning is conceptualised, designed and utilised has been said to be substantially influenced by organisational culture and context (Czerniewicz & Brown, 2009; Tarhini, Hone, & Liu, 2013; Tarhini, Hone, Liu, & Tarhini, 2016). A learning organisation can be described as one which fosters the sharing of knowledge and the delivery of opportunities for growth at individual and organisational levels. The fostering of a learning organisation can be driven through the implementation of e-learning and can cultivate an organisational culture which is founded on knowledge-sharing ideologies. The establishment of policies and organisational-specific criteria related to the allocation of goals, values and resources can contribute to successful e-learning institutional adoption (Czerniewicz & Brown, 2009). The strategic positioning of e-learning must be aligned with the learning and employee development policies of the company (Yoo & Huang, 2015). When e-learning is implemented in the workplace, there is a need for e-learning content to be consistent with the brand image which can be maintained with the introduction of standards for e-learning content (Czerniewicz & Brown, 2009). The intended learner's profile in terms of gender, age and level of computer skill must be considered when designing e-learning components for the workplace (Al-Qahtani, Al-Qahtani, & Al-Misehal, 2013).

3.3 Pedagogical Principles for Corporate e-Learning

It is important to define the roles related to the use of e-learning so that the associated responsibilities are made clear (Section 3.3.1). There are three dimensions of e-learning that need to be considered when designing an e-learning environment (Section 3.3.2). Once the pedagogy behind the tools and technology is understood, the pedagogy can be enriched with technology, such as assessment-centred training (Section 3.3.3). There are several underlying theories and assumptions that also need to be considered (Section 3.3.4).

3.3.1 Roles in e-Learning

Specific to the field of e-learning, Chikh and Berkani (2010) defined two categories of user roles, namely the support members and the learner members. Support members are responsible for the continuous and successful functioning of e-learning and learner members

contribute to the realisation of the current learning activities of e-learning. The sub-roles of support members are:

- **The coordinator:** identifies significant issues, evaluates the success of the e-learning environment and provides general supervision.
- **The moderator:** guides the users and animates the learning process to make it more attractive.
- **The manager:** helps to constantly improve the management of e-learning users and resources.
- **The reporter:** is responsible for gathering relevant knowledge from the e-learning environment and summarising the results of discussions.
- **The administrator:** maintains the technical environment that supports e-learning and helps users to use it.

The sub-roles of learner members are:

- **The consumer:** represents the role which triggers interaction by asking a question, stating a problem, or requiring explanations.
- **The provider:** responds to the consumer in order to find an answer by formulating the problem differently, giving some hints or directly providing the solution.

3.3.2 Dimensions for Software Training in e-Learning Environments

The terms *pedagogy* and *learning strategies* are used interchangeably and can directly affect and influence the tools and technologies that are chosen and used in e-learning (Kushnir & Berry, 2014). Due to the fact that pedagogy has a strong influence, e-learning initiatives should be built on a strong pedagogical foundation so that learning activities can be aligned with productive learning. Learning activities incorporated into e-learning can be structured by grouping related activities in units of study (Siqueira, Braz & Melo, 2007). Organisations must consider the arrangement of e-learning and how various e-learning components will be organised within the system. By structuring e-learning according to the three distinct dimensions in an e-learning environment envisioned by Siqueira *et al.* (2007), organisations can improve the quality of e-learning material as well as the ability for users to meet learning objectives. In the context of this study, the three dimensions of e-learning environments will be referred to as the CPT (content, pedagogy and technology) dimensions based on the

dimensions proposed by Siqueira *et al*. (2007). The principle behind the CPT dimensions is that pedagogy influences the content and the technology dimensions chosen for the e-learning environment (Figure 3-2).

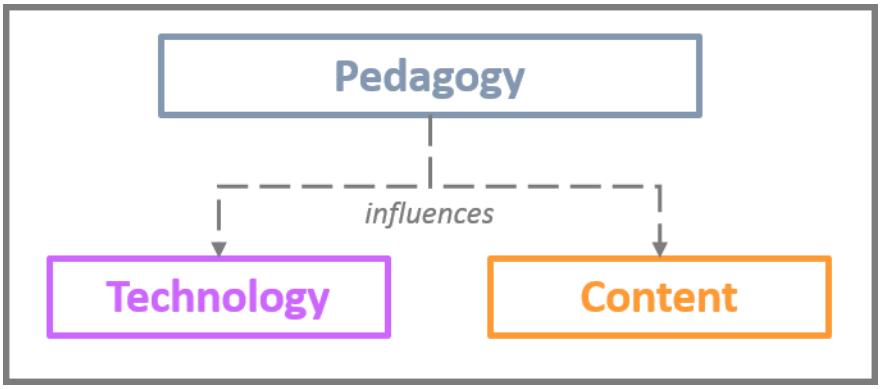

Figure 3-2: CPT Dimensions of e-Learning Environments (Adapted from Siqueira *et al*., 2007, p. 140)

3.3.3 Assessment-Centred Training

The process of assessing the knowledge gained by learners after interacting with an e-learning environment is important for the achievement of desired learning goals (Zlatovic, Balaban, & Kermek, 2015). Online knowledge assessments play an important role in e-learning (Macdonald, 2004; Zlatovic *et al*., 2015) and entail:

- Quantifying learners' knowledge;
- Stimulating the learning process in critical subject areas with demanding content; and
- Assisting in the continuing development of required skills.

The most popular online knowledge assessment method of practical applications is multiple-choice questions, according to Kim, Smith and Maeng (2008). Multiple-choice questions are easy to implement and measure lower levels of cognitive skills such as memory, reproduction and understanding as opposed to higher levels of cognitive skills such as analysis, synthesis and evaluation (Kim *et al*., 2008; Zlatovic *et al*., 2015). Online knowledge assessment reduces the workload of trainers and achieves the standardisation and impartiality required in examination settings (Shan, Huang, & Li, 2010).

Vocational and education training (VET) is a method used to prepare people for industry as well as to develop the skills of employees in order to respond to labour market needs (Petnuchova *et al*., 2012). The requirement for employees and customers to develop key competencies to meet the changing demands of industry has warranted the need for the introduction of competency-based training (CBT) in VET. CBT in the learning process is key to

VET and refers to the output of the educational training and experience, rather than a natural human attribute, such as intelligence (Gipps & Stobart, 2003; Mansfield, 1989; Rahman, Hanafi, Mukhtar, & Ahmad, 2014).

Certification can be utilised in the process of CBT as an indicator of an individual skill set (Coelho, 2010). In the IT industry, certification can signal to hiring managers that a job applicant has achieved a level of knowledge and the skill set necessary to perform a particular IT job role. The findings of a study done by Cegielski (2004) indicated that hiring managers placed greater emphasis on certifications when hiring for IT-related positions. Certification is especially considered important if the success of such courses largely depends on self-paced learning efforts as a result of personal investment as the motivating factor for learning and not as a result of corporate learning policy (Candy, 1991; Coelho, 2010).

3.3.4 Theories and Assumptions for Learning

According to Tajfel's **social identity theory**, it is reasonable to presume that professional training enables positive social identity dispositions and a satisfactory self-image (Tajfel & Turner, 1986). According to Tajfel and Turner (1986), the social identity theory can be explained as the extent to which a person identifies with a sense of belonging in a group situation. A higher social identity means that a person will better follow the norms of the group and behave in a way that reflects the group image due to a perceived feeling of group membership (Cheung, Chiu, & Lee, 2011; Chu & Chen, 2016; Riley & Burke, 1995).

Self-determination theory distinguishes between two types of motivation which can be associated with CBT, namely extrinsic and intrinsic motivation (Ryan & Deci, 2000). Extrinsic motivation relates to the will to do something based on the promise of a separable outcome, such as a reward in the form of money, a certificate or verbal feedback such as praise (Deci, Koestner, & Ryan, 1999) or through threat of punishment (Pee & Lee, 2015). Intrinsic motivation represents the pursuit of an activity due to a genuine interest or enjoyment associated with the activity (Deci *et al*., 1999). Both extrinsic and intrinsic motivation promote performance improvements, but only the latter has been associated with an improvement in psychological wellbeing and successfully meeting learning objectives (Mekler, Brühlmann, Tuch, & Opwis, 2015; Ryan & Deci, 2000). Although both intrinsic and extrinsic motivation have been found to have significant effects, intrinsic motivation is believed to have a stronger and more sustainable outcome whereas extrinsic motivation prompts temporary compliance

from employees which meets the minimum required learning outcomes (Bock, Zmud, Kim, & Lee, 2005; Gagné, 2009; Pee & Lee, 2015; Wei, Liu, & Calabrese, 2010).

According to Deci *et al.* (1999), Mekler *et al.* (2015) and Ryan and Deci (2000), a sub-theory of self-determination theory, namely **cognitive evaluation theory**, details how the effects of extrinsic rewards on intrinsic motivation are determined by a person's perception of these occurrences as informational or controlling (Figure 3-3). This perception determines how these occurrences influence the inherent psychological needs for competence and autonomy.

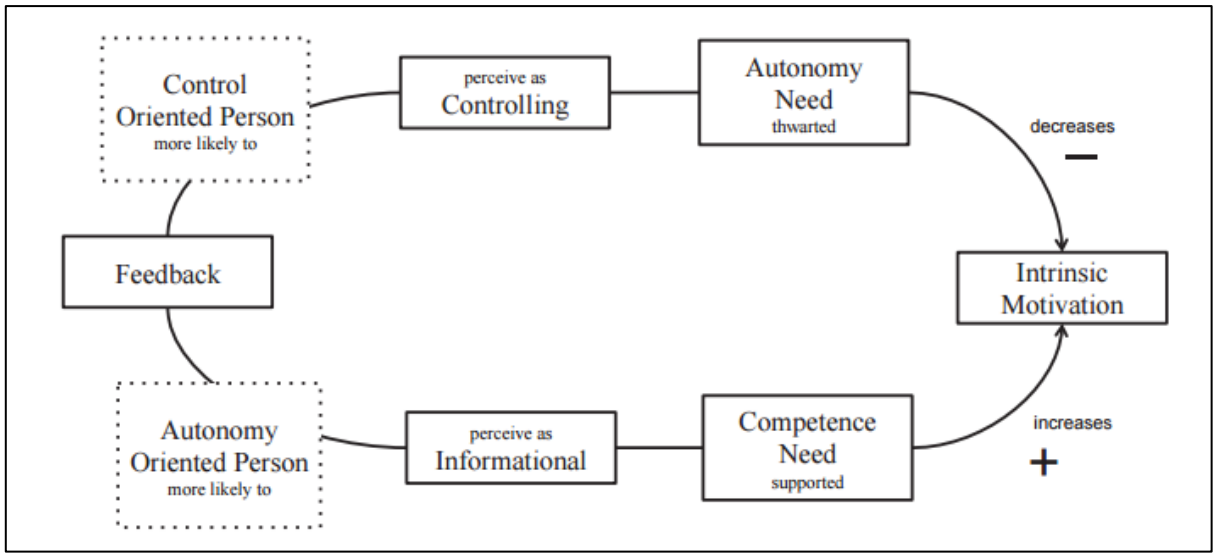

Figure 3-3: The Effects of Extrinsic Rewards on Intrinsic Motivation (Mekler *et al*., 2015, p. 3)

The perceived extent to which one's own actions cause the desired consequences in an environment is referred to as competence and thrives when met with positive feedback which is considered informational (Ryan & Deci, 2000). One's feelings of competence, namely self-efficacy, will not increase intrinsic motivation unless accompanied by the feeling of autonomy where one experiences one's behaviour as self-determined as opposed to controlled by an external source. If perceived as controlling, even positive feedback may thwart people's inherent need for autonomy and will therefore decrease intrinsic motivation, whereas feedback that is perceived as both non-controlling and informational, supports the need for competence and consequently enhances their intrinsic motivation (Deci *et al*., 1999). Although there are multiple reasons for learner motivation, there are also a variety of issues that can hinder the success of e-learning initiatives and cause barriers to learning.

3.4 Barriers to e-Learning[1]

Many factors may impact the ability of learners to gain value from e-learning and can cause damage to the learning process (May *et al*., 2012). The barriers associated with e-learning failure must be identified before embarking on such initiatives. There are excessive costs that can be linked to e-learning failures including time wasted, development costs of e-learning material as well as monetary expenses which can be avoided by being aware of the barriers leading to the failure of e-learning (Akaslan *et al.*, 2012). May *et al.* (2012) identified that the use of technology can cause security and privacy concerns for learners. Due to the fact that e-learning systems need to track learners' activities and outputs, there is the opportunity for the information to be exploited and used for purposes other than what learners intended it to be used for. Learners who have doubts about the security and privacy of their information may be deterred from using the e-learning system. Organisations should ensure that learners are informed of any tracking mechanisms when accessing e-learning platforms and that learners should approve of such tracking on the system.

Insufficient infrastructure and a lack of social and cultural interaction are seen as barriers to the success of e-learning initiatives and may hamper the ability of organisations to benefit from e-learning (Akaslan *et al.,* 2012). It has also been noted that learners feel isolated and disheartened about their studies without F2F interaction. Alzahrani and Ghinea (2012) stressed the importance of prompt feedback for learners due to the fact that e-learning prevents learners from having access to tutors, academic staff, career advisors and technical help.

Atanda and Ahlan (2014) focused on the barriers affecting the success of e-learning in developing countries from a Nigerian perspective. Infrastructure issues are prominent in developing countries such as the prominence of the Digital Divide where there is one group of people with access to technology and another group with no access to technology. Other factors affecting e-learning success in developing countries are fluctuating and unreliable electricity supply; computer ownership and availability; Internet access and Internet

[1] The results reported on in this section were obtained from research that was published as a full double-blind peer-reviewed conference paper at the International Development Informatics Association (IDIA) in November 2015. Esterhuyse, M & Scholtz, B. Barriers to e-Learning in a Developing Country: An Explorative Study. IDIA Conference. Zanzibar, Tanzania. **(Appendix B)**

experience in terms of the frequency of Internet usage by the learner as well as the computer competency of the learner. Implementing organisations in developing countries may have a lack of implementation expertise, a sole focus on technology and once-off funding with limited continued support, according to Gewald and Jacob (2013).

Stoffregen, Pawlowski and Pirkkalainen (2015) developed a barrier framework for open e-learning in the public administration domain. Open e-learning makes educational resources accessible on a global scale. The e-learning barriers were classified into three dimensions namely context, social and technical barriers. The context barriers are a lack of resources; management coordination or policy; managerial culture which includes practices and structure; and the perceived technology fit. The social barriers' dimension consists of the values on the national level; values on an organisational level; individual concerns such as communication, collaboration and language issues; perceived value of information and knowledge; the quality of information; ICT skills; lack of knowledge in open e-learning; and cognitive personal backgrounds. The technical barriers are availability; interoperability; technical conceptual differences; concerns about privacy and security; perceived functionality; usability and system quality; and the Digital Divide.

A detailed literature review of e-learning barriers enabled an extended e-learning barrier framework for developing countries to be synthesised by the author of this study (Table 3-1). The e-learning barrier framework is a modified version of the framework designed by Stoffregen *et al.* (2015) and was created by replacing the context dimension with three of the sub-categories, namely **lack of resources**, **infrastructure issues** and **organisation management**. These three new dimensions were considered significantly relevant to the context of the study and the resulting framework has five dimensions. The framework can be used by universities and corporates to reduce the potential barriers to e-learning initiatives and improve the chances of a successful project. Studies that are related to developing countries have been indicated using an asterisk.

Table 3-1: Barriers to e-learning

Barrier Dimension	Barrier Category	Authors	Country	Education or Industry Focus
Lack of resources	Lack of financial support	Akaslan *et al*. (2012)	Turkey	Education
		Bere, Silvestru and Nemeş (2013)	Romania	Industry
		Gewald and Jacob (2013)	South Africa	Industry
		Gunn (2010)	New Zealand	Both
		Klobas, McGill and Renzi (2014)	Multiple	Education
		Omidinia, Masrom and Harihuddin (2011)*	Iran	Both
	e-Learning content development costs	Akaslan *et al*. (2012)	Turkey	Education
		Klobas *et al*. (2014)	Multiple	Education
	Computer ownership and availability	Atanda and Ahlan (2014)*	Nigeria	Both
		Klobas *et al*. (2014)	Multiple	Education
	Internet access	Atanda and Ahlan (2014)*	Nigeria	Both
		Bhuasiri, Xaymoungkhoun, Zo, Rho and Ciganek (2012)	Multiple	Both
		Klobas *et al*. (2014)	Multiple	Education
		Witdono (2013)*	Indonesia	Education
	Computer competency	Atanda and Ahlan (2014)*	Nigeria	Both
		Bere *et al*. (2013)	Romania	Industry
		Bhuasiri *et al*. (2012)	Multiple	Both
		Butler, Feller, Pope, Emerson and Murphy (2008)	Multiple	Both
	Fluctuating and unreliable electricity supply	Atanda and Ahlan (2014)*	Nigeria	Both
Infrastructure issues	Digital Divide	Atanda and Ahlan (2014)*	Nigeria	Both
	Insufficient infrastructure support	Akaslan *et al*. (2012)	Turkey	Education
		Bhuasiri *et al*. (2012)	Multiple	Both
Technical issues	Security and privacy concerns	Ahmed, Buragga and Ramani (2011)*	Saudi Arabia	Education
		Alias *et al.* (2012)*	Malaysia	Education
		May *et al*. (2012)	Multiple	Both
Organisation management	Lack of implementation expertise	Gewald and Jacob (2013)*	South Africa	Industry
		Omidinia *et al*. (2011)*	Iran	Both
		Talbot (2009)	United Kingdom	Education
	Exclusive technology focus	Gewald and Jacob (2013)*	South Africa	Industry
		Omidinia *et al*. (2011)*	Iran	Both
	Limited continued top management support	Sannia, Ercoli and Leo (2009)	Italy	Industry
		Gewald and Jacob (2013)*	South Africa	Industry
		Talbot (2009)	United Kingdom	Education
Social interaction	Lack of social interaction	Akaslan *et al*. (2012)	Turkey	Education
		Alzahrani and Ghinea (2012)*	Saudi Arabia	Education
		Bere *et al*. (2013)	Romania	Industry
		Sannia *et al*. (2009)	Italy	Industry
	Lack of cultural interaction	Akaslan *et al*. (2012)	Turkey	Education
		Alzahrani and Ghinea (2012)*	Saudi Arabia	Education
		Talbot (2009)	United Kingdom	Education
	Isolation and decreased motivation	Akaslan *et al*. (2012)	Turkey	Education
		Alzahrani and Ghinea (2012)*	Saudi Arabia	Education
		Bhuasiri *et al*. (2012)	Multiple	Both

The framework is thus divided into five dimensions of barriers which are: **lack of resources**, **infrastructure issues**, **technical issues**, **organisation management** and **social interaction** (Figure 3-4). The **lack of resources** dimension consists of six barriers, namely: lack of financial support; e-learning content development costs; computer ownership and availability; Internet access; computer competency of learners; and the fluctuating and unreliable electricity supply. The **infrastructure issues** dimension consists of the barriers of the Digital Divide and insufficient infrastructure support. The dimension of **technical issues** consists of the barriers of security and privacy concerns. The **organisation management** dimension consists of three barriers, namely the lack of implementation expertise, a one-directional technology focus and limited continued managerial support. Lastly, the **social barrier** dimension encompasses the barriers of lack of social interaction, the lack of cultural interaction and the isolation and decreased motivation of some learners when working using technology.

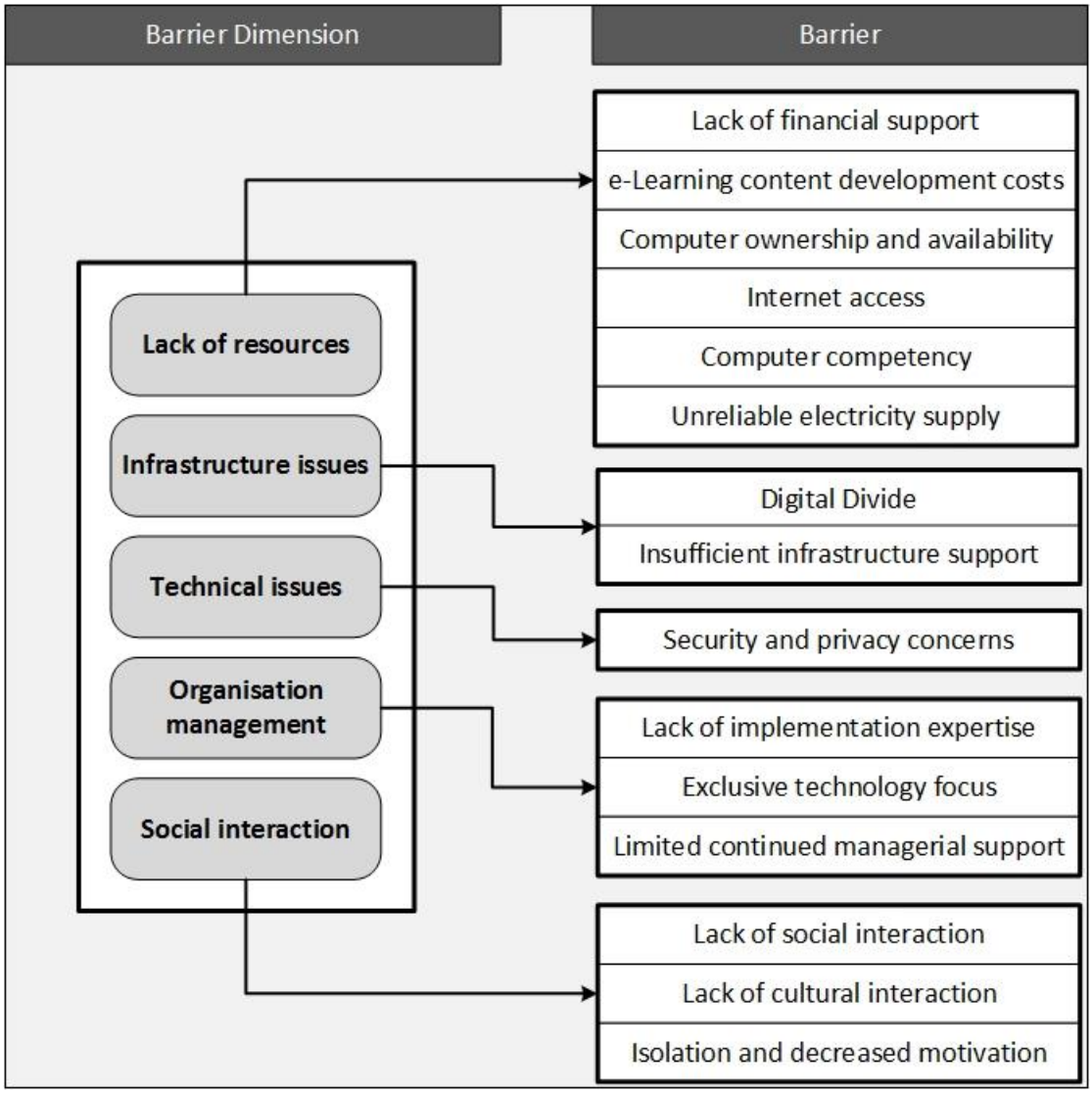

Figure 3-4: e-Learning Barrier Framework for e-Learning

3.5 Critical Success Factors for e-Learning

There are numerous advantages of e-learning including increased information accessibility, timely and on-demand content delivery, personalisation, standardisation of content and interactivity amongst others (Bhuasiri *et al*., 2012). Organisations may also realise advantages from e-learning in that there may be reductions in classroom and facilities costs, training costs, printed materials costs and labour costs. Organisations and learners using e-learning can realise these advantages by being aware of and applying factors for e-learning success (Klobas *et al*., 2014; Sun, Tsai, Finger, Chen, & Yeh, 2008). There are a variety of studies that have identified success factors for e-learning, in many of which the factors identified are similar, but many also identified previously undiscovered factors for e-learning success (Bhuasiri *et al*., 2012; Karaali *et al*., 2011; Jali & Zoubib, 2014; Klobas *et al*., 2014; Raymond *et al*., 2012).

Bhuasiri *et al.* (2012) identified six dimensions that can be used to classify critical success factors (CSFs) for e-learning implementations in developing countries. The six dimensions of CSFs for e-learning are:

- Learner characteristics;
- Instructor characteristics;
- Institution and service quality;
- Infrastructure and system quality;
- Course and information quality; and
- Extrinsic motivation.

The CSFs of the dimension regarding learner characteristics are: computer self-efficacy, Internet self-efficacy and attitude towards e-learning according to Bhuasiri *et al.* (2012). CSFs of the instructor characteristics dimension are timely response, self-efficacy, technology control, interaction focus, attitude towards student and interaction fairness. Computer training and program flexibility are the CSFs of the institution and service quality dimension. The infrastructure and system quality dimension has CSFs of Internet quality, reliability, ease of use, system functionality, system interactivity and system response. The dimension of course and information quality has CSFs of course quality, extent of relevant content and course flexibility. Perceived usefulness and clear direction are the CSFs of the extrinsic

motivation dimension (Section 3.3.4). Jali and Zoubib (2014) identified five variables as being significant in influencing e-learning adoption, namely relative advantage, complexity, information quality, system quality and service quality. They recommended that implementing organisations should focus on the completeness, security, accuracy, availability and comprehension of information as CSFs of e-learning.

Klobas *et al.* (2014) discussed CSFs for e-learning in terms of the sustainability of such initiatives. Organisations need to shift their focus from expecting financial benefits from e-learning to being prepared to continually financially invest in e-learning. A constant availability of technical and operational support is a CSF of a sustainable e-learning environment for it to function effectively. Another CSF of sustainable e-learning initiatives is the involvement of others in the development and support of the e-learning system so that the continuation of e-learning is not limited to a select group of people. The implementation of e-learning policies is another CSF of sustainable e-learning implementations by ensuring that workload is shared amongst those involved and that recognition is granted.

Karaali *et al.* (2011) determined factors for e-learning adoption specifically in the corporate environment, by looking at managerial motivational factors and approaches to e-learning. The factor of social influence was seen as one of the most prominent factors for the intention to use e-learning where managers positively endorse the use of e-learning which, in turn, motivates employees to use e-learning. Secondly, the adoption of autonomy-supportive techniques should be maintained by management by understanding the learners' perspective and therefore, learners will show greater interest, apply more effort and perform better. Organisations should approach computer anxiety by offering training programs to those who lack training or confidence in the use of the Internet or computers. In order for organisations to realise the benefits of e-learning, managers could treat the use of e-learning platforms as an objective for employees to achieve performance targets. Moon, Birchall, Williams and Vrasidas (2005) identified CSFs for online courses:

- Being relevant to learners' everyday business lives;
- Encompassing practical over theoretical content with some case studies;
- Including self-reflection opportunities;
- Providing access to a virtual network of learners, possibly supported by a tutor; and
- Providing small bites or "chunks" of online training material at a time.

The CSFs for e-learning focusing on developing countries, e-learning adoption, e-learning sustainability and corporate e-learning investigated in the literature were classified into a model of 40 CSFs for e-learning by the researcher according to Bhuasiri *et al*.'s (2012) six dimensions (Figure 3-5). The six dimensions of e-learning CSFs included all 22 of the CSFs identified by Bhuasiri *et al*. (2012) and 10 additional factors indentified by Jali and Zoubib (2014), four factors proposed by Klobas *et al.* (2014) and four factors proposed by Karaali *et al.* (2011). The 10 additional CSFs identified by Jali and Zoubib (2014) were added to the following dimensions:

- Institution and service quality (relative advantage and service quality);
- Infrastructure and system quality (system quality, security and availability); and
- Course and information quality (complexity, information quality, completeness, accuracy and comprehension).

The four additional CSFs identified by Klobas *et al.* (2014) pertained to the following dimensions of e-learning CSFs:

- Institution and service quality (operational support, e-learning policies and technical support); and
- Infrastructure and system quality (Continuity ability of system).

Karaali *et al.* (2011) focused on four CSFs in the corporate context and these were classified into the following dimensions:

- Institution and service quality (autonomy-supportive techniques, computer usage training programs and set performance targets); and
- Extrinsic motivation (social influence).

The institution and service quality dimension related to the highest number of CSFs identified in the literature and is the only dimension that involved CSFs from all four foci (developing countries, e-learning adoption, e-learning sustainability and corporate e-learning). The learner characteristics and extrinsic motivation dimensions both involved three CSFs and this was the lowest number of CSFs related to a dimension. The dimension of learner characteristics related to the work of one source whereas the dimension of extrinsic motivation related to CSFs identified by two sources.

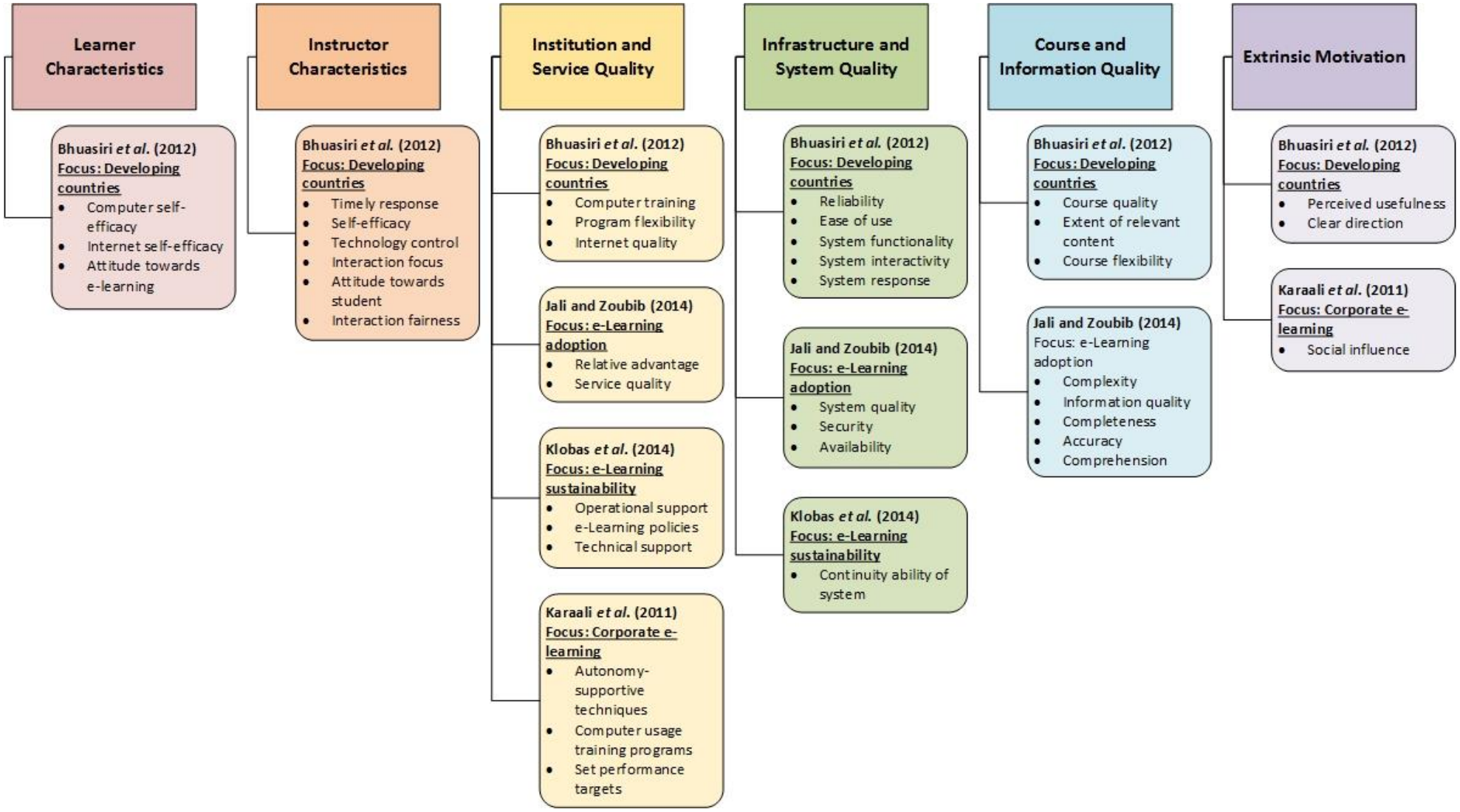

Figure 3-5: Model of e-Learning Critical Success Factors (CSFs)

3.6 Planning and Measuring the Success of e-Learning Projects

Due to the complexity involved in proving the monetary return on investment of e-learning, the success of e-learning implementations must be established and the actual measurement thereof planned. The success of e-learning can be measured by determining the behavioural intention to use and user satisfaction thereof (Al-Qahtani *et al*., 2013; Mohammadi, 2015). Behavioural intention to use (Section 3.6.1) indicates when a user is prepared to execute a specified behaviour and can be described as an immediate predecessor of usage behaviour (Tarhini *et al*., 2013). According to Chu and Chen (2016) and Tarhini *et al*. (2013), actual system usage can be predicted by determining behavioural intention to use (Section 3.6.2). The antecedents of technology adoption intention have been explored in previous studies and the attitude of users has been emphasised as a central predictor (Hsiao, 2012; Tarhini *et al.*, 2013; Tosuntas, Karadag, & Orhan, 2015). Chen and Tseng (2012) established that both motivation and self-efficacy had notable positive effects while computer anxiety had a significant negative effect on the intention to use e-learning.

3.6.1 Intention to Use

Some studies refer to *behavioural intention to use* or *behavioural intention* whilst others refer to *intention to use*. The latter term will be used hereafter in this study. The success of e-learning projects can be established by determining the intention to use (Mohammadi, 2015). If the corporate environment is to avoid the under-utilisation of technological resources, it should be a priority to focus on developing and implementing effective strategies in order to ensure continued usage by users (Weng, Tsai, & Weng, 2015). Studies involving intention to use technology highlight the antecedents that increase or influence the intended usage in the future (Armenteros, Liaw, Fernández, Díaz, & Arteaga Sánchez, 2013; Cheung & Vogel, 2013; Chu & Chen, 2016).

The **theory of reasoned action (TRA)** is one of several theoretical models that aim to study user behaviour. The TRA states that the intention of a user to perform or not to perform a given behaviour or task is considered the immediate determinant of actual behaviour (Fishbein & Azjen, 1975). The intention of a user to use technology can be influenced by user attitude and subjective norms. Nevertheless, a given behaviour or task performed by a user can be hampered by a shortage of opportunities, skills and resources (Cheung & Vogel, 2013). It was for this reason that the TRA was extended to incorporate the **theory of planned**

behaviour (TPB) by including an additional variable, namely **perceived behavioural control** (Azjen, 1991). Perceived behavioural control relates to the human perception of the ability to complete a specific task and self-efficacy is considered an element thereof (Cheung & Vogel, 2013). Behavioural intention can be explained by the combination of the components of the TPB model, namely attitudes, subjective norms and perceived behavioural control. The model has been frequently used to explore user behaviour specifically related to e-learning (Cheung & Vogel, 2013; Chu & Chen, 2016; Tarhini *et al*., 2013).

Smith and Sivo (2012) recommended that the identification of the metrics that could possibly influence the intention to use e-learning may assist educational supervisors, designers and facilitators to align the development of such systems with strategic planning that meets the needs of the intended users. The various metrics that can be combined in the form of a model to determine the e-learning usage intention were investigated in research conducted by Chatzoglou *et al*. (2009). This study included perceived usefulness and perceived ease of use which are metrics that originated from the Technology Acceptance Model (TAM). TAM provides reasoning regarding the determinants of computer acceptance and thus user behaviour across a diverse collection of end-user computing technologies and user profiles (Davis, Bagozzi, & Warshaw, 1989). The remaining metrics included in the study were: learning goal orientation, management support, self-efficacy, enjoyment, computer anxiety and intention to use (Chatzoglou *et al*., 2009).

Management support is described as the perceived level of general support provided by top management and includes aspects such as encouragement, motivation and resource provision (Igbaria, Zinatelli, Cragg, & Cavaye, 1997). ***Perceived usefulness*** refers to the degree to which people perceive the use of a computer to enhance job-related performance and task completion (Arbaugh, 2000; Davis, 1989; Davis *et al*., 1989; Sun, Ke & Cheng, 2007). The extent to which a person believes that using a computer will require minimum to no effort is termed ***perceived ease of use***. ***Learning goal orientation*** is referred to as the motivation driving people to improve their competency levels in order to facilitate job and task-related performance improvements by focusing on the process of learning (Carson, Mosley, & Boyar, 2004; Hwang & Yi, 2002; Printrich, 2000).

Self-efficacy describes the belief in one's capabilities to invoke one's motivation, cognitive resources and courses of action necessary to meet and exceed the demands of a certain

situation (Wood & Bandura, 1989). Self-efficacy was first explained by Bandura (1986) as being unrelated to the skillset one has and can rather be associated with the belief one has of what one can do with the skills possessed. Bandura (1986) further describes self-efficacy as involving the decision of what actions to take, the amount of effort to exert, the length of perseverance and the methods to use in challenging situations. Self-efficacy has been incorporated in more recent models investigating system usage as an antecedent of intention to use (Henry & Stone, 1995; Venkatesh & Davis, 2000; Yi & Hwang, 2003). The metrics of self-efficacy and enjoyment were proposed as determinants of ease of use in a study by Venkatesh (2000); however, the interrelationship between the metrics was not addressed. Yi and Hwang (2003) revealed self-efficacy to have a significant effect on enjoyment.

Within the field of IS, ***enjoyment*** can be described as the degree to which the task of using a given technology, system or environment is perceived as pleasing and promoting positive feelings for users, regardless of any performance consequences that may occur (Davis, Bagozzi, & Warshaw, 1992). The terms enjoyment and intrinsic motivation involve the pursuit of an activity due to a genuine interest or positive feelings associated with the activity and thus, enjoyment can be classified as a type of intrinsic motivation (Venkatesh & Speier, 2000). ***Computer anxiety*** relates to the obstruction of the intention to use a computer due to the anxiety and related negative feelings stemming from the use of a computer, which therefore hinders one from being able to complete tasks using a computer (Igbaria & Parasuraman, 1989). Computer anxiety describes the subjective reaction and feelings connected to any direct or indirect contact with a computer (Sievert, Albritton, Roper, & Clayton, 1988). Feelings such as uneasiness, apprehensiveness or fear may be experienced by users with computer anxiety who are thinking about current or future computer use. Since the study of intention to use e-learning investigates the future subjective probability of usage behaviour, it is necessary to explore the user satisfaction with e-learning during e-learning usage.

3.6.2 User Satisfaction

Along with intention to use, user satisfaction has been investigated as an antecedent to predict system success in a number of studies (DeLone & McLean, 2003; Liaw & Huang, 2013; Melone, 1990; Raymond, 1987). The concept of user satisfaction refers to the collective feelings or attitude toward the many influencing factors that affect a specific situation and is conceptualised as the manifestation of positive affections gained from an interaction (Shee &

Wang, 2008). The interaction of the user with various system components influences user satisfaction and is subjective (Lindgaard & Dudek, 2003). Within the IS domain, user satisfaction can be described as the extent to which users believe that the system in use conforms to and supports their requirements (Cyert & March, 1963).

Certain technologies that are classified as highly user-oriented such as e-learning, consider users crucial to success and thus the extent to which they are satisfied with using such systems is key (Shee & Wang, 2008). According to Bailey and Pearson (1983), in the context of research, satisfaction can be explained as the average of a person's perceptions of the numerous factors affecting a given situation. User satisfaction, in relation to human-computer interaction, is explained as the positive affections experienced by users from an interaction with a given technology which is influenced by a number of factors (Lindgaard & Dudek, 2003; Mahmood, Burn, Gemoets, & Jacquez, 2000). In addition, satisfaction can be described as the difference between the predicted future gain or advantage and the actual gain or advantage (Tsai, Yen, Huang, & Huang, 2007). Within the workplace, user satisfaction describes the positive emotional state of an employee with regards to various factors such as working conditions, managers, job duties and the company as a whole (Yeh, 2014).

For measuring the success of system implementation, Teo (2014) showed that satisfaction is the most important metric and can be influenced by factors concerning the student, teacher, course design, technology, system design and the environment. Consequently, a higher level of feeling satisfied with a system shows a higher degree of willingness to use it (Liaw & Huang, 2013). Kang and Lee (2010) identified enjoyment to be a prominent antecedent of user satisfaction. Due to computer anxiety being an adverse reaction towards computer usage, it can have an effect on users' positive feelings such as satisfaction (Kang & Lee, 2010).

3.7 e-Learning Components

The factors that may increase e-learning success and adoption can be closely linked to the components chosen to be included in the e-learning environment and can be linked to the content dimension of the CPT dimensions of e-learning environments (Figure 3-2). There are many types of e-learning components that can form part of an e-learning environment (Figure 3-6). For the purposes of this study, e-learning components refer to learning objects, multimedia, static visuals and dynamic visuals (Section 3.7.1) as well as interactive learning

objects (ILOs) (Section 3.7.2). The construction of e-learning components requires that certain content construction and standards be followed (Section 3.7.3).

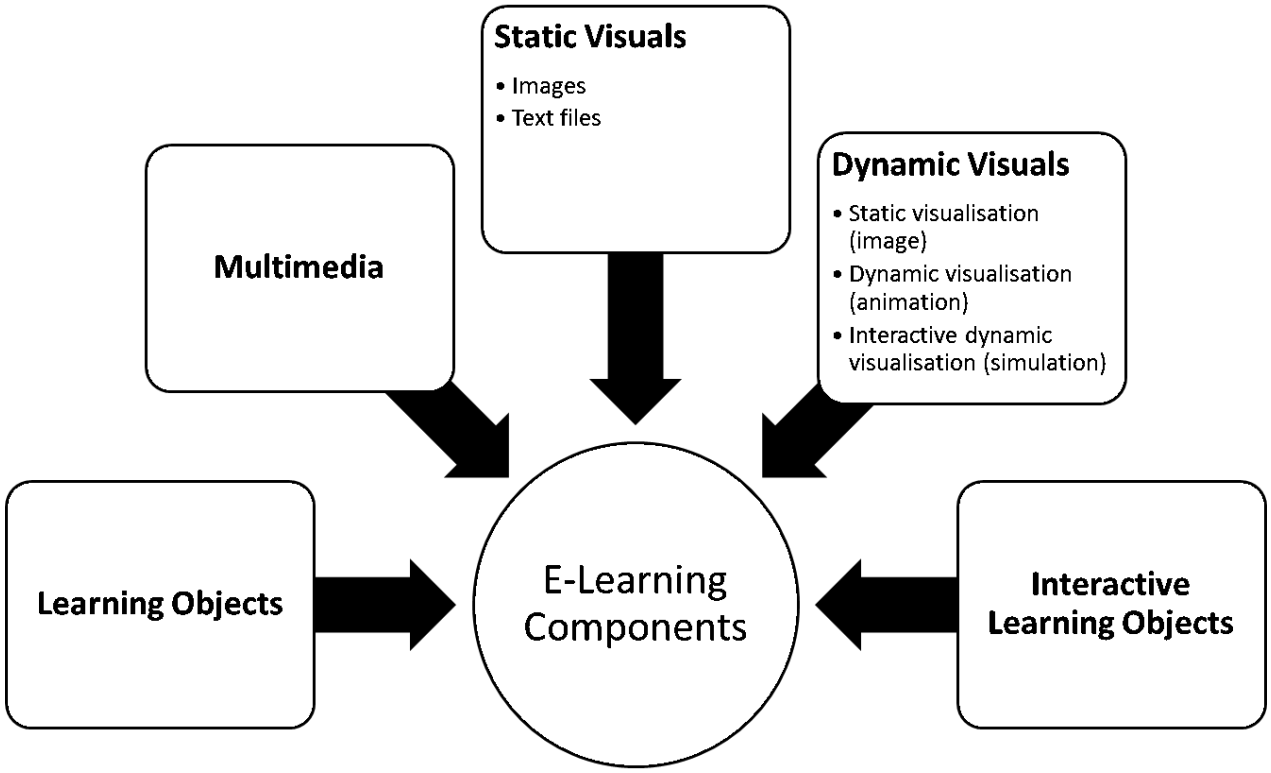

Figure 3-6: e-Learning Components

3.7.1 Learning Objects, Multimedia, Static Visuals and Dynamic Visuals

A learning object (LO) is described as an entity which is either digital or non-digital and is utilised for educational or training purposes, according to the official Learning Object Metadata (LOM) standard (IEEE-LTSE, 2002). However, this description cannot be termed universal because of the numerous definitions of LOs available which are context sensitive (Verbert & Duval, 2008). The purpose of generating learning resources in the form of LOs is because of the capability of LOs to be reused rather than having to create new learning resources each time they are required (Wiley, 2000). The smaller the size or information granularity of the LOs, the higher the ability is for future reuse (Duval & Hodgins, 2003). LOs can be clustered in the form of hierarchies, which is commonly termed authoring by aggregation, and can also be grouped in an arrangement that represents the process of learning (Duval & Hodgins, 2003; Gordillo, Barra, Gallego, & Quemada, 2013). Organisations have the opportunity to benefit from the reuse of LOs through reductions in the time and the

expenses linked to developing LOs and LOs have the ability to enhance the quality of learning, especially if they are of an interactive nature (Mohan & Brooks, 2003; Wiley, 2000).

Interactive media refers to a format of rich learning content with text, image and hypertext structures (Kör, Aksoy, & Erbay, 2014). Multimedia information presented in e-learning systems can appear in different forms such as audio, text, images, video and animation (Lau, Yen, Li, & Wah, 2014). Multimedia can be described as the presentation of material in both verbal form as well as pictorial form (Mayer, 2014). According to Mayer (2014), there are two approaches to the design of multimedia, namely technology-centred and learner-centred. The **technology-centred approach** to multimedia design involves focusing on the capabilities of the multimedia and how it can be incorporated into other technologies such as the Internet, or the construction of interactive multimedia. The **learner-centred approach** to multimedia design focuses on understanding how the human mind functions and establishing how multimedia can aid human cognition and information processing.

Advancements in technology have enabled the transfer of static visuals such as text files into digital settings (Kör *et al*., 2014). Static learning content is predominantly used in e-learning environments, regardless of dynamic visuals such as animation, simulation and interactive media being proven to make e-learning courses more engaging and motivating for learners (Berney & Bétrancourt, 2016; Kör *et al*., 2014). Kör *et al*. (2014) motivates that static visuals such as text files and images are preferred since they are easier to prepare and take less time and monetary investment as compared to dynamic visuals.

Animation can be described as the sequencing of a series of frames showing a moving object and then allowing these images to roll from one to the next in order to depict motion (Kör *et al*., 2014). Simulation involves replacing or intensifying real experiences, which can be immersive, to imitate aspects of the real world in a fully interactive way (Gaba, 2007; Mills, Carter, Rudd, Claxton, & O'Brien, 2016). Simulation aspects are especially important in software training contexts because learners are able to interact with software features in a way that closely resembles the real software.

The educational impact that these dynamic visuals have on learners depends on various design considerations that should be taken into account (Plass, Homer, & Hayward, 2009). Some examples of design considerations are the educational objectives, learning content, learner characteristics, educational settings and curriculum plans. The design considerations

influence the type of information representation, which can be one or a combination of the following:

- Static visualisation (image);
- Dynamic visualisation (animation); or
- Interactive dynamic visualisation (simulation).

According to Plass *et al*. (2009), decisions related to the design of dynamic visuals will impact their ability to facilitate learning. The following decisions related to design considerations must also be made:

- **The information design** and how the learning content and controls are going to be presented in the visual interface;
- **The interaction design** and how the features are going to be implemented so that they assist learning strategies; and the controls and navigation tools that are going to be available to learners; and
- **The support facilities** provided to learners in order to guide the learning process.

3.7.2 Interactive Learning Objects[2]

ILOs are referred to as web-based entities that support the learning process by improving, strengthening and guiding the cognitive processes of learners by using interactive mechanisms (Barak & Ziv, 2013; Kay & Knaack, 2008). ILOs must include explicit objectives and incorporate built-in assessment techniques because this is considered best practice (Barak & Ziv, 2013). AlfredoSanchez, Perez-Lezama and Starostenko (2015) state that ILOs usually consist of six outputs of the design and development processes, namely:

- The learning objectives (educational goals);
- The skills or competencies that are acquired after interacting with the ILO;
- Prerequisite knowledge of the learner required before using the ILO;
- The e-learning components;
- A set of practice tasks to be completed by the learner; and
- An assessment mechanism to measure learner competency.

[2] The literature discussed in this section was obtained from research that was published as a full double-blind peer-reviewed conference paper at the Mediterranean Conference on Information Systems (MCIS) in September 2016. Esterhuyse, M & Scholtz, B. A Process for Designing and Developing Interactive Learning Objects for Organisations. MCIS Conference. Paphos, Cyprus. **(Appendix C)**

The learning objectives entail the allowance in the ILO for the educational goals that should be obtained after using the ILO. Skills or competencies are the components of the ILO that refer to the abilities, attitudes and values acquired by the learner after interacting with the ILO. Prerequisites involve the knowledge or capabilities the learner should have attained previously so that full advantage of the ILO may be obtained. The e-learning components consist of the digital resources of the e-learning system, for example the ILOs, and includes the sequencing and the navigational information on such components. A set of practice tasks for the learner to perform whilst interacting with the ILO forms a component thereof and lastly, a mechanism to measure the knowledge acquired by the learner after interacting with the ILO must be designed and implemented to form a component of the ILO. These outputs can be linked to the CPT dimensions of e-learning environments (Figure 3-2), for example, evaluation and assessment mechanisms use pedagogical principles and the e-learning components fit into both content and technology dimensions.

3.7.3 Content Construction and Standards

If e-learning content is to be successfully uploaded and made accessible from a learning management system, such as the Modular Object Oriented Dynamic Learning Environment (Moodle), it needs to conform to a specified set of technical and instructional standards (Ghirardini, 2011). The technology aspect of the CPT dimensions of e-learning environments can be linked to the way in which content is constructed and the standards that are complied with (Figure 3-2). The way in which multimedia components are structured requires a set of instructions to be described so that the learning content contained within a multimedia element can be connected and structured accordingly (Lau *et al*., 2014). Shareable Content Object Reference Model (SCORM) is a collection of standards and specifications developed by the Advanced Distributed Learning (ADL) initiative which was established by the Office of the United States Secretary of Defense (Kun, 2009). SCORM addresses a number of problems associated with e-learning components such as the inability for resources to be shared and barriers of communication between systems. SCORM is a popular standard which creates hierarchical structures in order to connect learning content and schedule their delivery (Lau *et al*., 2014). It also specifies and controls the communication standard for the client and server components.

3.8 Interaction Design Lifecycle

Several authors have emphasised the importance of focusing on interactivity in e-learning rather than on the content itself during the process of designing (Boettcher & Conrad, 1999; D'Agustino, 2012; Kang, 2001; Palloff & Pratt, 2001). The emphasis is placed on learning through interactivity rather than through the transmission of information. The process of designing interactive artefacts that support the daily communication between people is termed interactive design (Rogers, Sharp, & Preece, 2011). By describing interaction design as the art of enabling the interaction between humans and computers, the creative aspect of it can be emphasised (Saffer, 2010). ILOs contain built-in multimedia elements and provide instant feedback to learners and it is because of this that they have been perceived as gratifying and easy to use, when analysing the pace of learning (Bradley & Boyle, 2004).

The interaction design lifecycle is comprised of four generic activities (Figure 3-7) and these activities are integrated, as the output of one activity forms the input of another and the overlapping of activities may occur (Rogers *et al*., 2011). The initial activity entails the elicitation of requirements and involves exploring the intended user's needs which will influence the succeeding processes of design and development. The next activity involves the suggestion of ideas that could possibly meet the needs of the users in the form of conceptual and physical designs. A physical design addresses the details of the artefact including menu design and colour usage and a conceptual design entails the modelling of the user interaction with the given artefact. Prototyping is the subsequent activity and entails the actual design of the interactive product which need not necessarily be a working software item; it can be paper-based but ought to provide a sense of the user's interaction with the artefact. The last activity is evaluating and involves measuring the acceptability and usability of the product which is determined using a set of criteria. Once feedback regarding the product has been obtained, it may be necessary to make additional improvements to the product in an iterative manner. According to (Gould & Lewis, 1985), iteration is inevitable because the solution to the problem is rarely completely right the first time around. The improvements made to the final product, such as e-learning components, will ultimately enhance the quality thereof.

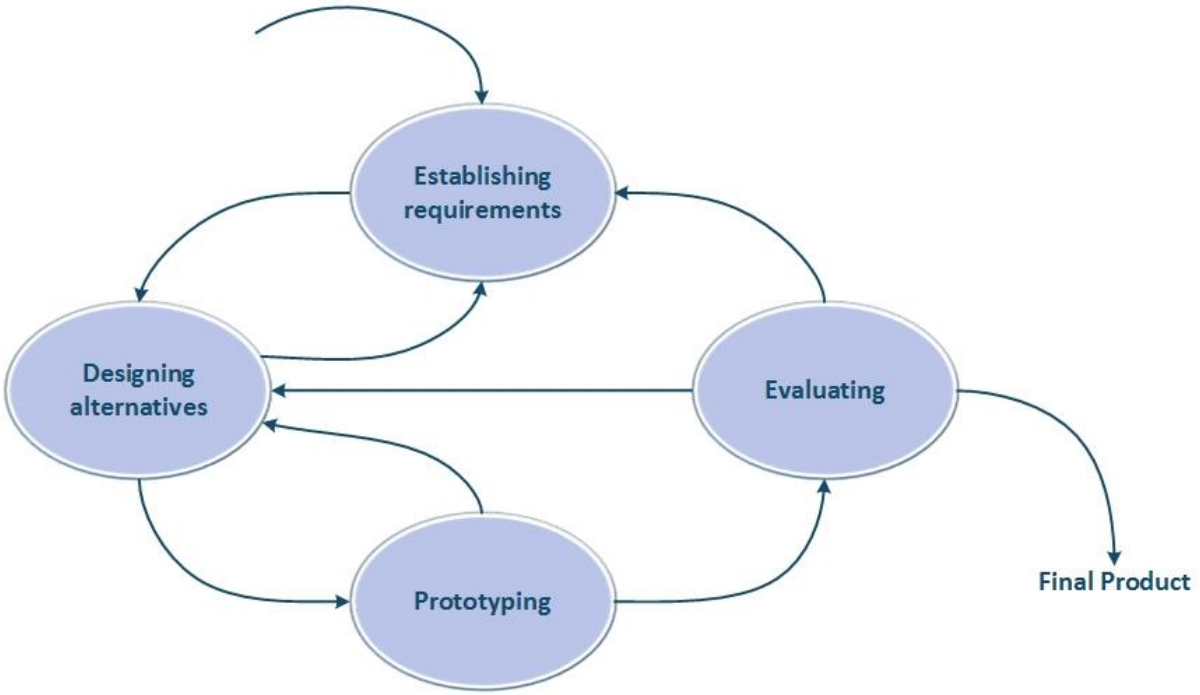

Figure 3-7: Interaction Design Lifecycle (Adapted from Rogers *et al*., 2011)

Within the field of interaction design, the UX of the product considered must be accounted for (Rogers *et al*., 2011). UX describes how a product is used by people and the feelings produced through the interaction with that product. There is a variety of UX objectives that can be identified in the form of goals. The establishment of goals should form part of the elicitation of users' requirements. UX goals can be divided into desirable and undesirable aspects which comprise the subjective users' feelings toward a product. Desirable UX goals can incorporate aspects including: *engagement, cognitively stimulating,* and being *motivating, challenging* and *rewarding*. Undesirable UX goals can include aspects such as being *frustrating, childish, patronising, annoying* and *boring*.

3.9 e-Learning Design Requirements

e-Learning is recognised for stimulating learners using visual elements; however the visual design characteristic of e-learning is often disregarded or considered a minor cosmetic feature (Horton, 2006). Bartuskova and Krejcar (2014) produced a set of design attributes and requirements for general e-learning purposes from a synthesis of literature. The design requirements involve five main elements: legibility, design consistency, visual presentation, content arrangement and content adjustment (Table 3-2).

Table 3-2: e-Learning Design Requirements (Bartuskova & Krejcar, 2014)

Requirement	Attributes
Legibility	Typeface, type/font size, tonal contrast, spacing, alignment, line length, media legibility
Visual presentation	Aesthetic design, colour, colour contrast, relevant graphics, supportive graphics, visual hierarchy
Design consistency	Functional consistency, aesthetic consistency, consistency in layout and structure
Content arrangement	Layout, organisation, navigation mechanism, multiple presentation media
Content adjustment	Chunking, white space, emphasis mechanisms, noise reduction

The ability of learners to read text and identify images is referred to as legibility and is considered important in the field of e-learning because it is more difficult to articulate text and imagery on a computer screen than on paper (Bartuskova & Krejcar, 2014; Weinschenk, 2011). Visual presentation is the use of graphics, colour and the visual hierarchy of content and can assist in establishing positive attitudes amongst users towards a given artefact (Bartuskova & Krejcar, 2014). Design consistency refers to two interpretations of consistency, the first referring to the consistency of appearance and style and the second concerning the consistency of meaning and action (Bartuskova & Krejcar, 2014; Fee, 2009; Lidwell, Holden, & Butler, 2003). Content arrangement involves the structuring and hierarchical location of multimedia content (Bartuskova & Krejcar, 2014). The assembly and grouping of content into logical parts as well as the emphasis of key content to assist in information processing by the learner is referred to as content adjustment.

The design requirements and attributes detailed by Bartuskova and Krejcar (2014) were obtained from studies founded on general design principles, e-learning systems and web design. The design requirements and attributes focus on e-learning aesthetics with an influence of graphic design. These suggestions for design are suitable for the design of ILOs because aspects such as consistency, colour usage and spacing are incorporated and are important in the design of ILOs.

3.10 Design, Prototyping and Evaluating e-Learning Components

According to Siqueira *et al*. (2007), e-learning course content of a high quality is expensive as well as time consuming to implement. It is therefore important that criteria for the design and prototyping (Section 3.10.1) and evaluation (Section 3.10.2) of e-learning components be investigated to ensure the success of e-learning projects and environments. The majority of

components included in e-learning systems involve interactivity (Section 3.7.2) as well as multimedia and thus, the media richness theory could be considered (Section 3.10.3).

3.10.1 Designing and Prototyping e-Learning Components

It has been shown that the information quality in digital training experiences can increase the potential success and adoption of e-learning (Section 3.5) and this can be mitigated by ensuring that the e-learning content is of a high standard (Stoffregen *et al*., 2015).

3.10.1.1 Design Implications of Cognitive Processes[3]

According to Norman (1994), two modes of cognition exist, namely the experiential and the reflective. Experiential cognition entails the mindset of people where perception, action and reaction to surrounding events is effective and effortless. On the other hand, reflective cognition involves thinking, associating, comparing and making decisions. Experiential and reflective cognition require different technological support and can be managed by considering the various cognitive processes of people (Rogers *et al*., 2011).

Attention is a process of cognition that entails the method of selecting from a set of available items, which to concentrate on, at a given point in time. People's attention can be either positively or negatively affected by the means by which information is presented. The way in which information is collected by people is referred to as the cognitive process of perception and such information is retrieved through the human sensory organs, for example through sight, touch and sound, and then subsequently converted into experiences (Roth, 1986). Information should be represented in a manner that can be perceived in the intended way. Memory is a cognitive process that involves the recalling of varying types of knowledge that enable people to react in an appropriate manner (Rogers *et al*., 2011). The cognitive process of learning can be described in the field of IS as either the process of learning to use a computer-based system or using a computer-based system to learn to understand subject matter. The cognitive processes of reading, speaking and listening are forms of language processing that need to be considered when designing interactive technologies such as ILOs. Lastly, the reflective cognitive processes of problem-solving, planning, reasoning and decision-making, entail contemplating a subject, considering the available options, evaluating

[3] The literature discussed in this section was obtained from research that was published as a full double-blind peer-reviewed conference paper at the Mediterranean Conference on Information Systems (MCIS) in September 2016. Esterhuyse, M & Scholtz, B. A Process for Designing and Developing Interactive Learning Objects for Organisations. MCIS Conference. Paphos, Cyprus. **(Appendix C)**

the consequences of possible decisions and then choosing the most favourable option. It is considered best practice to design for the six cognitive processes in e-learning components. Rogers *et al.* (2011) state that there are a variety of design implications linked to the cognitive processes that could be considered as guidelines for designing e-learning components (Table 3-3).

Table 3-3: Design Implications for Cognitive Processes (Adapted from Rogers *et al.*, 2011)

Cognitive Process	Design Implication Example
Attention	Use techniques like graphics, colour, underlining, hierarchy and structure of items, ordering of related information and spacing of items to highlight information.
Perception	Text should be legible and distinguishable which can be ensured by using light text on dark backgrounds or vice versa.
Memory	Design interfaces that promote recognition rather than recall by using menus, familiar icons and consistently placed items.
Learning	Encourage exploration with interface design.
Reading, Speaking and Listening	Provide options for enlarging the text on a screen without compromising on formatting.
Problem Solving, Planning, Reasoning and Decision-Making	Provide supplementary concealed information or tips that are easily accessed for users who want to know more about carrying out tasks more efficiently.

3.10.1.2 Multimedia Principles

Training programs that are well-designed, effective and appealing take both multimedia principles and human cognitive architecture into account (Van Merriënboer & Kester, 2014). Multimedia learning involves building mental representations from words and pictures, where words include printed or spoken text and pictures are static or dynamic and include illustrations, photos, animation or video (Mayer, 2014). By considering multimedia principles, a suitable selection of educational media, the presentation and arrangement thereof as well as practice and feedback mechanisms can be chosen for e-learning environments. Van Merriënboer and Kester (2014) suggest seven multimedia principles for e-learning environments and they are as follows:

- The sequencing principle;
- The fidelity principle;
- The self-pacing principle;
- The temporal split-attention principle;
- The spatial split-attention principle;
- The signaling principle; and
- The modality principle.

The *sequencing principle* specifies that it is better when learning tasks for information to be organised to form a sequence from simple to complex, instead of material being presented in its full complexity at once (Van Merriënboer & Kester, 2014). The *fidelity principle* states that there are situations where either high-fidelity task environments or low-fidelity task environments are appropriate. Learning is more effective for novice users in low-fidelity task environments where non-essential details are eliminated and only material that is necessary for learning outcomes is included. The *self-pacing principle* specifies that learners should be given control over the pace of learning so that deep processing and elaboration is fostered.

The *temporal split-attention principle* describes the deterioration of multimedia comprehension when learners are required to divide their attention between multiple media sources and are required to mentally integrate disparate information. The temporal split-attention principle can ensure optimal learning by simultaneously presenting multimedia that refer to related information. The *spatial split-attention principle* refers to the finding that optimal learning can be achieved by physically integrating mutually referring multimedia. Learning benefits have been realised by integrating pictures with explanatory text. This principle is in agreement with the work by Cerpa, Chandler and Sweller (1996) who verified that learners being trained to use a computer application were more successful when all the learning material was placed on the computer as opposed to learning with a paper-based manual and the computer.

The *signaling principle*, which is also referred to as the attention-focusing principle, describes the value that is added when a learner's attention is focused on important areas of the information presented (Van Merriënboer & Kester, 2014). The learning process is improved by reducing cognitive resources required and the need for visual search by learners. The *modality principle* indicates that presentation techniques with a dual-mode approach are more effective than learning using a single-mode approach. It is therefore better for learners to interact with auditory text or narration that is used to explain visual animations, demonstrations or diagrams than solely with visual information.

3.10.2 Evaluating e-Learning Components

Harpur and De Villiers (2015) proposed a framework for evaluating m-learning artefacts, also referred to as components, which include ILOs. Whilst this framework was proposed for evaluating M-learning environments and places emphasis on the **Usability and User**

eXperience encountered in mobile Educational contexts (MUUX-E), it is a customisable template that has a grounding in theoretical principles. The categories of criteria incorporated in the framework are:

- General interface usability;
- Web-based learning;
- Educational usability;
- m-Learning features; and
- User experience.

The detailed criteria can be found in Appendix D. The first category of criteria involving general interface usability was derived from Nielsen's heuristics for interface usability and places emphasis on the design of a system that is consistent and user-centred (Nielsen, 2005). The second category involving web-based learning is related to the navigation and structuring as well as the format of the system and includes its suitability for the process of learning (Harpur & De Villiers, 2015). The category of educational usability highlights learning-specific use and the inclusion of LOs or outcomes based on some learning theory. Only one of the five categories involved in the MUUX-E framework is specific to mobile contexts.

The fourth category is associated with m-learning and stresses the affordance of contextual requirements. The m-learning criteria can be modified for the purposes of e-learning because m-learning is a subset of e-learning (Kumar, 2013; Whale, Scholtz, & Calitz, 2015) with some added limitations such as screen size. The final category of MUUX-E is user experience (UX) which entails the measurement of the extent to which a user has positive feelings towards a system. The MUUX-E framework evaluates some elements of the interactive nature of products and considers the element of learning. Due to m-learning being considered a subset of e-learning, most of the criteria are applicable to e-learning components, excluding those that relate to handheld devices. Therefore, the five categories of the MUUX-E framework are appropriate for the design and evaluation of e-learning systems, including ILOs. UX is concerned with the feelings generated from user interactions with a system, which can be enhanced by the extent to which media can be considered rich.

3.10.3 Media Richness Theory

Because e-learning components could include dynamic visuals such as simulations, animations and interactive media, the **media richness theory (MRT)** should be considered. The MRT was developed by Daft, Lengel and Trevino (1987) who proposed that the communication effectiveness between people is affected by the suitability of the media and the characteristics of the communication task. The MRT involves the level of media richness that is able to enhance user concentration without affecting the ability to process rich information (Liu, Liao, & Pratt, 2009). There are four criteria that determine the richness of media (Daft *et al*., 1987):

- **Immediate feedback capacity:** The media facilitates quick convergence on a common interpretation.
- **Ability to transmit multiple cues:** Instead of merely providing information or data, a selection of cues, including physical presence, voice articulations, body gestures, words, numbers, and graphic representations, facilitate conveyance of interpretation and meaning.
- **Language variety:** Although numbers and formulas provide accuracy, natural language conveys a broader set of concepts and the ability to convey abstraction.
- **Capacity of personal focus of the media:** This criterion refers either to emotion portrayal, or to the ability of the media to be tailored to the specific needs and perspectives of the receiver.

3.11 An e-Learning Environment for Software Training ($eLEST_T$)

An important feature of e-learning relates to the numerous types of content that can be supplied to learners such as text documents, presentations, multimedia, tasks and combined media (Bartuskova & Krejcar, 2014). ILOs are available in many forms such as flashcards, virtual tours, enriched videos and interactive presentations (Barak & Ziv, 2013). The interactive nature of ILOs can enhance education and training through the provision of high quality resources and thus, organisations should design ILOs well enough to uphold the quality standards of this technology.

Irrefutably, user interface design is essential in many domains, including e-learning (Bartuskova & Krejcar, 2014). However, there is a lack of available e-learning design guidelines

and expertise (Wiklund-Engblom, 2015). The body of knowledge accumulated from the fields of UX and web design is often drawn from when designing for learning, but the uniqueness of the learning process warrants the need for the inclusion of specialised knowledge (Peters, 2014; Wiklund-Engblom, 2015). According to Bartuskova and Krejcar (2014), design guidelines can differ according to the context and purpose of the e-learning environment but some design guidelines are universal for all contexts. Design is included as one of the many facets of e-learning and is described in the context of e-learning as the presentation of the content in e-learning systems (Bartuskova & Krejcar, 2014; Pelopidas & Kokkinaki, 2014). Many studies have focused on interaction design and it has become a fundamental aspect of IS product design and development, yet there is a lack of research linked to the design of e-learning components and processes for designing these components, particularly in the software training context.

In the early stages of this research, a **Process for Designing and Developing ILOs (PDILO)**[4] was proposed, which was derived from a synthesis of literature, based on the four activities involved in the interaction design lifecycle (Figure 3-7). The reason for incorporating the interaction design lifecycle activities is that several authors have emphasised the importance of focusing on interactivity in e-learning rather than on the content itself during the process of designing (Section 3.8). Since the components of e-learning can be interactive, the interaction design lifecycle activities were applied in this study to the field of e-learning to form the basis of the PDILO. According to Rogers *et al.* (2011), the four activities of interaction design are:

- Establishing requirements;
- Designing alternatives;
- Prototyping; and
- Evaluating system.

In the PDILO, the establishment of requirements is the first activity of interaction design and it relates to the establishment of learning objectives, competencies or skills as well as the

[4] Some of the literature discussed in this section was obtained from research that was published as a full double-blind peer-reviewed conference paper at the Mediterranean Conference on Information Systems (MCIS) in September 2016. Esterhuyse, M & Scholtz, B. A Process for Designing and Developing Interactive Learning Objects for Organisations. MCIS Conference. Paphos, Cyprus. **(Appendix C)**

required learning prerequisites of the ILO. In the course of the first activity, the desirable and undesirable UX goals should be identified. The design guidelines, corporate culture and context should also be considered. The design is the second activity where alternative designs for the ILOs are created. There are cognitive design implications related to the second activity as well as e-learning design attributes and requirements that must be considered. The third activity involves prototyping, during which e-learning components, such as ILOs, are developed and therefore the output of this activity is the ILO content.

The artefact is evaluated in the final activity of the PDILO. In the practice activity, the learner practices tasks using the e-learning artefact and is subsequently assessed during the assessment activity to enable the measurement of the knowledge obtained by interacting with the ILO. Notably, the PDILO is an iterative process and involves continuous improvement in all of the activities entailing designing alternatives, prototyping and evaluating. The MUUX-E heuristics inform the three activities of designing alternatives, prototyping and evaluating the artefact. It can be noted that criteria from all five categories of the MUUX-E framework were incorporated into the PDILO.

An extended PDILO was designed by the researcher based on the literature reviewed in this study to create an e-learning environment for software training purposes, namely $eLEST_T$ (Figure 3-8). During the course of this study, the PDILO was extended from the literature investigated and the outputs of the activities were made clearer (Table 3-4). The additions made to PDILO derived from the literature were the underlying theories and assumptions; the e-learning barrier framework, the model of CSFs for e-learning; the design considerations and guidelines; and the CPT dimensions of e-learning and the multimedia principles. The design guidelines for this study are the e-learning design requirements, the cognitive design implications, the multimedia principles, the e-learning (MUUX-E) heuristics and the PDILO. The main purpose of $eLEST_T$ is to produce outputs which are the competency of the learner as well as the certification of the learner (Section 3.3.3).

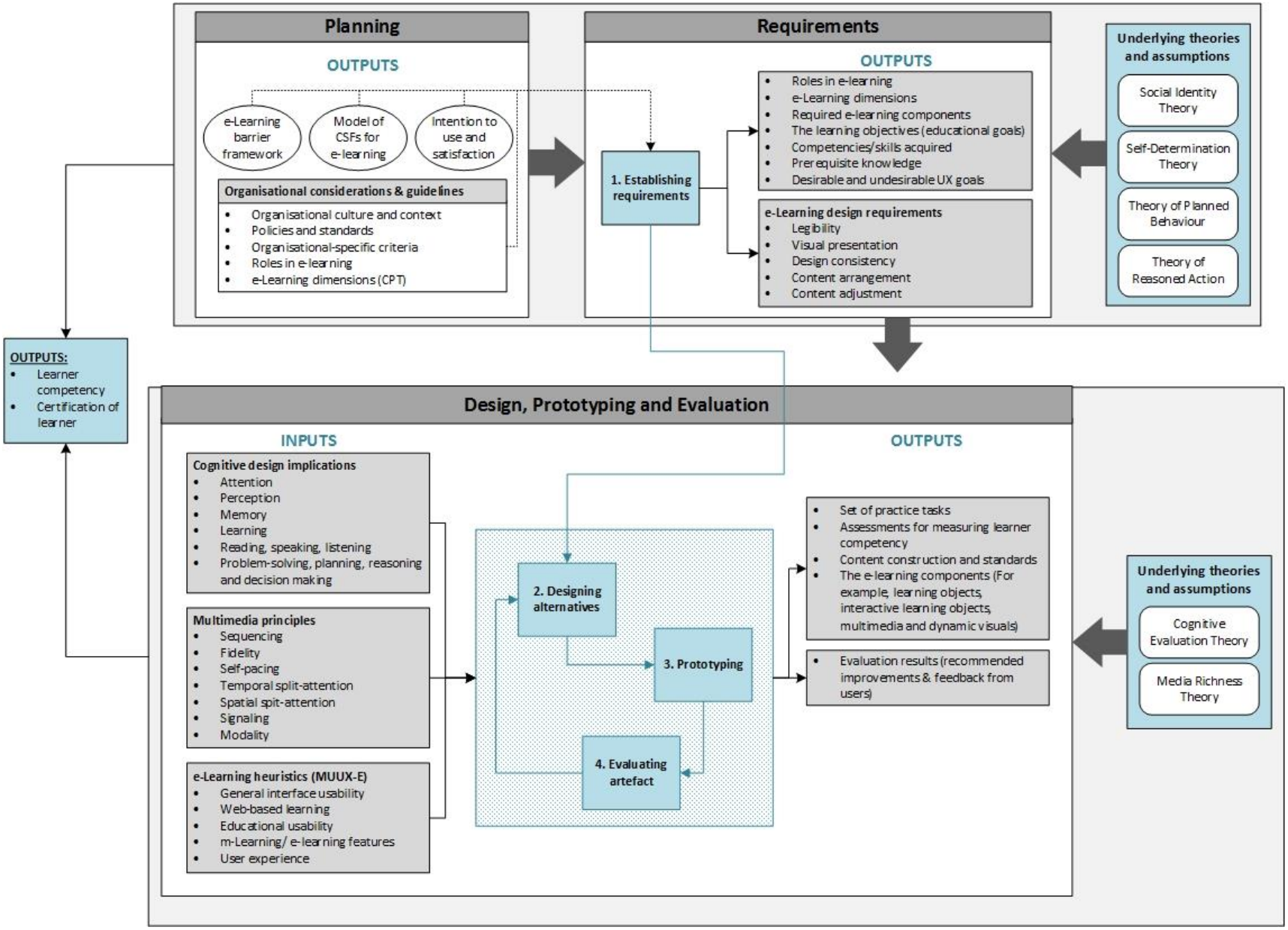

Figure 3-8: An e-Learning Environment for Software Training ($eLEST_T$)

The three stages of eLEST$_T$ are **1) planning**, **2) establishing requirements** and **3) design, prototyping and evaluation**.

During the planning stage, there are several outputs, namely:

- The organisational culture and context (Section 3.2);
- The organisational policies and standards (Section 3.2);
- Organisational-specific criteria (Section 3.2);
- The roles in e-learning (Section 3.3.1); and
- The CPT e-learning dimensions for software training (Section 3.3.2).

There are theoretical models for the planning stage and the results of these models are outputs, and these models are:

- The barriers to e-learning (Section 3.4);
- The CSFs of e-learning (Section 3.5);
- The intention to use e-learning (Section 3.6.1); and
- The satisfaction with e-learning (Section 3.6.2).

The outputs of planning serve as inputs to the gathering of the requirements activity. For the purposes of this study, *planning* is considered the first stage of eLEST$_T$. The first activity of interaction design, namely *establishing requirements* is informed by the underlying theories and assumptions. The outputs of the establishing requirements activity are the inputs to the activities in *design, prototyping and evaluation* and are:

- Roles in e-learning (Section 3.3.1);
- e-Learning dimensions which are: content, pedagogy and technology (Section 3.3.2);
- The required e-learning components (Section 3.7);
- The learning objectives, which are also referred to as educational goals (Section 3.7.2);
- The competencies and skills to be acquired (Section 3.7.2);
- Prerequisite knowledge (Section 3.7.2);
- Desirable and undesirable UX goals (Section 3.8); and
- The e-learning design requirements (Section 3.9).

There are additional underlying principles and heuristics that must be considered as inputs to design, prototyping and evaluation, namely:

- Design implications of cognitive processes (Section 3.10.1.1);
- Multimedia principles (Section 3.10.1.2); and
- e-Learning (MUUX-E) heuristics (Section 3.10.2).

The outputs of design, prototyping and evaluation are:

- The e-learning components, for example, LOs, ILOs, multimedia and dynamic visuals (Section 3.7);
- A set of practice tasks (Section 3.7.2);
- Assessments for measuring learner competency (Section 3.7.2);
- Content construction and standards (Section 3.7.3); and
- Evaluation results which are the recommended improvements and feedback from users (Section 3.8).

Four underlying theories and assumptions inform the planning and requirements stages and they are:

- The social identity theory (Section 3.3.4);
- The self-determination theory (Section 3.3.4);
- The TPB (Section 3.6.1); and
- The TRA (Section 3.6.1).

Two underlying theories and assumptions inform the stage of design, prototyping and evaluation and they are:

- The cognitive evaluation theory (Section 3.3.4); and
- The MRT (Section 3.10.3).

Table 3-4: The Elements of eLEST$_T$

Element	Section
Outputs of all activities:	
Learner competency	Section 3.3.3
Certification of learner	
Planning	
Organisational considerations and guidelines	
○ Organisational culture and context	Section 3.2
○ Policies and standards	Section 3.2
○ Organisational-specific criteria	Section 3.2
○ Roles in e-learning	Section 3.3.1
○ e-Learning dimensions (content, pedagogy, technology)	Section 3.3.2
• Barriers to e-learning	Section 3.4
• Critical success factors for e-learning	Section 3.5
• Intention to use e-learning	Section 3.6.1
• Satisfaction with e-learning	Section 3.6.2
Requirements outputs	
• Roles in e-learning	Section 3.3.1
• e-Learning dimensions (content, pedagogy, technology)	Section 3.3.2
• Required e-learning components	Section 3.7
• The learning objectives (educational goals)	Section 3.7.2
• Competencies/skills acquired	
• Prerequisite knowledge	
• Desirable and undesirable UX goals	Section 3.8
• e-Learning design requirements (legibility, visual presentation, design consistency, content arrangement and content adjustment)	Section 3.9
Design, prototyping and evaluation	
Inputs:	
Design implications of cognitive processes (attention; perception; memory; learning; reading; speaking and listening; and problem-solving, planning, reasoning and decision-making)	Section 3.10.1.1
Multimedia principles (sequencing, fidelity, self-pacing, temporal split-attention, special split-attention, signaling and modality)	Section 3.10.1.2
e-Learning (MUUX-E) heuristics (general interface usability, web-based learning, educational usability, m-learning/e-learning features and user experience)	Section 3.10.2
Outputs:	
• The e-learning components (For example, learning objects, interactive learning objects, multimedia and dynamic visuals)	Section 3.7
• Set of practice tasks	Section 3.7.2
• Assessments for measuring learner competency	Section 3.7.2
• Content construction and standards	Section 3.7.3
• Evaluation results (recommended improvements and feedback from users)	Section 3.8

Theory	Section
• Social identity theory	Section 3.3.4
• Self-determination theory	Section 3.3.4
• Cognitive evaluation theory	Section 3.3.4
• Theory of planned behaviour	Section 3.6.1
• Theory of reasoned action	Section 3.6.1
• Media richness theory	Section 3.10.3

3.12 Conclusions

Several CSFs for e-learning are identified from the literature that can assist organisations in establishing a clear direction for the success of e-learning environments as well as for indicators of performance related to success (Section Figure 3-5). This chapter has therefore answered the first research question (Section 1.4) ***RQ_1:*** *What are the critical success factors for e-learning environments?* Key barrier dimensions, namely a lack of resources, infrastructure issues, technical issues, organisation management and social interaction, can impede the usage of e-learning (Figure 3-4). The barriers that fall under these dimensions during the planning stage must be identified and minimised by corporations in order to increase the chances of e-learning success. The second research question (Section 1.4) has thus been partially answered ***RQ_2:*** *What are the barriers affecting the adoption of e-learning?*

There are four activities of interaction design that can be used in a process for designing e-learning components and they are: establishing requirements, designing alternatives, prototyping and evaluating the artefact. The requirements related to the design of e-learning components involve legibility, visual presentation, design consistency, the arrangement of content and the adjustment thereof. The e-learning components that are to be included in e-learning environments for software training must undergo a design, prototyping and evaluation stage. During this stage, the MRT can be considered for designing. The design guidelines of $eLEST_T$ are: the e-learning design requirements, the cognitive design implications, the multimedia principles, the e-learning (MUUX-E) heuristics and the PDILO. The MUUX-E framework and metrics of intention and satisfaction are also possible options for evaluating e-learning components.

The following research question (Section 1.4) has therefore been answered from a theoretical perspective in this chapter:

RQ_4: *Which e-learning process can be used for developing a best practice e-learning environment for software training?*

As part of the e-learning process, there are pedagogical principles that must be considered. The e-learning user roles can be categorised as either support or learner members. The dimensions of e-learning environments involve the content, pedagogy and technology and there are considerations surrounding these dimensions. There is an assortment of e-learning

components available, such as LOs, multimedia, static visuals, dynamic visuals and interactive learning objects (Figure 3-6). There is a commonly used standard available, namely SCORM, which enables resources to be shared and ensures the communication between systems.

A theoretical contribution in the form of an e-learning environment for software training ($eLEST_T$) is proposed. This theoretical environment is one of the deliverables of Cycle 1: *Problem Investigation and Proposal* (Figure 3-8). Two research questions (RQ_2 and RQ_4) will also be addressed and answered in a real-world context and reported on in Chapter 4 (RQ_2) and Chapter 5 (RQ_4). Chapter 4 will report on the results of a focus group and a survey conducted in a real-world corporate context for the planning stage of $eLEST_T$.

Chapter 4. e-Learning Problem Analysis and Planning: A Real-World Context

4.1 Introduction

Chapter 3 focused on the literature surrounding e-learning and a theoretical e-learning environment was proposed for software training in the workplace. Cycle 1: *Problem Investigation and Proposal* is reported on in this chapter where DBR and a case study research strategy are used to ground the literature investigated in Chapter 3 in a real-world context. The findings of this chapter will assist in planning for the requirements and subsequently, the design of the final artefact. The investigation and analysis of the problem, which involves the focus group and the e-learning survey, is considered part of Cycle 1: *Problem Investigation and Proposal* for this study. This chapter answers the following research questions from a practical real-world context:

> **RQ_2:** What are the barriers affecting the adoption of e-learning?
>
> **RQ_3:** What are the metrics affecting the intention to use and the satisfaction with using e-learning environments?

The chapter presents a set of specified research objectives to be met as a result of the findings of this chapter as well as the deliverables that are to be produced (Figure 4-1). The organisational considerations and guidelines for the case study must be identified (Section 4.2) and the CPT dimensions of e-learning pertaining to Korbitec must be considered (Section 4.3). A focus group was conducted at the case study company to gather more detailed insights into the context of this study and to plan for the requirements (Section 4.4). In order to contextualise this research in a real-world setting and to plan for the success of the project, an e-learning survey was conducted at the company (Section 4.5). The demographic information results provide insights into the user roles of the study (Section 4.6). The results of the use of computer devices and applications questions provide insight into the respondents' use of technology (Section 4.7). An understanding of the respondents' perceptions of their self-efficacy, enjoyment and computer anxiety is obtained from the results (Section 4.8). The findings from questions related to previous experience with F2F training provide insight into what is important for respondents regarding their training (Section 4.9). The results of the sections regarding intention to use e-learning questions

(Section 4.10) and the satisfaction with using e-learning questions (Section 4.11) assist in planning the e-learning environment for the case study. The results of the metrics were aggregated, analysed and compared (Section 4.12). An analysis of the results enabled a number of conclusions to be made (Section 4.13).

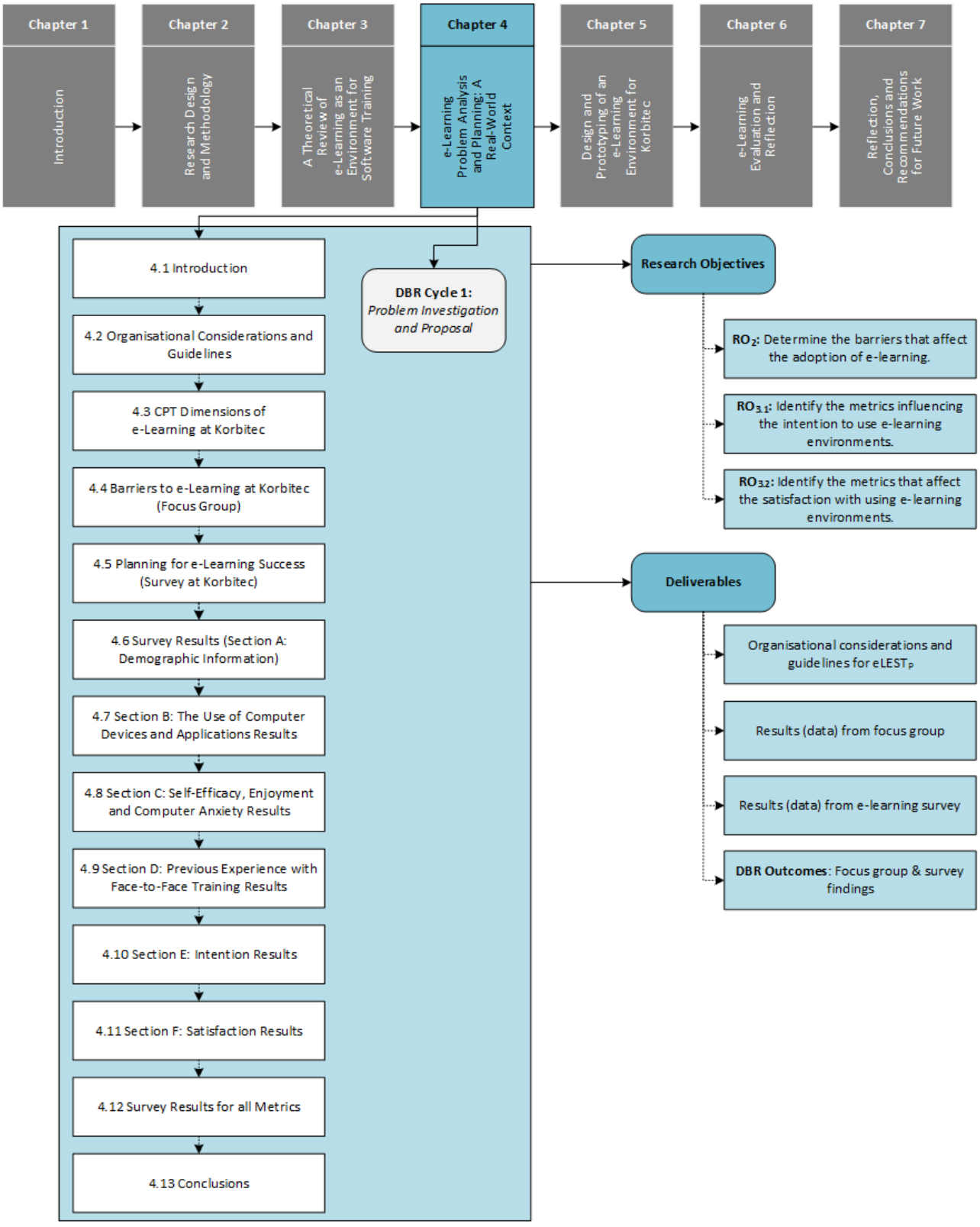

Figure 4-1: Chapter 4 Layout and Deliverables

4.2 Organisational Considerations and Guidelines

In order to plan for the Korbitec case study, eLEST$_T$ is implemented by identifying the necessary outputs or the sources of the outputs related to the case study (Table 4-1). The case-specific organisational considerations and guidelines related to organisational culture and context; policies and standards; e-learning user roles; e-learning dimensions; and organisational-specific criteria are identified. Additionally, during planning, e-learning barriers, CSFs, the intention to use e-learning and the satisfaction with using e-learning related to the case study are investigated.

Table 4-1: Application of eLEST$_T$ to Case Study – Stage 1 (Planning)

<table>
<tr><th colspan="2">Planning</th></tr>
<tr><th>OUTPUTS</th><th>Examples of application to case study</th></tr>
<tr><td colspan="2">Organisational considerations and guidelines</td></tr>
<tr><td>○ Organisational culture and context</td><td rowspan="5">Interviews with the stakeholders of the case study will reveal the following from an internal perspective:
○ The company's organisational culture and context in relation to how e-learning is conceptualised, designed and utilised;
○ The company's policies that govern e-learning and the standards surrounding how e-learning is handled;
○ The types of users that are involved in online software training;
○ The current uses of content, pedagogy and technology within the company in terms of:
• The types of content used for software training (content);
• The company's current software training programs and assessment techniques (pedagogy); and
• The company's current use of technology for software training (technology).
○ The criteria that are specific to the case study.</td></tr>
<tr><td>○ Policies and standards</td></tr>
<tr><td>○ Organisational-specific criteria</td></tr>
<tr><td>○ Roles in e-learning</td></tr>
<tr><td>○ e-Learning dimensions (content, pedagogy, technology)</td></tr>
<tr><td>• Barriers to e-learning</td><td>• A focus group will be conducted to determine potential barriers that learners may face; and
• An e-learning survey will enable respondents to rate the barriers derived from literature and the focus group.</td></tr>
<tr><td>• Critical success factors for e-Learning</td><td>• Interviews with the stakeholders of the case study will reveal the critical success factors for e-learning in the company.</td></tr>
<tr><td>• Intention to use e-learning</td><td>• An e-learning survey will determine the respondents' intention to use e-learning.</td></tr>
<tr><td>• Satisfaction with e-learning</td><td>• An e-learning survey will determine the respondents' satisfaction with using e-learning.</td></tr>
</table>

The planning of an e-learning environment as suggested in eLEST$_T$, entails considering the organisational culture, context, policies, standards and criteria (Section 4.2.1). Korbitec has a variety of users who are involved in F2F and online training administered through the KOTW (Section 4.2.2). A focus group was conducted with several F2F course participants at Korbitec in order to gain some perspective of what the problems are with the current method of training for Korbitec customers and what the participants' perceptions of e-learning is as well

as their intention to use e-learning (Section 4.4), which can be linked to the barriers to e-learning usage (Section 3.4).

4.2.1 Korbitec Culture, Context, Policies, Standards and Criteria

An interview was held with the general manager and national training manager at Korbitec (Joanne Jones & Peter Raine, personal communication, 25 February 2015). The purpose of this interview was to obtain a thorough understanding of the status and mindset surrounding e-learning at Korbitec at a strategic level. Korbitec has adopted a management strategy of converting their training provisions for customers and employees from traditional F2F training to an e-learning environment. Prior to the commencement of this study, Korbitec designed, developed and implemented the KOTW, which aimed to train the customers that utilise the software that Korbitec develops, as well as provide induction methods for new employees. However, some of the e-learning components in the KOTW were not obtaining the success that was expected. At the time of the interview, the KOTW was underutilised by customers and employees and was used mostly as a content management system where training documents were made available to trainees.

Korbitec ensures that there are resources, such as the style guide for interactive tutorials (Korbitec, 2016), available to their training team to ensure that consistency regarding the brand image is maintained in the e-learning components provided on the KOTW. An interview was held with the national training manager and content developers to understand the technical details of e-learning at Korbitec at an operational level (Roshan Fillies, Joanne Jones & Marcia Kitshoff, personal communication, 26 May 2015). The content development team at Korbitec is required to ensure that their e-learning components meet specific criteria and this criteria can be linked to the theory investigated in this study (Table 4-2). These criteria are the selected set from the proposed theoretical design guidelines.

Table 4-2: Link between Korbitec-Specific Criteria and Literature

Korbitec-specific criteria	Equivalent literature term	Reference	Link to Literature
Visual appeal	Visual appeal related to aesthetic design, colour, colour contrast, relevant graphics, supportive graphics and visual hierarchy must be accounted for.	Bartuskova and Krejcar (2014)	Table 3-2
Time suitability for tasks	The self-pacing principle relates to time suitability because the principle states that learners should be given control over the pace of learning so that deep processing and elaboration is fostered.	Van Merriënboer and Kester (2014)	Section 3.10.1.2
Corporate suitability	Corporate suitability relates to e-learning courses being relevant to learners' everyday business lives.	Moon *et al.* (2005)	Section 3.5
Consistency of e-learning components	The functional and aesthetic consistency of e-learning components as well as consistency in layout and structure must be considered.	Bartuskova and Krejcar (2014)	Table 3-2
Ability to encourage active learning	Intrinsic motivation relates to active learning as it represents the pursuit of an activity due to a genuine interest in the activity.	Deci *et al*. (1999)	Section 3.3.4
Accuracy of e-learning components	The accuracy of the information presented in e-learning components is important and can be considered a critical success factor for e-learning.	Jali and Zoubib (2014)	Section 3.5
Appropriate assessment mechanisms	Assessment mechanisms can be used to measure lower levels of cognitive skills such as memory, reproduction and understanding as well as higher levels of cognitive skills such as analysis, synthesis and evaluation, depending on the type of assessment.	Kim *et al.* (2008) and Zlatovic *et al.* (2015)	Section 3.3.3

According to Korbitec, visual appeal refers to the appealing presentation of e-learning components and time suitability for tasks describes the pacing of e-learning components and the appropriate allocation of time limits where necessary, such as with assessments. Corporate suitability refers to the ability for e-learning components to meet the context-specific requirements of the company. The consistency of e-learning components entails uniformity that is noticeable in both the visual presentation as well as the information presented in the e-learning components. The ability of e-learning components to encourage active learning describes the extent to which learners feel motivated to continue learning and to take responsibility for learning. The accuracy of the e-learning components refers to the information presented in the e-learning components and the extent to which this information can be considered correct. Appropriate assessment mechanisms describes the suitable usage of the various assessment techniques available, depending on the type of question being asked.

4.2.2 Roles at Korbitec

The participants in the case study predominantly consist of the customers of Korbitec but also include subject matter experts, content developers, training managers and training administrators. The customers are considered novice users of the Korbitec software and the employees are considered expert users. The employees consulted with in the case study have varying levels of knowledge and experience, as well as differing areas of expertise. Their participation in this study ensures that the quality of the proposed e-learning environment meets the needs of the company.

The stakeholders and job titles identified at Korbitec are in agreement with the work by Chikh and Berkani (2010) where support and learner members were distinguished according to their activities and responsibilities (Section 3.3.1). Some of the Korbitec job titles can be classified into more than one sub-role when linked to the support and learner user roles (Table 4-3). For example, the general manager at Korbitec cannot be linked to one sub-role because the general manager's activities and responsibilities involve the sub-roles of the coordinator as well as the manager.

Table 4-3: Classification of Korbitec Jobs Related to e-Learning

User Role (Chikh & Berkani, 2010)	Sub-role (Chikh & Berkani, 2010)	Korbitec Stakeholder/Job Title
Support	The coordinator	General manager
	The moderator	National training manager
	The manager	Content developer
	The reporter	Subject matter expert
	The administrator	Training administrator
Learner	The provider	
	The consumer	Customers

4.3 CPT Dimensions of e-Learning at Korbitec

During the application of $eLEST_T$ to the case study, the three CPT e-learning dimensions must be considered (Section 3.3.2). Technology is an important dimension of CPT and Korbitec uses the Moodle learning management system as a platform for their e-learning system (Section 4.3.1). When e-learning components need to be developed for Korbitec's software training

purposes, there is a specific process that is usually followed by content developers (Section 4.3.2).

4.3.1 Moodle as an e-Learning Platform

The technology dimension is addressed at Korbitec through the use of Moodle in the development of the KOTW. The purpose of the KOTW is to allow customers to electronically and remotely access support for Korbitec's software. The system was developed using Moodle as a foundation and was customised according to the company's specific needs and provisions made for customers.

Moodle is a popular open source learning platform (Gogan, Sirbu, & Draghici, 2015) and after careful consideration, Korbitec chose the Moodle platform as the basis for the KOTW. Moodle can be used as a tool to create dynamic online websites for users where effective learning can take place. It is an integrated and flexible learning platform that can be used to create customised learning environments (Moodle, 2014). Moodle is provided to users as open source software under the GNU General Public License which enables any user to extend or modify an instance of Moodle for either commercial or non-commercial purposes without the need to pay licensing fees. Moodle is scalable, which means that it can adapt to a growing organisation. There are roles that can be defined for users in Moodle and it is a very secure and robust system that can be personalised.

Moodle is very flexible and allows for assessment methods to be put in place such as "true or false" questions, "questions with a single correct version", "multiple choice questions" and "fill gaps". In Moodle, a variety of learning resources can be made available such as chats, forums, lecture notes and multimedia files containing graphics, video and audio. These assessment methods and learning resources are related to the content dimension of CPT e-learning environments (Figure 3-2). When working with a version of Moodle that has not been customised, the level of expertise required to administrate such a system is the same as for any word processor. If the implementing organisation requires more sophisticated learning content such as animations or software demonstrations, this would need to be developed in external multimedia or content authoring software.

Moodle has a strong grounding in pedagogical principles due to the fact that it was constructed in accordance with the teaching approach which emphasises the formation of

knowledge through active and interactive learning and learning using multi-sensory experiences with multimedia products (Brandl, 2005; Gogan *et al*., 2015). Gogan *et al*. (2015) synthesised the five main functionalities of Moodle, namely: online self-learning and virtual classroom (Section 1.1 and 3.2); online testing or evaluation (Section 3.3.3 and 3.10.2); communication and exchange; monitoring and control; and administration and security (Table 4-4).

Table 4-4: The Five Functionalities of Moodle (Adapted from Gogan *et al*., 2015)

Functionality	Description	Pedagogical
Online self-learning and virtual classroom	The self-training module enables the delivery of content in a pre-determined order, asynchronously, to the users and they have the power to browse the content at the pace they want. Virtual classroom enables the delivery of content to users, synchronous learning with the assistant of an instructor. The instructor and students can chat and the instructor has the ability to manage learner's instant tests and see the results immediately.	✓
Online testing or evaluation	The system allows the administration of tests with questions of varying types constructed from random sets of questions, corrections and automatic report generation. The platform allows teachers to plan evaluations at a set date and time, which will be shown to the students whilst the test is taken. At the allotted time, the test will close automatically and the system will show the results.	✓
Communication and exchange	There are forums for students so that they can interact with teachers or peers for discussion of any issues or the exchange of experience. The system allows users to exchange private messages. The messaging functionality supports the sending out of events and can be emailed to each user.	✓
Monitoring and control	The learning process can be monitored and controlled through reports which can be exported in a variety of formats for advanced analysis and printing. Examples of reports that can be generated include: online users list at a time, number of completed training activities, number of training activities not yet started, progress of a certain activity and test results.	
Administration and security	A controlled environment is provided for carrying out training by restricting access to users with a valid username and password or with an enrolment key. Each user is assigned a role which determines the rights of the user within the platform.	

4.3.2 e-Learning Components for Software Training Development Process

Whilst applying eLEST$_T$ to the case study, the CPT e-learning dimensions (Section 3.3.2) are again accounted for by Korbitec in the e-learning components development process. Before the commencement of this study, the technological tools that were used to develop e-learning components at Korbitec for the KOTW depended on the nature of the content being developed. For instructional documents, with step-by-step guidelines of how to accomplish tasks in the KOTW, Microsoft Word was used to type the instructions which were then

converted into a pdf document, along with static dynamics in the form of screenshots (Figure 4-2).

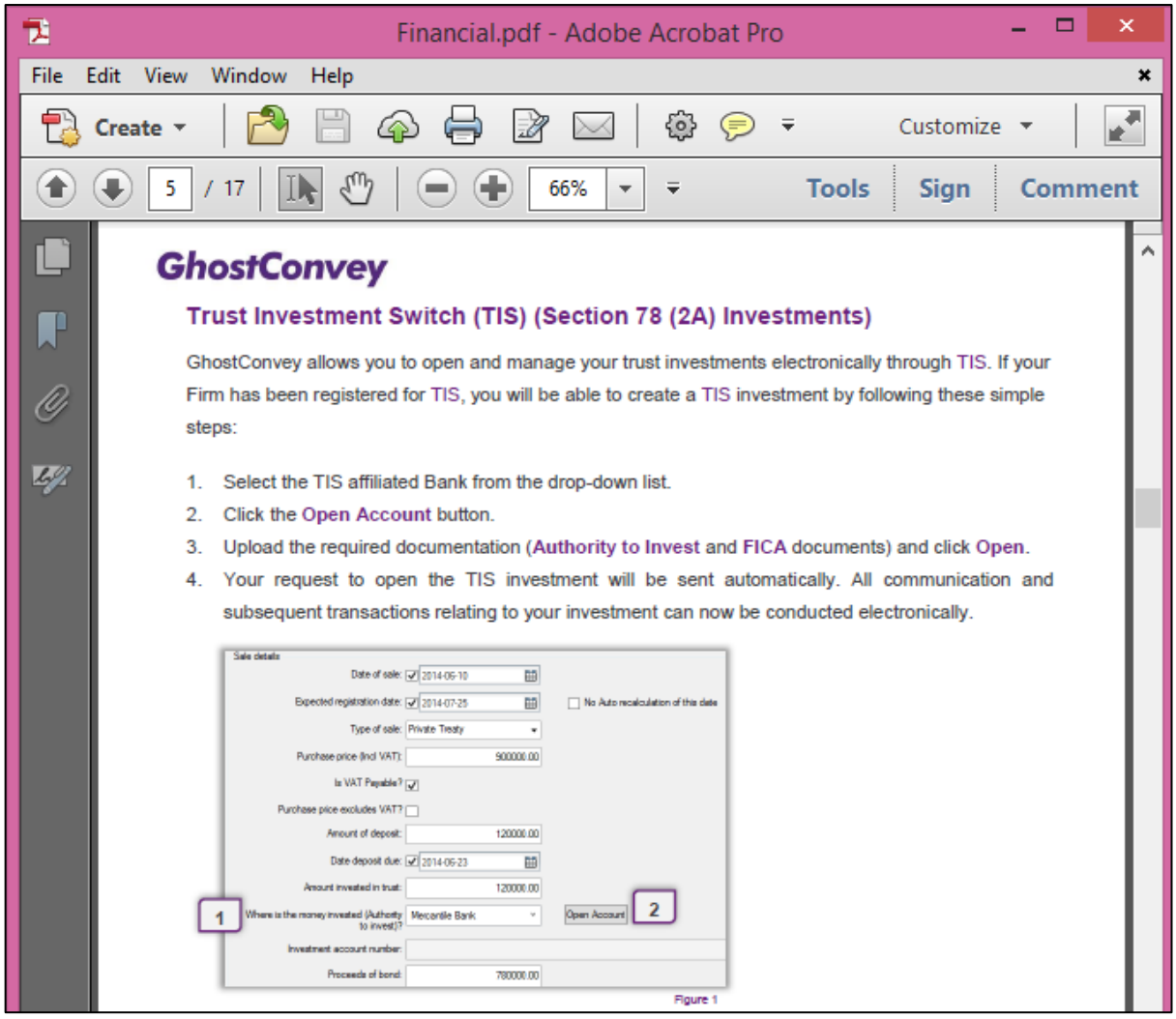

Figure 4-2: Example of Instructional Document in the KOTW

The content developers at Korbitec are required to undergo training for the courses that they are developing products for. This training is the same F2F training that customers would typically be involved in. They are required to produce a certificate of attendance to prove that they participated in a training course. The courses that the content developers participate in are F2F sessions that include a substantial amount of interaction with the software. The researcher of this study was required to undergo the same training that the content developers would partake in. Consequently, a certificate was issued for the training undertaken by the researcher (Appendix E).

4.4 Barriers to e-Learning at Korbitec (Focus Group)[5]

The application of $eLEST_T$ to the case study entails identifying the potential barriers that may hinder learners from using e-learning so that these barriers can be managed and reduced (Figure 3-8). This identification process also contributed to the exploration of a real-world problem (DBR Cycle 1: *Problem Investigation and Proposal*), a qualitative study was conducted to provide additional clarification of the problems faced by Korbitec customers involved in F2F software training and the required assessments as well as what their perceptions of e-learning is, along with the potential barriers to e-learning. This study was exploratory and used a focus group as proposed (Section 4.4.1). Exploratory research is conducted from a broad perspective initially and as it progresses, results are manifested (Adams & Schvaneveldt, 1991). The sample for the focus group was drawn from participants attending a corporate F2F software training course at Korbitec. Qualitative data analysis was used since it is able to provide more detailed and nuanced understanding of phenomena (Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010). The results of the focus group were organised into themes, namely: assistance (Section 4.4.2), social interaction (Section 4.4.3), personal (Section 4.4.4) and external factors (Section 4.4.5).

4.4.1 Focus Group Overview

Eight participants took part in a focus group and the participants were clients of Korbitec who needed training on the company's software products. The study was described to the participants prior to their involvement and all participants provided informed consent prior to participating in the focus group. The participants were encouraged to express their opinions and contribute aspects that they considered important and applicable to the study. Data was collected from participants through the use of a semi-structured audio-recorded focus group guided by a series of open-ended questions. Audio recordings were transcribed verbatim and themes were identified from the responses by employing thematic analysis techniques (Adams & Schvaneveldt, 1991).

[5] The results reported on in this section were obtained from research that was published as a full double-blind peer-reviewed conference paper at the International Development Informatics Association (IDIA) in November 2015. Esterhuyse, M & Scholtz, B. Barriers to e-Learning in a Developing Country: An Explorative Study. IDIA Conference. Zanzibar, Tanzania. **(Appendix B)**

The aim of the focus group was to obtain rich data concerning F2F training and to obtain insights into the barriers to e-learning as well as the opinions of e-learning. None of the participants had ever used an e-learning system prior to the study. Therefore, a formal definition of e-learning was conveyed to the participants so that they could contribute to the study based on their perceptions surrounding the idea of e-learning. A more accurate response was ensured because participants were not required to be aware of or understand e-learning.

The selection of the focus group participants was opportunistic as the participants were unaware that a focus group had been planned for the day's activities. There are advantages and limitations of spontaneous focus groups. A shallow understanding may be obtained due to participants being unprepared for the activity, yet if participants were prepared for the focus group, the risk that effort would be made to access an e-learning system prior to the focus group would be evident and this could skew the data collected and a learning curve would be evident (Hrastinski & Aghaee, 2012). There were seven female participants and one male participant and this is representative of the customer base of Korbitec. Of the eight participants, seven were between the ages of 40 and 59, and one participant was between the ages of 18 and 24.

Summaries of the main responses were made in order to remove the noise present in the focus group such as discussions of topics unrelated to the study. The summaries enabled the researcher to focus on the key points and themes that emulated from the focus group (Saunders, Lewis, & Thornhill, 2009). According to Braun and Clarke (2006), there are six phases of thematic analysis. The first phase involves familiarisation with the data whilst the second phase entails the initial coding of the data collected. In this study, the familiarisation with the data was achieved by transcribing the focus group recording to text by listening to the recording and reading the data several times to ensure accuracy. The data was then organised into preliminary groups of codes. The search for potential themes and the revision thereof are the steps of the third and fourth phases. The analysis of the data entailed organising the initial codes under broader themes and these themes were verified against the complete data set. The last two phases of thematic analysis involve the identification and reporting of themes. The thematic analysis resulted in identifying four principle themes, namely: assistance, social interaction, personal and external factors (Figure 4-3).

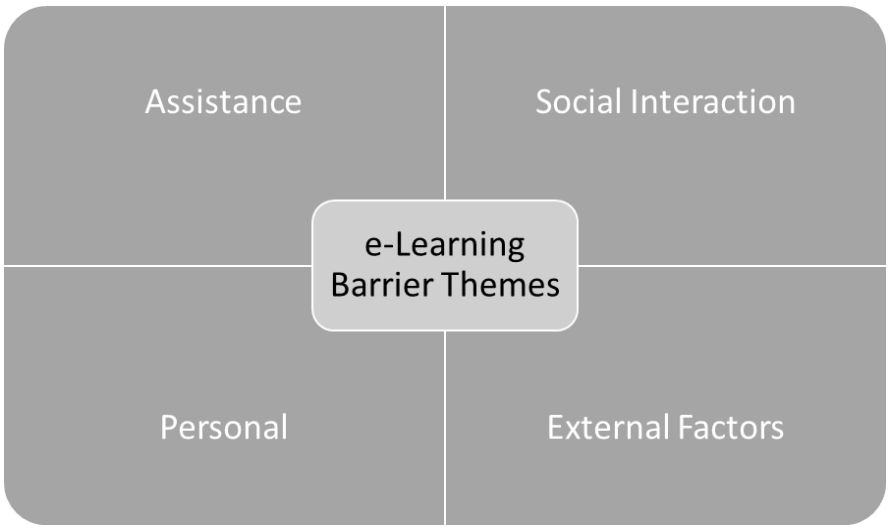

Figure 4-3: e-Learning Barrier Themes

4.4.2 Assistance

The participants were in agreement that a clear advantage of F2F training is the ability to ask questions where a trainer is available to answer immediately. Participants also find it advantageous that tasks may be demonstrated for learners on the computer. A suggestion to improve F2F training according to the participants is to have an assistant at the office after training has been conducted to assist with tasks when users cannot proceed any further. One of the participants stated that:

> *"It is a factor of frustration if you are stuck and you try and try and struggle all the time, whereas if there is someone there, you can get help immediately and move on, otherwise you are going to sit there with the same problem, time wasting, counter-productive."*

This statement was the only comment regarding the assistance theme and further discussion from the other participants surrounding this theme occurred. The statement made by the participant is related to the e-learning barrier framework for e-learning concerning the social interaction barrier dimension and specifically, the barrier involving isolation and decreased motivation.

4.4.3 Social Interaction

There was a substantial amount of general discussion and agreement surrounding the social interaction theme and comments were made from all eight participants. Participants indicated that they like learning from problems that other learners face in a F2F training environment. Regarding suggestions to improve F2F training, participants specified that they would prefer not to have the F2F courses modified in terms of social interaction and that they

enjoy interacting with the trainer. Participants stated that home is where there are interruptions as well as demands and this is usually where learners would interact with e-learning systems. Participants furthermore mentioned that they would feel isolated using e-learning. This feeling of isolation relates to the social interaction barrier dimension of the e-learning barrier framework for e-learning (Figure 3-4) and confirms the study by Akaslan *et al*. (2012).

4.4.4 Personal

There were three noteworthy statements made by participants concerning the personal theme and further discussion from the other participants surrounding this theme occurred. Car parking provision, time sacrifice and the compulsory nature of training were some of the personal barriers to F2F training that were identified. Alternatively, participants identified some of the benefits of F2F training. One participant noted that:

> "*Barriers are external factors, as with training there is always a positive outcome. You come to get information. Yes there are obstacles, parking issues, time issues, time away from the office which is a bad thing, your boss is forcing you to be here, you don't want to be here but at end of day there is always a positive outcome. So you overcome the barriers to better yourself at the end of the day."*

The statement concerning overcoming the barriers was made by the same participant whose comment was reported on in the assistance theme. Participants stated that the perceived barriers to e-learning include the lack of time during working hours to dedicate to e-learning. Participants mentioned that if e-learning helps to increase productivity, then time devotion to e-learning is strongly motivated. Participants agreed that if learning periods are short and not mentally straining, the prospect of them participating in e-learning is increased. An older female participant made the comment:

> *"I prefer e-learning, I like being tech-savvy, being technologically oriented, not good at making notes in F2F training."*

Conversely, a middle-aged female participant indicated:

> *"At school, we are accustomed to traditional learning, and a change of mind is necessary to go electronic because for us, this is easier. Today's youth have the Internet, they have*

Whatsapp, Skype and they are used to technology and it is the way forward. We have to adapt, some are slower to adapt than others."

This comment regarding the difficulty involved in adopting the latest technological innovations can be related to the lack of resources barrier dimension of the e-learning barrier framework (Figure 3-4), specifically to the computer competency barrier category.

4.4.5 External Factors

There was a substantial amount of general discussion and agreement surrounding the external factors theme and one noteworthy comment was reported on. Participants were in agreement that an advantage of F2F training is the time away from the office or having to work. On the other hand, having to commute to sessions for F2F training and having to wake up earlier than usual if the venue requires further travel distance is considered a barrier. Regarding the intention to use e-learning, not having to commute to sessions makes e-learning appealing to participants. Barriers to e-learning related to external factors such as Internet speed were described by participants. A participant felt that:

"Working on a very slow server where content just keeps loading and loading is frustrating."

This sentiment is in agreement with the studies on e-learning barriers in developing countries (Table 3-1) reported by Atanda and Ahlan (2014) and Bhuasiri *et al*. (2012) as well as the barrier category in the e-learning barrier framework involving the lack of resources, specifically the barrier concerning Internet access (Figure 3-4). Thus, a link is made between the theory and the results of the focus group regarding Internet access and the experience of participants using the Internet in developing countries.

Although the focus group was undertaken with a small sample size at a F2F training course, the results are valuable in providing an in-depth understanding of the e-learning barriers faced by users and to contextualise the problem to be solved by this study in a real-world setting. The empirical findings clarify that participants can identify potential barriers to e-learning despite not having used e-learning before. Depending on the severity of the barrier, it is clear that barriers can discourage learners from using e-learning and this can therefore affect the success of such systems (Section 3.8). In order to support e-learning initiatives and improve the chances of e-learning success in developing countries, the infrastructure of

organisations needs to improve. The e-learning barriers, particularly those that affect the intention to use, should be addressed if the success of such systems is valued.

4.5 Planning for e-Learning Success (Survey at Korbitec)[6]

In the course of planning for the case study according to eLEST$_T$, an e-learning survey was conducted to measure the intention to use e-learning (Section 3.6.1) and the satisfaction with using e-learning (Section 3.6.2) at Korbitec and was predominantly based on the model derived by Chatzoglou *et al.* (2009). The model was updated by the findings of the literature review (Figure 4-4). The model proposes that the success of e-learning usage intention and satisfaction can be determined by measuring three metrics: computer anxiety, self-efficacy and enjoyment (Section 4.5.1). The e-learning survey (Section 4.5.2) that aims to measure the metrics said to influence intention and satisfaction is validated by expert reviewers (Section 4.5.3). In order to ensure that a reliable and consistent set of data was obtained, the Cronbach's alpha coefficients were calculated for the metrics (Section 4.5.4).

4.5.1 e-Learning Success Model

The literature review revealed relationships between intention to use e-learning, satisfaction and the three metrics said to influence the aforementioned: self-efficacy, enjoyment and computer anxiety (Section 3.6). Several hypotheses were formulated by following a similar method to Chatzoglou *et al.* (2009) who undertook a study that measured the intention of employees to accept web-based training. The hypotheses were identified based on the theories concerning computer anxiety, self-efficacy, enjoyment, intention and satisfaction with e-learning. A model of e-learning success incorporating the hypotheses was designed (Figure 4-4). The following hypotheses were proposed in the model:

[6] The results reported on in this section were obtained from research that was published as:

a) A full double-blind peer-reviewed conference paper at the International Conference on Information Resources Management (Conf-IRM) in May 2016. Esterhuyse, M. & Scholtz, B. The Intention to Use e-Learning in Corporations. Conf-IRM Conference. Cape Town, South Africa. **(Appendix F)**
b) A double-blind peer-reviewed full journal article in the Interdisciplinary Journal of Information, Knowledge, and Management (IJIKM) in November 2016 (Vol. 11). Esterhuyse, M & Scholtz, B. Intention to Use and Satisfaction of e-Learning for Training in the Corporate Context. **(Appendix G)**

$H_{1.1}$: Computer anxiety has a negative effect on intention.

$H_{1.2}$: Self-efficacy has a positive effect on intention.

$H_{1.3}$: Enjoyment has a positive effect on intention.

$H_{1.4}$: Enjoyment and computer anxiety are negatively correlated.

$H_{1.5}$: Self-efficacy and computer anxiety are negatively correlated.

$H_{1.6}$: Enjoyment and self-efficacy are positively correlated.

$H_{1.7}$: Computer anxiety has a negative effect on satisfaction.

$H_{1.8}$: Self-efficacy has a positive effect on satisfaction.

$H_{1.9}$: Enjoyment has a positive effect on satisfaction.

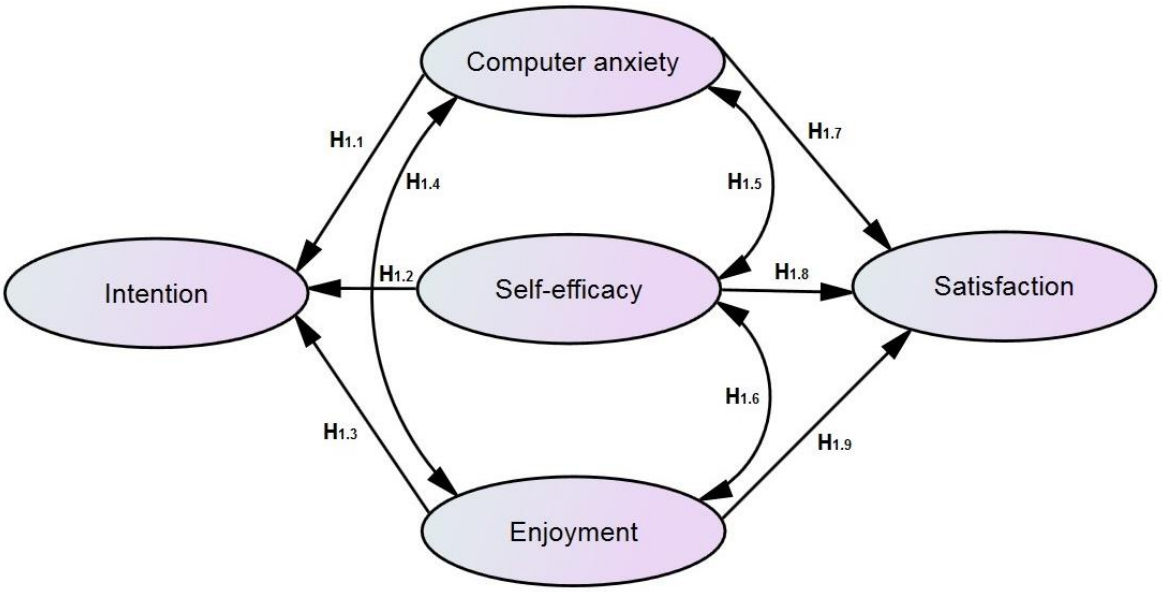

Figure 4-4: Model for e-Learning Success

It was decided to exclude the metrics of management support and learning goal orientation, since these metrics are outside of the scope of this study. The focus of this study is on user behaviour, attitude and intentions towards e-learning. The metrics of perceived usefulness and perceived ease of use were also omitted due to scope constraints. The metrics selected from the study by Chatzoglou *et al.* (2009), namely self-efficacy, enjoyment and computer anxiety, were selected based on their suitability to the target profile. The target profile is a female conveyancing secretary who is 30 years old, Afrikaans-speaking and has experience with using GhostConvey software.

4.5.2 e-Learning Survey

A survey research strategy was adopted in order to empirically test the e-learning success model proposed. In the respondent pool of this study, there were two groups of respondents: those who have never used an e-learning system before and those who have used or are currently using e-learning. This study measured the first respondent pool's intention to use an e-learning system and the second respondent pool's satisfaction with e-learning systems, which is a metric that was not included by Chatzoglou *et al.* (2009) but has been added for the purposes of this study.

The *e-Learning Survey* (Appendix H) was used to source data for Cycle 1: *Problem Investigation and Proposal* using an online survey tool, namely Google Forms, where data can be exported to a variety of formats including spreadsheets. The structured survey was distributed electronically to the customer base of Korbitec using email and there were 94 respondents. The target respondents have varying levels of expertise and familiarity in the field of e-learning in the corporate context. Due to Korbitec's interest in the results of the survey, a report was generated for the company (Appendix I).

The survey measured seven metrics, namely: barriers to e-learning, self-efficacy, enjoyment, computer anxiety, F2F training, intention and satisfaction. The questionnaire was divided into five sections (Figure 4-5). It was obligatory for all respondents to answer Sections A, B, C and D but respondents only had to answer Section E: Intention or Section F: Satisfaction, depending on whether they had used an e-learning system before. The items in the questionnaire used to measure the intended metrics had five-point semantic differential scales where there were opposing levels such as Least Preferred and Most Preferred.

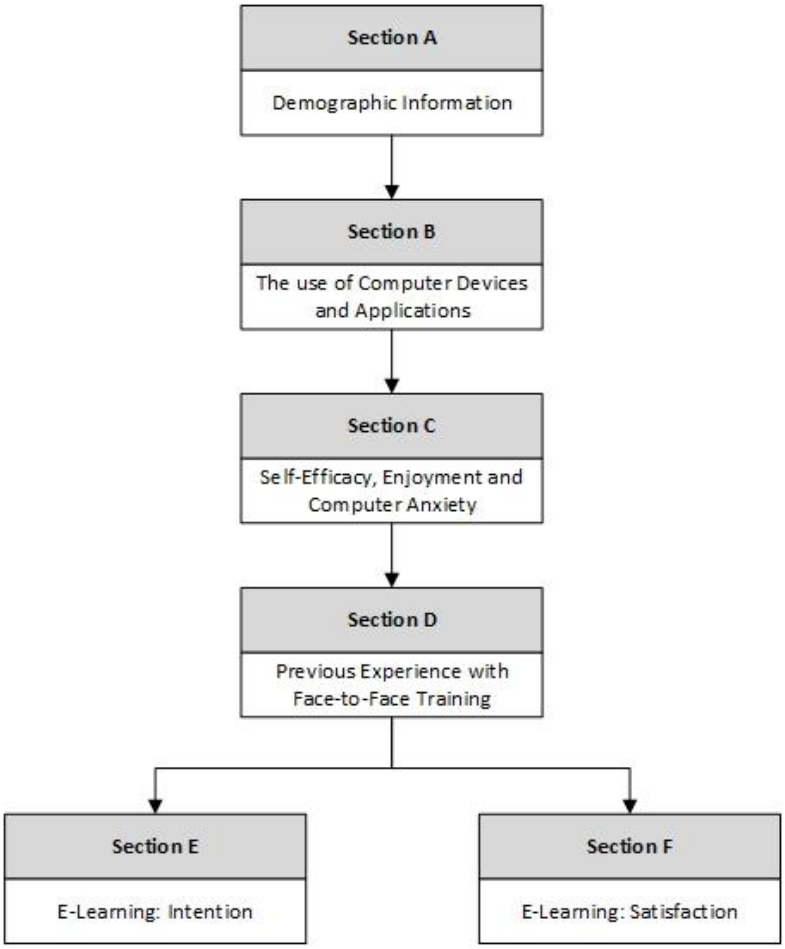

Figure 4-5: e-Learning Survey Design

4.5.3 Expert Review

The validity of the survey was established through a survey pre-testing process (Zikmund, 2003). Two academic expert users and three industry expert users were asked to make remarks regarding the research survey instructions and to point out any drawbacks or lack of clarity in the items observed. Academic Expert 1 made comments to ensure that the survey items would produce the results that the study aimed to measure and to ensure that the survey is aligned with the literature surrounding the problem at hand. Academic Expert 2 was concerned with the statistical validity of the survey items and suggested that a few changes be made to the structural model of the survey. Industry Expert 1 analysed the survey from the perspective of Korbitec to ensure that the survey was aligned with the brand image and was appropriate to be distributed to their customer base. Industry Experts 2 and 3 analysed the survey from the perspective of the customers of Korbitec to ensure that the customers would complete the survey and that all the survey items were clear. Industry Expert 3 was a

language editor and suggested a few instances of language editing that had to be considered and implemented.

4.5.4 Validity and Reliability of Survey Data

The reliability, related to internal consistency, of the data obtained from the quantitative feedback was measured using Cronbach's alpha. The Cronbach's alpha coefficients for the seven metrics investigated varied between 0.61 and 0.92 (Table 4-5). Self-efficacy, enjoyment and F2F training were the metrics scoring below the commonly acceptable value of 0.70; however, some authors argue that a Cronbach's alpha value between 0.60 and 0.70 is satisfactory for exploratory research (Gravetter & Wallnau, 2009). Consequently, the results derived from the responses to the questionnaire can be considered as fairly reliable.

Table 4-5: Cronbach's Alpha Coefficients – All Metrics

Metric	n	Cronbach's α
Barriers	94	0.87
Self-Efficacy	94	0.64
Enjoyment	94	0.61
Computer Anxiety	94	0.76
Face-to-Face Training	94	0.68
Intention	52	0.92
Satisfaction	42	0.89

4.6 Survey Results (Section A: Demographic Information)

A variety of descriptive statistics were calculated based on the five items of Section A of the survey, namely Demographic Information. Respondents were classified according to their gender (Table 4-6), home language (Table 4-7), age (Table 4-8), highest level of education (Table 4-9) and computer experience (Table 4-10). The proportion of female respondents in relation to male respondents is noteworthy. A total of two males (2%) and 92 females (98%) responded to the survey. However, this ratio is representative of the customer base of Korbitec. With regards to home language, the majority of the respondents speak Afrikaans (53%) with English being spoken by 37 of the respondents (39%) and six of the respondents speak another African language such as Zulu, Pedi or Tswana (6%) whilst one respondent spoke another European language, namely German (1%). There were no Xhosa-speaking respondents.

Table 4-6: Frequency Distribution – Gender (n = 94)

Item	n	%
Male	2	2%
Female	92	98%

Table 4-7: Frequency Distribution – Home Language (n = 94)

Item	n	%
Afrikaans	50	53%
English	37	39%
Xhosa	0	0%
Other African	6	6%
Other European	1	1%

The majority of the respondents fell within the 25 to 39 age group (61%) and 23 of the respondents were between the ages of 40 and 49 (24%). Some of the respondents were over the age of 50 (14%) and one respondent fell within the 18 to 24 age group (1%). The frequency distribution of the highest level of education obtained by respondents show that the majority of respondents have a high school level of education or a qualification of equal standard (68%). A total of 12 respondents stated that their highest level of education was at vocational or technical school (13%) and eight respondents hold a Bachelor's degree (9%). Some of the respondents have Honour's degrees or a four-year equivalent qualification (6%) and a frequency result of two was obtained for both respondents with some high school and with Master's degrees (2%).

Table 4-8: Frequency Distribution – Age (n = 94)

Item	n	%
18 - 24	1	1%
25 - 39	57	61%
40 - 49	23	24%
50 +	13	14%

Table 4-9: Frequency Distribution – Highest Level of Education (n = 94)

Item	n	%
Some High School (no National Senior Certificate)	2	2%
High School or equivalent	64	68%
Vocational/Technical School	12	13%
Bachelor's Degree	8	9%
Honour's Degree/4-year equivalent	6	6%
Master's Degree	2	2%

The frequency distribution of computer experience indicates that 51 respondents believe that they are expert users and can troubleshoot problems and work without assistance to complete tasks (54%). A total of 41 respondents believe that they have intermediate computer experience and are comfortable to use computers to complete end-user tasks (44%). Some of the respondents consider their computer experience to be at novice level due to their ability to perform only basic tasks (2%).

Table 4-10: Frequency Distribution – Computer Experience (n = 94)

Item	n	%
Novice user – I can perform basic tasks using a computer, but don't use them regularly	2	2%
Intermediate user – I am comfortable using a computer and can use many end-user commands	41	44%
Expert user – I am able to successfully troubleshoot problems and work independently to accomplish tasks	51	54%

4.7 Section B: The Use of Computer Devices and Applications

The second section of the survey was concerned with the use of computer devices and applications and there were 12 items that were recorded. Questions related to devices owned and used; social media websites accessed; e-learning appeal and training material preference; barriers to e-learning; and webinars were recorded. The respondents were asked which devices they own and were able to select multiple options which were: smartphone, tablet, laptop, personal desktop computer, work desktop computer and an option for Other (Table 4-11). From this item, the number of devices owned by respondents could be deduced (Table 4-12).

Table 4-11: Frequency Distribution – Computer Devices Owned (n = 94)

Item	No		Yes	
	n	%	n	%
Smartphone	24	26%	70	74%
Tablet	54	57%	40	43%
Laptop	45	48%	49	52%
Personal Desktop Computer	71	76%	23	24%
Work Desktop Computer	30	32%	64	68%
Other	94	100%	0	0%

Table 4-12: Frequency Distribution – Number of Devices Owned (n = 94)

Item	n	%
One	20	21%
Two	24	26%
Three	29	31%
Four	14	15%
Five	7	7%

With regards to the type of devices owned by respondents, the majority of respondents own a smartphone (74%), whilst 64 respondents have a desktop computer at work (68%), 49 own laptops (52%), 40 own tablets (43%) and 23 of the respondents have desktop computers at home (24%). A total of 29 respondents own three computer devices (31%), whilst 24 of the respondents own two devices (26%), 14 respondents own four devices (15%) and seven respondents own five devices (7%). None of the respondents recorded another type of device owned.

The respondents were then asked which of the devices they own are used to connect to social media websites. They were able to select multiple options including the ability to indicate that they do not use social media (Table 4-13). From this item and due to the ability of respondents to select multiple options, the total number of devices used to connect to social media websites could be deduced (Table 4-14).

Table 4-13: Frequency Distribution – Computer Devices used for Social Media (n = 94)

Item	No		Yes	
	n	%	n	%
I use social media	4	4%	90	96%
Smartphone	25	27%	69	73%
Tablet	64	68%	30	32%
Laptop	65	69%	29	31%
Personal Computer	74	79%	20	21%
Work Computer	74	79%	20	21%
Other	94	100%	0	0%

Table 4-14: Frequency Distribution – Number of Devices used for Social Media (n = 94)

Item	n	%
None	4	4%
One	41	44%
Two	27	29%
Three	16	17%
Four	5	5%
Five	1	1%

A total of 69 respondents use their smartphone to connect to social media websites (73%). A frequency of 30 was obtained for respondents using tablets to connect to social media websites (32%), 29 respondents use their laptops (31%) and a shared result of 20 respondents use personal or work computers (21%). Four respondents stated that they do not use social media (4%) and none of the respondents used another device to connect to social media websites. Results show that 41 of the respondents use one device to connect to social media websites (44%). A total of 27 respondents use two computer devices to connect to social media websites (29%) whilst 16 use three devices (17%), five respondents use four devices (5%), four respondents use no devices as they do not use social media (4%) and one respondent uses five devices to connect to social media (1%).

Respondents were required to state which social media websites they use and how often they use them which could be either: never or very seldom which is less than once a month, seldom which is once or twice a month, occasionally which is once a week or more, frequently which is every day and always which is numerous times a day (Table 4-15). A total of 41 respondents access Facebook on a frequent basis (44%) and 25 respondents access Facebook multiple times a day (27%) whilst Instagram is used very seldom or never (81%). A total of 66

respondents never use Twitter or use it very seldom and the same can be said for YouTube (39%) and LinkedIn (63%).

Table 4-15: Frequency Distribution – Social Media Websites (n = 94)

	Very Seldom or Never (Less than once a month)		Seldom (Once or twice a month)		Occasionally (Once a week or more)		Frequently (Everyday)		Always (Numerous times a day)	
Facebook	10	11%	4	4%	14	15%	41	44%	25	27%
Twitter	66	70%	12	13%	10	11%	3	3%	3	3%
Instagram	76	81%	7	7%	5	5%	2	2%	4	4%
YouTube	37	39%	21	22%	30	32%	4	4%	2	2%
LinkedIn	59	63%	20	21%	10	11%	5	5%	0	0%

The appeal of e-learning was measured by asking respondents to rate the extent to which they think e-learning would appeal to them on a semantic differential scale where 1 indicates *Strongly Disagree* and 5 indicates *Strongly Agree* (Table 4-16). The majority of respondents strongly agreed that e-learning would appeal to them (64%).

Table 4-16: Frequency Distribution – Using an e-Learning Platform would Appeal to me (n = 94)

Item	n	%
Strongly Disagree	1	1%
2nd option	0	0%
Neutral	13	14%
4th option	20	21%
Strongly Agree	60	64%

Respondents were asked to estimate the amount of time, on average, per week that they would have available to dedicate to e-learning. Options given were: less than one hour, one to two hours and more than two hours (Table 4-17). The majority of respondents stated that one to two hours would be suitable for them (54%) and some respondents have less than an hour available per week (30%).

Table 4-17: Frequency Distribution – Time Availability for e-Learning (n = 94)

Item	n	%
Less than 1 hour	28	30%
1 - 2 hours	51	54%
More than 2 hours	15	16%

The subsequent item measured by the survey is the online training material preference of respondents and three items were rated by respondents, namely: pdf documents with step-by-step instructions, interactive tutorials where the learner is involved in the self-paced

demonstration of tasks and video material which could be a visual recording of a task (Table 4-18). Respondents were required to rate each item on a semantic differential scale where 1 indicates *Least Preferred* and 5 indicates *Most Preferred*. The majority of the respondents prefer pdf documents when considering online training material (52%). A total of 35 respondents prefer videos for online training material (37%) and 29 respondents prefer interactive tutorials (31%). The result related to the preference of static training material rather than interactive training material can be influenced by a number of factors such as the quality of the training material that respondents had interacted with previously (Figure 3-5).

Table 4-18: Frequency Distribution – Online Training Material Preference (n = 94)

	Mean	Standard Deviation	Least preferred		2nd option		Neutral		4th option		Most preferred	
Item	**μ**	**σ**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
PDF documents (step-by-step instructions)	3.94	1.33	7	7%	10	11%	14	15%	14	15%	49	52%
Interactive tutorials (self-paced demonstration of task)	3.51	1.28	7	7%	15	16%	24	26%	19	20%	29	31%
Video (visual recording of task)	3.30	1.58	18	19%	17	18%	13	14%	11	12%	35	37%

Respondents were asked about their access to online videos and sound at their place of work (Table 4-19). A total of 67 respondents are able to view online videos at work (71%) and 74 respondents have access to sound which could be either through the use of speakers or earphones (79%).

Table 4-19: Frequency Distribution – The use of Computer Devices and Applications (n = 94)

Item	No		Yes	
	n	**%**	**n**	**%**
Can you view online videos at your place of work?	27	29%	67	71%
Do you have access to sound on your computer at work? This may be via the use of earphones or speakers.	20	21%	74	79%

With regards to barriers to e-learning, respondents were required to rate their perception of barriers that were extracted from literature[7]. Options given were: not a barrier, somewhat of

[7] The results reported on in this paragraph were obtained from research that was published as a full double-blind peer-reviewed conference paper at the International Development Informatics Association (IDIA) in

a barrier, moderate barrier and extreme barrier (Table 4-20). A total of 15 respondents rated their concern for the privacy of their personal information as an extreme barrier (16%), whilst 14 respondents reported the security of their personal information as an extreme barrier (15%). The majority of the respondents considered their computer competency not to be a barrier (74%) and 65 respondents considered computer ownership and availability not to be a barrier to e-learning (69%).

Table 4-20: Frequency Distribution – Barriers (n = 94)

Item	Mean	Standard Deviation	Not a barrier		Somewhat of a barrier		Moderate barrier		Extreme barrier	
	μ	σ	n	%	n	%	n	%	n	%
Unreliable electricity supply	2.17	1.02	29	31%	33	35%	19	20%	13	14%
Computer ownership and availability	1.67	1.08	65	69%	5	5%	14	15%	10	11%
Internet access and speed	1.80	1.07	52	55%	20	21%	10	11%	12	13%
Computer competency of learner	1.46	0.88	70	74%	8	9%	12	13%	4	4%
Face-to-face training preference	1.69	0.92	52	55%	25	27%	11	12%	6	6%
Privacy of personal information	1.93	1.11	46	49%	23	24%	10	11%	15	16%
Security of personal information	1.97	1.10	43	46%	24	26%	13	14%	14	15%
Feeling isolated	1.46	0.80	64	68%	20	21%	6	6%	4	4%

Respondents were required to state if they had participated in a webinar before (Table 4-21). A total of 39 respondents had never participated in a webinar before (41%) and more than half of the respondents had participated in a webinar before (59%). Respondents that had participated in webinars previously were asked additional questions regarding webinars. Respondents were required to state the likelihood of participating in a webinar again (Table 4-22) and the majority said that it was very likely that they would utilise a webinar again (62%) and 17 respondents rated it likely that they would use a webinar again (31%). When asked about their preference of webinars to F2F training, the majority of respondents strongly agreed that they prefer webinars (40%) whereas 16 respondents were neutral with their response (Table 4-23).

November 2015. Esterhuyse, M & Scholtz, B. Barriers to e-Learning in a Developing Country: An Explorative Study. IDIA Conference. Zanzibar, Tanzania. **(Appendix B)**

Table 4-21: Frequency Distribution – Participation in a Webinar Previously (n = 94)

Item	n	%
No	39	41%
Yes	55	59%

Table 4-22: Frequency Distribution – Willingness to Participate in a Webinar Again (n = 55)

Item	n	%
Unlikely	2	4%
2nd option	0	0%
Neutral	2	4%
4th option	17	31%
Very Likely	34	62%

Table 4-23: Frequency Distribution – Preference of Webinars to F2F Training (n = 55)

Item	n	%
Strongly Disagree	4	7%
2nd option	4	7%
Neutral	16	29%
4th option	9	16%
Strongly Agree	22	40%

4.8 Section C: Self-Efficacy, Enjoyment and Computer Anxiety Results

Respondents were asked four questions related to self-efficacy and were required to rate their responses on a semantic differential scale where 1 indicates *Strongly Disagree* and 5 indicates *Strongly Agree*. When asked about the degree to which respondents agreed with feeling confident using a computer without assistance, the majority stated that they strongly agreed (83%), whilst eight respondents (9%) were neutral with their response (Table 4-24). With regards to the respondents' agreement with finding it easy to adapt to new software versions, 68 respondents stated they strongly agree (72%) and 14 respondents were neutral with their response (15%). A total of 69 respondents (73%) strongly agreed that when faced with a problem that is computer-related, they try and solve the problem first before asking for assistance and 17 respondents agreed with the statement (18%). When a problem cannot be solved on the first attempt whilst using a computer, 66 respondents strongly agree that they would try again (70%), whilst 22 respondents agree that they would try again (23%).

Table 4-24: Frequency Distribution – Self-Efficacy Items (n = 94)

Item	Mean	Standard Deviation	Strongly Disagree		2nd Option		Neutral		4th Option		Strongly Agree	
	μ	σ	n	%	n	%	n	%	n	%	n	%
I feel confident using a computer without any assistance.	4.68	0.81	2	2%	0	0%	8	9%	6	6%	78	83%
I find it easy to adapt to new software versions.	4.45	0.97	0	0%	6	6%	14	15%	6	6%	68	72%
When faced with a problem whilst using a computer, I try solving it myself before calling for assistance.	4.63	0.70	0	0%	2	2%	6	6%	17	18%	69	73%
If I cannot solve a problem on my first attempt whilst using a computer, I try again.	4.57	0.80	0	0%	6	6%	0	0%	22	23%	66	70%

Respondents were asked three questions related to their enjoyment of using computers and were required to rate their responses on a semantic differential scale where 1 indicates *Strongly Disagree* and 5 indicates *Strongly Agree*. When asked about the degree to which using computers to complete daily tasks is pleasant, the majority of the respondents stated that they strongly agreed (91%), whilst five respondents disagreed (Table 4-25). With regards to having fun solving problems using a computer, 48 respondents stated they strongly agree (51%) and 25 respondents agree (27%). A total of 66 respondents (70%) strongly agreed that they felt innovative because using a computer allows them to accomplish tasks and 13 respondents agreed with the statement (14%).

Table 4-25: Frequency Distribution – Enjoyment Items (n = 94)

Item	Mean	Standard Deviation	Strongly Disagree		2nd Option		Neutral		4th Option		Strongly Agree	
	μ	σ	n	%	n	%	n	%	n	%	n	%
Using computers to complete daily tasks is pleasant.	4.78	0.79	1	1%	5	5%	0	0%	2	2%	86	91%
I have fun solving problems using a computer.	4.20	1.01	3	3%	2	2%	16	17%	25	27%	48	51%
Because using a computer allows me to accomplish tasks, I feel innovative.	4.51	0.84	0	0%	3	3%	12	13%	13	14%	66	70%

Respondents were asked four questions related to their computer anxiety and were required to rate their responses on a semantic differential scale where 1 indicates *Strongly Disagree* and 5 indicates *Strongly Agree*. When asked about the degree to which respondents agreed

that they hesitate to use a computer for fear of losing work that cannot be recovered, the majority stated that they strongly disagreed with the statement (82%) and 14 respondents (15%) disagreed (Table 4-26). With regards to the respondents' agreement with finding computers intimidating, 85 respondents stated they strongly disagree (90%) and seven respondents disagreed (7%). A total of 85 respondents (90%) strongly disagreed that they feel fearful of not being able to progress with their work as a result of errors made whilst using a computer and seven respondents disagreed (7%). With regards to feeling fearful of unfamiliar technology, 77 respondents strongly disagreed (82%) and 15 respondents disagreed with the statement (16%).

Table 4-26: Frequency Distribution – Computer Anxiety Items (n = 94)

Item	Mean	Standard Deviation	Strongly Disagree		2nd Option		Neutral		4th Option		Strongly Agree	
	μ	σ	n	%	n	%	n	%	n	%	n	%
I hesitate to use a computer for fear of losing work that cannot be recovered.	1.23	0.59	77	82%	14	15%	2	2%	0	0%	1	1%
Computers are intimidating to me.	1.16	0.63	85	90%	7	7%	0	0%	0	0%	2	2%
I fear that I won't be able to progress with my work as a result of errors made whilst using a computer.	1.14	0.52	85	90%	7	7%	1	1%	0	0%	1	1%
I have a fear of unfamiliar technology.	1.22	0.57	77	82%	15	16%	1	1%	0	0%	1	1%

4.9 Section D: Previous Experience with Face-to-Face Training Results

Respondents were asked whether they had attended F2F training previously. The majority stated that they had participated in F2F training before (96%) and three respondents (4%) had not (Table 4-27). Based on the respondents' answer to this question, only those who stated that they had attended F2F training before were required to continue with the next set of question items related to F2F training (Table 4-28).

Table 4-27: Frequency Distribution – Attendance of F2F Training Previously (n = 94)

Item	n	%
No	3	4%
Yes	91	96%

Respondents who had participated in a F2F training course previously were asked five items related to their F2F training experience by rating their responses on a semantic differential scale where 1 indicates *Strongly Disagree* and 5 indicates *Strongly Agree*. A total of 43 respondents (47%) indicated that they strongly agreed with the statement related to liking the interaction with fellow course attendees whilst 26 respondents were neutral with their response (29%). When asked about the degree to which respondents liked F2F training because of the free meal received, 49 respondents strongly disagreed with this statement (54%) and a shared result of 13% was obtained for neutral, agree and strongly agree scale items. The majority of respondents strongly agreed that the certificate of attendance received is important to them (57%) and 23 respondents agreed with this statement (25%). A total of 52 respondents stated that they strongly agree that receiving a certificate based on competency would be important to them (57%) and 24 respondents agreed (26%). The majority of respondents (75%) strongly agreed that they enjoyed F2F training because it gave them the opportunity to improve their skills.

Table 4-28: Frequency Distribution – F2F Training Items (n = 91)

Item	Mean	Standard Deviation	Strongly Disagree		2nd Option		Neutral		4th Option		Strongly Agree	
	μ	σ	n	%	n	%	n	%	n	%	n	%
I liked interacting with fellow course attendees.	3.87	1.19	1	1%	13	14%	26	29%	8	9%	43	47%
I liked the training because of the free meal I received.	2.25	1.53	49	54%	6	7%	12	13%	12	13%	12	13%
The certificate of attendance that I received is important to me.	4.32	0.98	3	3%	1	1%	12	13%	23	25%	52	57%
If I received a certificate of competence based on a mark I received for assessments, it would be important to me.	4.34	0.95	3	3%	0	0%	12	13%	24	26%	52	57%
I enjoyed the training because it gives me the opportunity to improve my skills.	4.64	0.77	2	2%	0	0%	4	4%	17	19%	68	75%

Respondents were required to state whether they had used an e-learning system before, and based on this answer, they answered a set of questions (Table 4-29). The 52 respondents who answered no (55%) to having used an e-learning system before were required to answer

questions based on their intention to use e-learning. The 42 respondents who answered yes (45%) to having used an e-learning system before rated their satisfaction with using e-learning.

Table 4-29: Frequency Distribution – Respondents Having Used an e-Learning System Before (n = 94)

Item	n	%
No	52	55%
Yes	42	45%

4.10 Section E: Intention Results

Respondents that had not used an e-learning system before were asked four questions related to their intention to use e-learning and were required to rate their responses on a semantic differential scale where 1 indicates *Extremely Unlikely* and 5 indicates *Extremely Likely*. When asked about the degree to which respondents intend to use e-learning for training when it is implemented, the majority rated it extremely likely (56%) and 12 respondents (23%) found it likely (Table 4-30). With regards to intention to use e-learning for training in order to improve performance, 35 respondents rated it extremely likely (67%) and 9 respondents were neutral with their response (17%). A total of 21 respondents rated it extremely likely that they would use e-learning for training on a regular basis (40%) and 19 respondents rated it likely (37%). With regards to respondents' intention to use e-learning instead of requesting assistance from facilities such as call centres, live chats or F2F training, the results show that a total of 24 respondents found this extremely likely (46%) and 16 respondents found it likely (31%).

Table 4-30: Frequency Distribution – Intention Items (n = 52)

Item	Mean	Standard Deviation	Extremely Unlikely		2nd Option		Neutral		4th Option		Extremely Likely	
	μ	σ	n	%	n	%	n	%	n	%	n	%
I intend to use e-learning for training when it is implemented.	4.27	1.01	2	4%	0	0%	9	17%	12	23%	29	56%
I intend to use e-learning for training in order to improve my performance.	4.35	1.08	2	4%	1	2%	9	17%	5	10%	35	67%
I intend to use e-learning for training on a regular basis.	4.08	1.01	2	4%	1	2%	9	17%	19	37%	21	40%
My intention is to use e-learning instead of requesting assistance (using call centre, live chat, face-to-face training).	4.02	1.23	4	8%	3	6%	5	10%	16	31%	24	46%

4.11 Section F: Satisfaction Results

Respondents who had used an e-learning system before were asked five questions related to their satisfaction with using e-learning and were required to rate their responses on a semantic differential scale where 1 indicates *Strongly Disagree* and 5 indicates *Strongly Agree*. When asked about the degree to which respondents achieved their learning goals whilst using e-learning, 29 respondents (69%) strongly agreed and six respondents (14%) agreed (Table 4-31). With regards to the degree to which respondents' agree that using e-learning helped them to improve their performance, 29 respondents (69%) strongly agreed and six respondents (14%) agreed. The majority of respondents strongly agreed that they were satisfied with using e-learning for training (74%) and five respondents agreed with this statement (12%). With regards to respondents' response to use e-learning for training on a regular basis, 31 respondents strongly agreed (74%) and six respondents agreed with this statement (14%). Respondents were asked whether they would recommend using e-learning for training to their colleagues and the majority strongly agreed that they would recommend e-learning (76%) and five respondents agreed (12%).

Table 4-31: Frequency Distribution – Satisfaction Items (n = 42)

Item	Mean	Standard Deviation	Strongly Disagree		2nd Option		Neutral		4th Option		Strongly Agree	
	μ	σ	n	%	n	%	n	%	n	%	n	%
I achieved my learning goals using e-learning.	4.40	1.08	2	5%	1	2%	4	10%	6	14%	29	69%
Using e-learning helped me to improve my performance.	4.45	0.94	0	0%	3	7%	4	10%	6	14%	29	69%
I was satisfied with using e-learning for training.	4.55	0.86	0	0%	2	5%	4	10%	5	12%	31	74%
I would use e-learning for training on a regular basis.	4.62	0.70	0	0%	0	0%	5	12%	6	14%	31	74%
I would recommend using e-learning for training to my colleagues.	4.62	0.76	0	0%	1	2%	4	10%	5	12%	32	76%

4.12 Survey Results for All Metrics

A semantic differential response scale of 1 to 5 was used to measure the seven metrics measured by the survey by calculating the average of the responses to the relevant items in the questionnaire. Thus, the respondents' perception of the metrics measured provided the results for each scale item (Table 4-32). The column headings of the frequency distributions

for the metrics describe how the metric scores were classified into ranges where square brackets indicate inclusion in the relevant interval and parentheses depict exclusion.

Table 4-32: Frequency Distributions – All Metrics

	Very Negative [1.00 to 1.80)		Negative [1.80 to 2.60)		Neutral [2.60 to 3.40]		Positive (3.40 to 4.20]		Very Positive (4.20 to 5.00]	
Barriers	62	66%	17	18%	12	13%	3	3%	0	0%
Self-Efficacy	0	0%	0	0%	8	9%	9	10%	77	82%
Enjoyment	0	0%	2	2%	4	4%	21	22%	67	71%
Computer Anxiety	87	93%	6	6%	0	0%	1	1%	0	0%
F2F Training	0	0%	2	2%	6	7%	25	27%	58	64%
Intention	2	4%	2	4%	5	10%	11	21%	32	62%
Satisfaction	0	0%	0	0%	8	19%	2	5%	32	76%

More than 60% of the respondents rated five of the seven metrics (self-efficacy, enjoyment, F2F training, intention and satisfaction) as Very Positive. The self-efficacy metric had the highest incidence of very positive ratings (82%). Computer anxiety was rated very negatively by the largest portion of respondents (93%) which is a positive result because if respondents rated computer anxiety positively, this would imply that they have an unconstructive perception regarding their capabilities concerning the tasks that they carry out using a computer. From this it can be deduced that respondents are therefore confident in their ability to use a computer to complete everyday tasks and do not fear computer usage.

Measures of central tendency, specifically the mean, as well as dispersion, specifically the standard deviation, were calculated for the seven metrics measured in this study (Table 4-33). The overall mean ratings show that respondents rated their self-efficacy the highest (M = 4.58) which is a very positive score, and rated computer anxiety the lowest (M = 1.19) which is a very negative score. Due to the ability for computer anxiety to negatively affect the intention to use a system, a negative rating for computer anxiety is a positive result which is a similar result to that obtained by Chatzoglou *et al*. (2009). The metric concerning Barriers also obtained a very negative score (M = 1.77) which is a positive result as it means that the majority of the respondents do not feel that barriers inhibit their e-learning usage. In addition to Self-Efficacy, Satisfaction (M = 4.52), Enjoyment (M = 4.50) and F2F Training (M = 4.29) obtained very positive mean scores; and Intention (M = 4.18) obtained a positive mean score.

Table 4-33: Overall Mean and Standard Deviation

Metric		Overall Mean Rating	Overall Standard Deviation
	n	M	S
Barriers	94	1.77	0.73
Self-Efficacy	94	4.58	0.82
Enjoyment	94	4.50	0.88
Computer Anxiety	94	1.19	0.58
F2F Training	94	4.29	0.70
Intention	52	4.18	1.08
Satisfaction	42	4.52	0.87

Correlations between the metrics were tested at the 95% significance level ($\alpha = 0.05$) and are deemed significant if they are both statistically and practically significant (Table 4-34). Statistical significance relies on the significance level as well as the size of the sample, for example, for a 0.05 significance level and sample size n = 94 (number of respondents for the survey), the absolute value of a correlation's coefficient must be greater than 0.203 in order to be statistically significant, whereas correlations greater than 0.300 are deemed practically significant (Gravetter & Wallnau, 2009). Significant correlations between the metrics are specified in bold red and italics while correlations that are statistically but not practically significant are depicted in plain red.

Table 4-34: Pearson Product Moment Correlations – All Metrics

	Barriers	Self-Efficacy	Enjoyment	Computer Anxiety	F-to-F Training	Intention	Satisfaction
Barriers	-	-.161	-.061	.010	.189	.019	-.215
Self-Efficacy	-.161	-	***.505***	-.267	-.057	.178	.284
Enjoyment	-.061	***.505***	-	-.240	.136	.209	***.338***
Computer Anxiety	.010	-.267	-.240	-	.093	-.164	-.005
F2F Training	.189	-.057	.136	.093	-	.139	.168
Intention	.019	.178	.209	-.164	.139	-	-
Satisfaction	-.215	.284	***.338***	-.005	.168	-	-

There were two significant relationships identified between *enjoyment* and *self-efficacy (r = 0.505)* and also between *enjoyment* and *satisfaction (r = 0.338)*. Some relationships were identified as statistically significant but not practically significant and these were:

- Self-efficacy and computer anxiety (r = -0.267);
- Self-efficacy and satisfaction (r = 0.284);
- Enjoyment and computer anxiety (r = -0.240); and
- Enjoyment and intention (r = 0.209).

Hypotheses associated with the relationships between enjoyment and self-efficacy ($H_{1.6}$) and between enjoyment and satisfaction ($H_{1.9}$) are supported by the outcome of the statistical analysis and thus are accepted (Table 4-35). The strongest direct relationship was calculated between enjoyment and self-efficacy (r = 0.505) and thus confirms that an enticing and fulfilling training program may lead trainees to establish new initiatives, to overcome complex job-related problems and to improve their self-esteem related to their jobs, which has been confirmed in earlier studies (Chatzoglou *et al*., 2009; Yi & Hwang, 2003). The second strongest direct relationship was between enjoyment and satisfaction (r = 0.338). Consequently, it can be deduced that trainees use e-learning because they believe that the training process is interesting, beneficial and enjoyable and because of this, trainees are content to use it. On the contrary, if trainees perceive e-learning to be boring and of no real value, trainees will not be eager and motivated enough to participate in the training process. This result is in agreement with the relationship between enjoyment and satisfaction established by Kang and Lee (2010). The remaining seven hypotheses originally proposed are not accepted because the relevant correlations are not significant.

To conclude, by taking into account the results of the Pearson Product Moment correlations, the following statement can be made:

"$H_{1.6}$ and $H_{1.9}$ are accepted since there is a significant relationship between enjoyment and self-efficacy and between enjoyment and satisfaction."

Table 4-35: Hypothesis Testing Results

Hypothesis	Relationship	Remarks
$H_{1.1}$	Computer anxiety → intention (-)	Not accepted
$H_{1.2}$	Self-efficacy → intention (+)	Not accepted
$H_{1.3}$	Enjoyment → intention (+)	Not accepted
$H_{1.4}$	Enjoyment ↔ computer anxiety (-)	Not accepted
$H_{1.5}$	Self-efficacy ↔ computer anxiety (-)	Not accepted
$H_{1.6}$	Enjoyment ↔ self-efficacy (+)	Accepted
$H_{1.7}$	Computer anxiety → satisfaction (-)	Not accepted
$H_{1.8}$	Self-efficacy → satisfaction (+)	Not accepted
$H_{1.9}$	Enjoyment → satisfaction (+)	Accepted

The model for e-learning success has thus been updated to exclude the metrics of computer anxiety and intention (Figure 4-6). The metrics of enjoyment, satisfaction and self-efficacy formed the updated model for e-learning success.

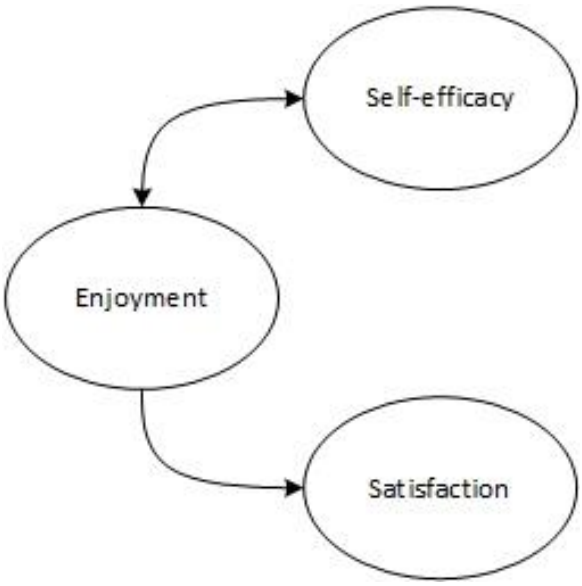

Figure 4-6: Updated Model for e-Learning Success

4.13 Conclusions

The analysis of the Korbitec case study indicate that there are a number of roles applicable to e-learning at the company which are: the customers, subject matter experts, content developers, training managers and training administrators (Section 4.2.1). Interviews were conducted with the relevant stakeholders at the company indicated that the current KOTW is not meeting expectations in terms of usage (Section 4.2.1). It was established that Moodle is a popular open source learning platform and forms the foundation of the KOTW (Section 4.2.1) which is where learning content, in the form of pdf documents that are developed in-house, are uploaded (Section 4.3).

From the focus group conducted with customers of Korbitec, it can be said that although none of the participants had used e-learning before, they were able to conceptualise the idea of e-learning and consequently identify potential barriers that could hinder their use of such systems (Section 4.4). The results from the focus group indicate that some of the barriers were confirmed by participants and the themes are assistance, social interaction, personal factors and external factors. These barrier themes correspond to the literature (Table 4-36) where the e-learning barrier framework was proposed. The empirical research on barriers in this chapter, along with the literature study on barriers in Chapter 3, has now fully answered **RQ_2**: What are the barriers affecting the adoption of e-learning?

Table 4-36: Focus Group Themes Linked to Literature

Focus Group Theme	e-Learning Barrier Framework Dimension (Figure 3-4)
Assistance	Infrastructure issues
Social interaction	Social interaction
Personal	Lack of resources and technical issues
External factors	Technical issues, infrastructure issues and lack of resources

The e-learning survey used to analyse the data of Korbitec's customers generated a set of quantitative data. The metrics were: barriers, F2F training, self-efficacy, computer anxiety, enjoyment, intention and satisfaction. This chapter therefore completely answers the third research question **RQ_3:** What are the metrics affecting the intention to use and the satisfaction with using e-learning environments? With regards to e-learning barriers, respondents are most concerned about the privacy of their personal information which falls under the dimension of the theoretical e-learning barrier framework concerning technical issues (Figure 3-4). The most prominent reason for respondents enjoying F2F training is due to the opportunity to improve their skills. Nine hypotheses were tested but only two hypotheses were confirmed, namely the relationship between enjoyment and self-efficacy as well as between enjoyment and satisfaction (Section 4.12). This result is in agreement with the literature and indicates that a training course that is stimulating will increase the confidence or self-efficacy that trainees have in their jobs studies (Chatzoglou *et al*., 2009; Yi & Hwang, 2003) and when trainees perceive e-learning to be enjoyable, they want to use it (Kang & Lee, 2010).

$eLEST_T$ (Figure 3-8) was successfully applied to the case study to identify the outputs of planning for an e-learning environment. The theoretical environment can now be expanded to include an application specific to the case study and not solely a theoretical environment as previously proposed. In this case, the contextual focus is on the conveyancing software vendor, namely Korbitec, and specifically the company's training website. Chapter 5 will report on the design and prototyping of the real-world solution for Korbitec.

Chapter 5. Design and Prototyping of an e-Learning Environment for Korbitec

5.1 Introduction

Chapter 4 reported on the elaboration of the problem in a real-world context, which was achieved by conducting a focus group and survey of participants from the Korbitec case. Gathering both qualitative and quantitative sets of data from potential and existing e-learning users enabled a rich and comprehensive understanding of the problem and assisted with the establishment of an e-learning environment for software training. Chapter 4 further enabled requirements to be obtained in a real-world setting and Chapter 5 will furthermore use these requirements in order to design and prototype a solution. The design and prototyping of the proposed real-world solution for Korbitec ($eLEST_P$) is of great importance to this research study and is the main focus of this chapter.

This chapter reports on how the analysis of Prototype 1, which is a design alternative for $eLEST_P$, was conducted in Cycle 2: *Design Alternative 1*. The design and prototyping of Prototype 2 is considered the start of Cycle 3: *Design and Evaluate Alternative 2* and the evaluation aspect will be reported on in Chapter 6.

This chapter will discuss and answer the following research questions:

> **RQ_4:** Which e-learning process can be used for developing a best practice e-learning environment for software training?
>
> **RQ_5:** What design guidelines can be used for e-learning environments in a software training context?

The theoretical environment proposed in this study was applied to the Korbitec case study with regards to the planning stage (Chapter 4). The requirements stage and the design, prototyping and evaluation stage of $eLEST_P$ was applied and reported on in this chapter. The theoretical e-learning environment, $eLEST_T$, is applied to the case study to drive the design of the real-world solution, $eLEST_P$ (Section 5.3). Two design alternatives for $eLEST_P$, namely for Prototypes 1 and 2 are considered (Section 5.4) as well as the prototype design guidelines (Section 5.5). The components, practice tasks, assessments and content construction and standards of Prototype 2 are detailed as the outputs of $eLEST_P$ (Section 5.6). Several

conclusions can be made from this chapter (Section 5.7). The layout of Chapter 5 as well as the research objectives met and deliverables produced in this chapter are illustrated (Figure 5-1).

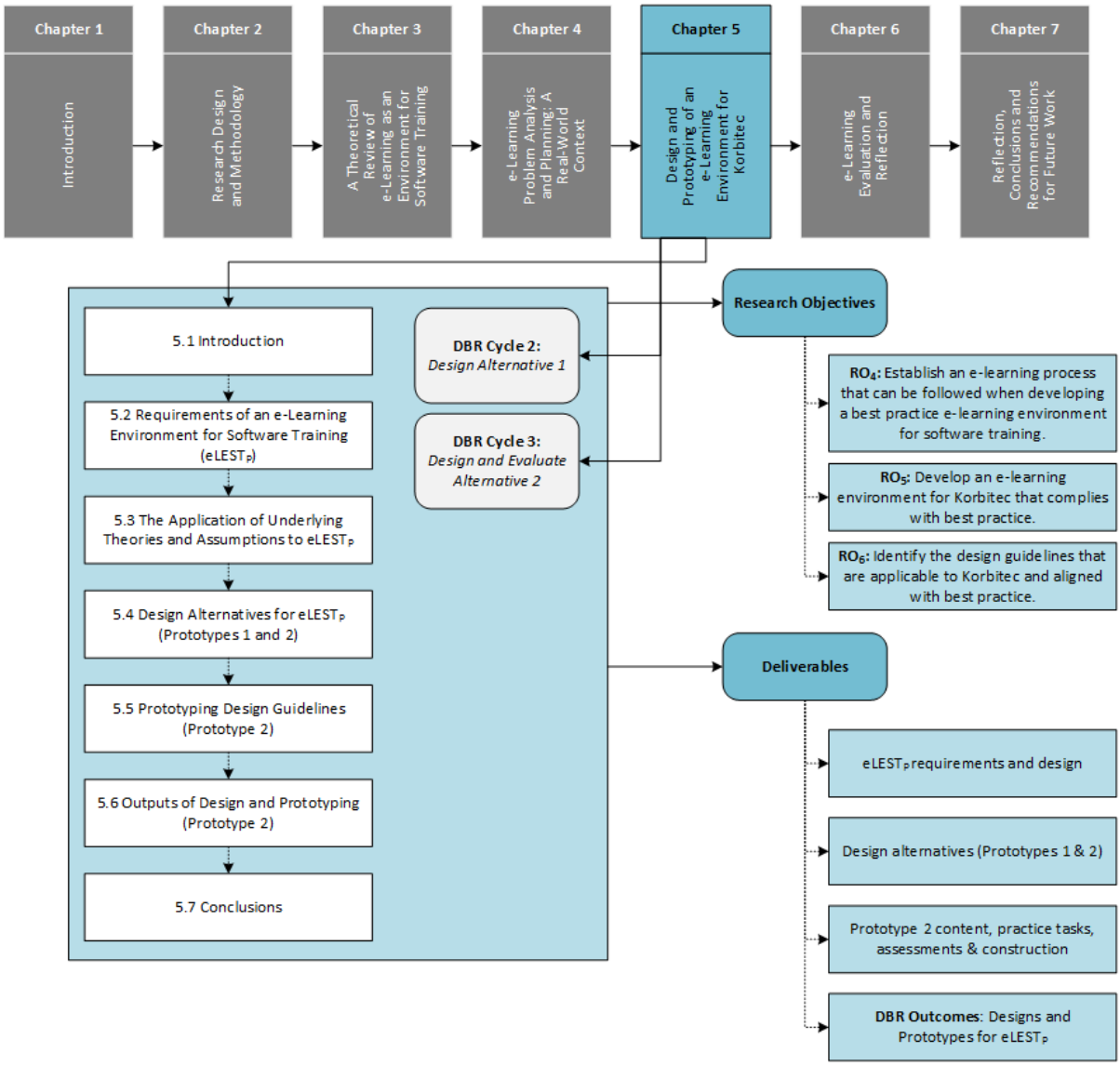

Figure 5-1: Chapter 5 Layout and Deliverables

5.2 Requirements of an e-Learning Environment for Software Training ($eLEST_P$)

Before an e-learning environment and the associated e-learning components can be designed and developed, it is necessary to establish the requirements of the components. The first activity of the interaction design lifecycle in the theoretical $eLEST_T$ (Figure 3-8) entails the establishment of requirements and this was applied to the case study in order to identify requirements for the real-world solution (Section 5.2.1). The requirements of the case study specific to the UX goals and design are established (Section 5.2.2).

5.2.1 Establishing Requirements for $eLEST_P$[8]

The requirements for the e-learning environment for software training based on practice ($eLEST_P$) were established by defining the necessary outputs related to the case study (Table 5-1). From the problem investigation, a number of objectives and requirements were determined. These objectives and requirements were identified in the literature review, the focus group and survey, as well an interviews conducted with Korbitec stakeholders (Joanne Jones & Peter Raine, personal communication, 25 February 2015; Roshan Fillies, Joanne Jones & Marcia Kitshoff, personal communication, 26 May 2015). The requirements for Korbitec related to e-learning roles; CPT e-learning dimensions; the e-learning components; learning objectives, competencies or skills acquired; prerequisite knowledge; and the desirable and undesirable UX goals were identified during DBR Cycle 1: *Problem Investigation and Proposal*. The design requirements for e-learning related to Korbitec were also described.

[8] The results reported on in this section were obtained from research that was published as a full double-blind peer-reviewed conference paper at the Mediterranean Conference on Information Systems (MCIS) in September 2016b. Esterhuyse, M & Scholtz, B. A Process for Designing and Developing Interactive Learning Objects for Organisations. MCIS Conference. Paphos, Cyprus. **(Appendix C)**

Table 5-1: Application of eLEST$_T$ to Case Study (Activity 1 - Establishing Requirements)

Activity 1: Establishing requirements	
OUTPUTS	**Examples of application to case study**
Roles in e-learning	• The roles of users that are involved in online software training are: o General manager; o National training manager; o Content developer; o Subject matter expert; o Training administrator; o Content developer; and o Customer.
e-Learning dimensions (content, pedagogy, technology)	• **Content:** Korbitec requires e-learning components that are of a more interactive nature and not solely consisting of static visuals. Because most customers would be training after working hours, the content must be arranged in manageable units of learning. • **Pedagogy:** Korbitec would like the e-learning components to recognise and evaluate learner competency so that certification procedures can be implemented. • **Technology:** The e-learning components must be SCORM compatible.
Required e-learning components	• Company-specific requirements were elicited from Korbitec with management specifying that the company needed interactive e-learning components developed for the conveyancing software that the company develops.
The learning objectives (educational goals)	The main learning objectives were identified as: • Opening a new transfer file; • Entering in the details of the transfer; • Specifying the financial information related to the transfer; • Conducting SARS transactions; • Performing tasks related to electronic rates; and • Using the Message/Diary Centre.
Competencies/skills acquired	The skills needed that were identified from the interviews and observations were: • The ability to open a new Transfer file using the conveyancing software; • Learn new methods to complete tasks more efficiently; • Problem solving skills; and • Obtain a low dependence on help mechanisms (e.g. call centres, live chats, colleagues or F2F training).
Prerequisite knowledge	• The learner should have some knowledge of conveyancing processes regarding transfers; and • The learner should have intermediate computer experience in terms of being comfortable using a computer and using computers regularly.

5.2.2 e-Learning UX Goals and Design Requirements for eLEST$_P$

During the interaction design activity of establishing requirements, the UX goals and requirements for e-learning design were established (Table 5-2). The e-learning design requirements for Korbitec were related to legibility, visual presentation, design consistency, content arrangement and content adjustment (Table 3-2) and proposed by eLEST$_T$. It is also important that the e-learning components meet the organisational-specific criteria that are described in the Korbitec Style Guide (Korbitec, 2016).

Table 5-2: Application of eLEST$_T$ to Case Study – UX Goals and e-Learning Design Requirements (Activity 1 - Establishing Requirements)

Activity 1: Establishing requirements	
OUTPUTS	**Examples of application to case study**
Desirable and undesirable UX goals	• **Desirable UX goals:** engaging, challenging, cognitively stimulating and rewarding • **Undesirable UX goals:** patronising, boring, gimmicky and frustrating
e-Learning design requirements	
Legibility	• The typeface, type and font size, tonal contrast, spacing, alignment, line length as well as media legibility of the e-learning components must be acceptable.
Visual presentation	• The e-learning components must contain relevant graphics and screenshots that support the text contained in the documents.
Design consistency	• The aesthetic and structural consistency of the e-learning components must be pleasing to the eye.
Content arrangement	• The navigation mechanism of the e-learning components must be user friendly and the e-learning components must contain multiple presentation media.
Content adjustment	• The white space contained in the e-learning components must be balanced with appropriate emphasis mechanisms included.

Korbitec needs to protect the company's brand image, and there are therefore rules that govern the production of artefacts for use by the company and its customer base (Roshan Fillies, Joanne Jones & Marcia Kitshoff, personal communication, 26 May 2015). This company-specific requirement is in agreement with the aspect of eLEST$_T$ relating to organisational considerations and guidelines where policies and standards are essential to e-learning environments for software training (Section 3.2). All software that is developed by the company must represent the brand image by ensuring that the logo appears on the user interface. The font style to be used in all text content provided in the form of paper-based and electronic training material is the Open Sans font group (Figure 5-2). Normal text is formatted to be the Open Sans-Regular font style and bold text is formatted to be the Open Sans-Semibold font style. For text that needs to be italicised, there is the option of using the Open Sans-Italic font style. The text contained in the training material must be checked for grammar and spelling before it is presented to the customer base.

Figure 5-2: Korbitec Font Styles

According to the Korbitec Style Guide for Interactive Tutorials (Korbitec, 2016), there is a specific colour palette that is to be used when designing and developing e-learning components for Korbitec, including the development of software and training material, and there are also specific circumstances under which such colours must be used (Figure 5-3). The use of this colour palette is in agreement with the element of $eLEST_T$ relating to organisational considerations and guidelines (Section 3.2). In the design and development of training material for Korbitec, the purple hue is to be used for darker accents for headers, introductory screens, title screens and exit screens. The blue hue is to be used to accentuate important information and features that require the user's attention. This is in agreement with the signaling multimedia principle (Section 3.10.1.2). The grey hue is to be used for the font colour, and when using white text, a grey background should be used.

Figure 5-3: Korbitec Colour Palette

The static and dynamic multimedia provided in the Korbitec training material must be of a high resolution so that quality is associated with the brand image and to ensure clarity in the information portrayed in the multimedia. e-Learning components must have cross-platform functionality so that they can be used on the various devices that customers use to access them.

5.3 The Application of Underlying Theories and Assumptions to $eLEST_P$

The e-learning environment for software training contexts based on theory ($eLEST_T$) specifies that there is a set of underlying theories and assumptions that must be considered in establishing requirements, design, prototyping and evaluating (Figure 3-8). When establishing requirements, four theories (social identity theory, self-determination theory, TPB and TRA) were applied to the case study for $eLEST_T$ (Table 5-3). For design, prototyping and evaluating, two theories (cognitive evaluation theory and MRT) were applied to the case study.

Table 5-3: eLEST$_P$ Underlying Theories and Assumptions (Requirements and Design, Prototyping and Evaluation Stages)

Underlying theories and assumptions	Examples of application to case study
Requirements Stage	
Social identity theory	• The e-learning content should convey the prerequisite knowledge intricately so that the probability of learner certification is increased, which in turn will make learners feel accomplished and competent.
Self-determination theory	• The e-learning content must be stimulating and exciting so that the majority of learners will be motivated to learn and to be certified, not because they are forced to be certified by company policy.
Theory of planned behaviour	• The e-learning content must encourage learners to continuously return to the KOTW so that they can resume training and be certified.
Theory of reasoned action	• The intention of customers to use e-learning has been identified in the e-learning survey (Section 4.10); and • The e-learning content should encourage positive attitudes towards e-learning.
Design, Prototyping and Evaluation Stage	
Cognitive evaluation theory	• The e-learning content should convey tasks in a way that is informational and not controlling in order to increase the intrinsic motivation of learners to learn; • The e-learning content should provide feedback in assessments so that the learner need for competence is supported which is linked to intrinsic motivation; and • Extrinsic motivation is linked to the certification feature of eLEST$_P$.
Media richness theory	• The e-learning content for eLEST$_P$ must provide immediate feedback in assessments; • Use must be made of multiple media types to convey information; and • The language of the information conveyed in the e-learning content must be acceptable.

5.4 Design Alternatives for eLEST$_P$ (Prototypes 1 and 2)[9]

Two prototypes were considered as the two design alternatives in this study, as follows:

- Prototype 1 – The KOTW that existed before this study began (Section 5.4); and
- Prototype 2 – The e-learning components that were designed and developed for the case study (Sections 5.5 and 5.6).

The pre-existing version of the KOTW prior to the commencement of this study is referred to as Prototype 1. Prototype 1 was developed by Korbitec for the KOTW and was implemented before the commencement of this study by the content developers at Korbitec. These content developers at Korbitec customised Moodle and used it as a backbone for Prototype 1, based on company policies and standards (Korbitec, 2016). Prototype 2 is considered the practical

[9] The literature discussed in this section was obtained from research that was published as a full double-blind peer-reviewed conference paper at the Mediterranean Conference on Information Systems (MCIS) in September 2016b. Esterhuyse, M & Scholtz, B. A Process for Designing and Developing Interactive Learning Objects for Organisations. MCIS Conference. Paphos, Cyprus. **(Appendix C)**

application of eLEST$_T$ to the case study and includes the e-learning components. This section provides a brief overview of Prototypes 1 and 2 and the results of the application of the theory to the case study.

The users of Prototype 1 are required to login in order to use the system and can register to gain access if they are using the platform for the first time (Figure 5-4). Once the user has logged in, there are three main links that the user can select from, based on the software products licensed to the company where the user works. The three links are: GhostConvey, WinDeed and PropCtrl (Figure 5-5).

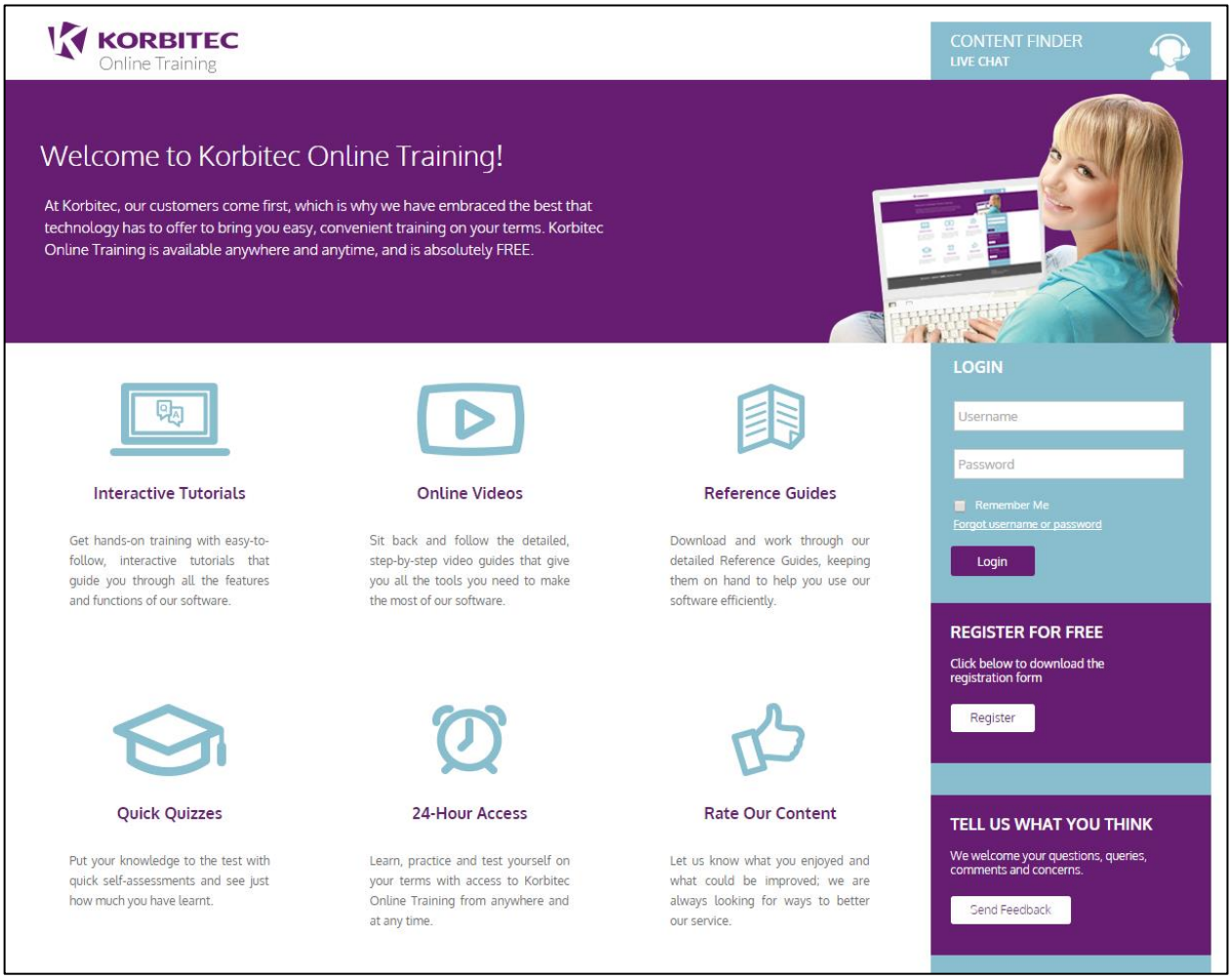

Figure 5-4: Landing Page of Prototype 1

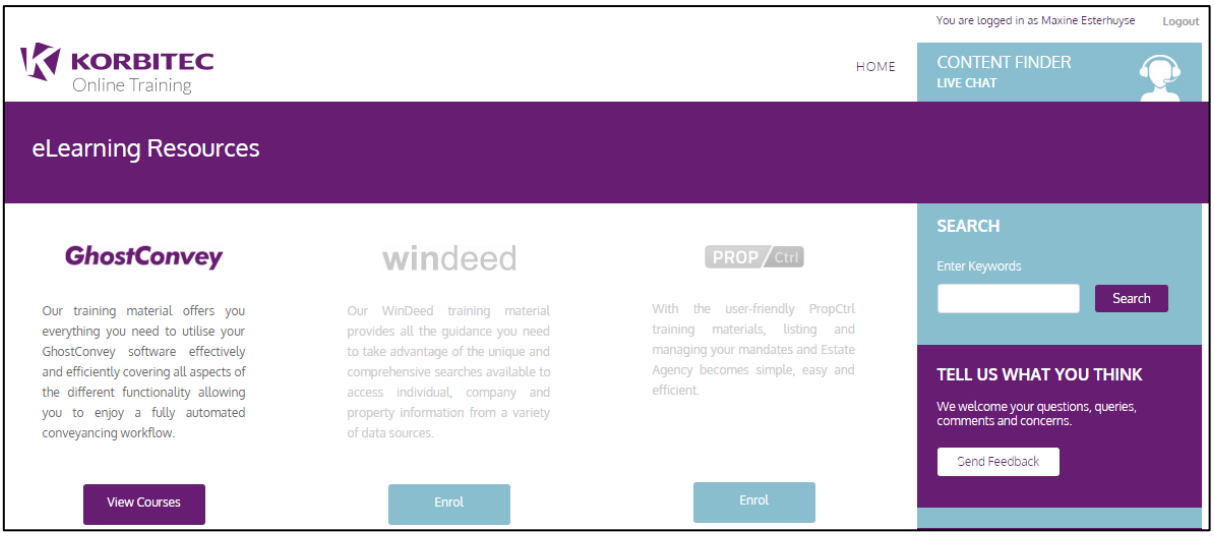

Figure 5-5: Prototype 1 Resources

GhostConvey is a conveyancing management system that automates the process of assembling documentation and enables communication with property stakeholders (GhostConvey, 2016). WinDeed is software that enables users to search for individual, company and property information from one access point, across a number of data sources (WinDeed, 2016). PropCtrl is listing and agency management software that is most often used by Office Administrators, Estate Agents and Principals (Property24, 2016).

The second activity of interaction design in eLEST$_T$, namely designing alternatives, was applied to the case study for eLEST$_P$. The cognitive design implications, multimedia principles and e-learning (MUUX-E) heuristics were applied to the evaluation of Prototype 1 (Section 3.10.2) and several shortcomings were identified (Table 5-4). The results of the evaluation revealed that Prototype 1 lacked in terms of its interactivity aspects, its ability to simplify complex information and does not accommodate learners that want to know more than what is required from the learning objectives.

Prototype 1 lacked when considering the cognitive design implications of attention; learning; and problem-solving, planning, reasoning and decision-making. It also lacked when considering the multimedia principles concerning sequencing, fidelity, temporal split-attention, spatial split-attention and modality. The e-learning (MUUX-E) heuristics with regards to the categories of general interface usability, web-based learning, educational usability, m-learning or e-learning features and user experience are lacking in Prototype 1.

Table 5-4: Application of eLEST$_T$ to Case Study (Activity 2 - Prototype 1)

Activity 2: Designing alternatives	
	Examples of application to case study
Cognitive Design Implications	
Attention	Prototype 1 uses colour that matches the corporate brand and effectively uses colour to convey meaning. The learning content lacks the effective use of colour and the structuring of items is linear which affects learner attention.
Perception	The text is legible on Prototype 1 and the learning content with dark text used on a light background and vice versa.
Memory	Prototype 1 considers the cognitive process of memory by consistently placing the navigational menu and important icons.
Learning	The learning content does not promote learner exploration with its design.
Reading, speaking, listening	The text can be magnified on all components.
Problem-solving, planning, reasoning, decision-making	The learning content does not provide additional information for learners wanting to know more than what is required.
Multimedia Principles	
Sequencing	The information presented in the e-learning components is presented in its full complexity all at once, especially in the pdf documents.
Fidelity	Prototype 1 presents the necessary information for a high-fidelity task environment but there is a lack in the representation of the GhostConvey software in the screenshots provided in the e-learning content.
Self-pacing	The learners are given control over the pace in which they complete the tasks in the e-learning content.
Temporal split-attention	Prototype 1 deteriorates the learning process in terms of the temporal split-attention principle because learners are required to divide their attention between the e-learning content and the GhostConvey software. The two information sources need to be integrated.
Spatial split-attention	The e-learning content of Prototype 1 effectively links text with mutually referring images. However, this representation of mutually referring media is not interactive.
Signaling	Important information is emphasised in the e-learning content.
Modality	Prototype 1 is presented using images and text, but it is not interactive.
e-Learning (MUUX-E) Heuristics	
General interface usability	**Match to the real world:** There is a poor link with the e-learning components of Prototype 1 and the GhostConvey software. **Consistency:** The e-learning components are consistent in their presentation. **Aesthetics and minimalism in design:** The e-learning components are cluttered and result in information overload for learners. **Help and documentation:** There are links provided to external help facilities.
Web-based learning	**Simple, well-organised navigation:** Prototype 1 is easy to navigate. **Suitable course content of a high quality:** The e-learning components are mundane, do not promote interaction and lack learner control. **Excellent video and digital media:** There are few dynamic visuals included in the e-learning components.
Educational usability	**Clarity of goals, objectives and outcomes:** These requirements are briefly explained in the e-learning components. **Feedback, guidance and assessment:** Immediate feedback and guidance is non-existent and assessment is implemented as a multiple-choice quiz.
m-Learning/e-Learning features	**User-centricity:** Not considered with regards to active learning, specification of user requirements and experimentation and exploration. **Flexibility:** System can be used anytime and anywhere. **Interactivity:** Severely lacking in terms of multimedia embedded in high quality lessons.
User experience	**Emotional issues:** Prototype 1 does not encourage excitement, fun and interest. **Needs:** Competency is addressed with quiz assessments but certification has not been implemented. **Appeal:** The e-learning components are lacking in terms of aesthetic factors but the actual KOTW is aesthetically pleasing and has a modern design. **Satisfaction:** Prototype 1 lacks features that promote cognitive stimulation, achievement and motivation.

5.5 Prototyping Design Guidelines (Prototype 2)

The design guidelines from $eLEST_T$ were applied to the case study and the result is considered as the second design alternative, also referred to as Prototype 2. Prototype 2 consists of three units, namely Show Me, Try Me and Test Me (Table 5-5). The three units of Prototype 2 enable a task to be demonstrated for learners (Show Me), encourage learners to practice what they have learnt (Try Me) and be assessed to identify possible areas of weakness (Test Me). The design implications related to cognitive processes, according to $eLEST_T$, were applied to the case study during design, prototyping and evaluating stage (Section 5.5.1). The multimedia principles were considered (Section 5.5.2), as well as the e-learning heuristics from the MUUX-E framework (Section 5.5.3).

Table 5-5: Prototype 2 Units for $eLEST_P$

e-Learning component unit	Description of unit	Cognitive process involved	Literature concerned
Show Me	The software is demonstrated to the learner	Learning and attention	e-Learning components (Section 3.7)
Try Me	The learner attempts to use the software	Perception and problem solving	Simulation of software (Section 3.7.1)
Test Me	The learner is assessed based on their knowledge of the given module	Memory	Assessment-centred training (Section 3.3.3)

5.5.1 $eLEST_P$ Cognitive Processes

Cognitive processing is limited by the capacity of working memory to accommodate a few elements at a time and this applies to the context of learning through the use of multimedia. The six design implications related to human cognition (Section 3.10.1.1) were accounted for in designing Prototype 2 for $eLEST_P$ and are described in this section.

Attention

- A variety of media was incorporated into Prototype 2, of which some are interactive and some static;
- Underlining, bolding and colour coding techniques were used to emphasise important information;
- Information that was related was grouped together in the form of visual blocks; and
- Appropriate use of white space was maintained.

Perception

- The rule of light text on a dark background and dark text on a light background was followed; and
- Text was of an appropriate font type, size and pixel quality.

Memory

- Familiar icons, such as the "lightbulb" for hints and tips from the Korbitec Style Guide (Korbitec, 2016), were used to promote recognition rather than recall;
- Tasks were consistently placed in the bottom right-hand corner; and
- A player menu was displayed on all screens that allow the learner to navigate between screens, amongst other features.

Learning

- Prototype 2 contains additional information to accommodate a learner who wants to learn more than what is outlined in the learning objectives.

Reading, Speaking and Listening

- Prototype 2 was developed so that text can be enlarged with a tool like the Microsoft Windows Magnifier, without compromising on the quality of the information.

Problem Solving, Planning, Reasoning and Decision-Making

- Supplementary concealed information was incorporated for the learner who wishes to be more advanced and efficient.

5.5.2 eLEST$_P$ Multimedia Principles

Multimedia principles for designing and developing e-learning multimedia (Section 3.10.1.2), were taken into consideration when designing and developing Prototype 2. The way in which each multimedia principle was applied to the design of Prototype 2 is described in this section.

Sequencing

- The complex learning tasks were organised and deconstructed into manageable modules and each module consists of three units that relate to the literature concerning dividing learning content into manageable chunks (Moon *et al*., 2005). The three units of Prototype 2 are Show Me, Try Me and Test Me and are

underpinned by the literature explored (Chapter 3) and involve cognitive processes (Section 5.5.1).

Fidelity

- Prototype 2 makes no attempt to mimic the real task environment because only those features that users are required to interact with are operational and the unrelated features are inactive;
- Only those aspects of the real environment that are necessary to perform the task are represented;
- The information represented in the multimedia in Prototype 2 is concise; and
- There is no background music, non-essential videos and other unnecessary multimedia included in Prototype 2.

Self-pacing

- The screens of Prototype 2 are advanced by the learner and the learner is able to choose to return to a previous screen, giving learners control over the pace at which the information is presented to them (this functionality was disabled in the Test Me units); and
- Video controls are play, pause and stop.

Temporal split-attention

- The learners are not required to work in the actual GhostConvey software system when using Prototype 2, as all necessary information was integrated into Prototype 2; and
- The task instructions in the Try Me units were placed in the same slide where the corresponding information is found.

Spatial split-attention

- Descriptive labels were placed next to the corresponding multimedia to ensure that related information is presented simultaneously and not in succession.

Signaling

- Information that warrants attention from the learner was indicated by highlighting the feature with a blue hue that is used consistently by Korbitec (Figure 5-3).

Modality

- Visual information included in Prototype 2 is supported with the use of text in a dual-mode approach.

5.5.3 e-Learning (MUUX-E) Heuristics for eLEST$_P$

Heuristics from the MUUX-E framework proposed by Harpur and De Villiers (2015) were considered in the design of Prototype 2 (Table 5-6). The categories of the heuristics are general interface usability, web-based learning, educational usability, m-learning/e-learning features and UX.

Table 5-6: Application of eLEST$_T$ to Case Study (Design, Prototyping and Evaluating Stage)

Design, Prototyping and Evaluating Stage	
e-Learning Heuristics (MUUX-E) Category	**Examples of application to case study**
General interface usability	**Match to the real world:** There is a link between Prototype 2 and the GhostConvey software. **Consistency:** Prototype 2 is consistent in its presentation. **Aesthetics and minimalism in design:** Prototype 2 is not cluttered and minimises information overload for learners. **Help and documentation:** Links are provided to external help facilities.
Web-based learning	**Simple, well-organised navigation:** Prototype 2 is easy to navigate. **Suitable course content of a high quality:** Prototype 2 is not mundane and promotes interaction and provides learner control. **Excellent video and digital media:** A variety of dynamic visuals are included in Prototype 2.
Educational usability	**Clarity of goals, objectives and outcomes:** The goals, objectives and outcomes are be detailed before any information related to training is provided. **Feedback, guidance and assessment:** Immediate feedback and guidance was implemented and assessment consists of a variety of methods.
m-Learning/e-Learning features	**User-centricity:** Active learning is encouraged in Prototype 2 by engaging learners through interactivity and experimentation, and exploration is welcomed. **Flexibility:** Prototype 2 can be accessed anytime and from anywhere. **Interactivity:** High quality multimedia is embedded in Prototype 2.
User experience	**Emotional issues:** Prototype 2 encourages excitement, fun and interest. **Needs:** Competency is addressed with quiz assessments and subsequently, certification functionality. **Appeal:** Prototype 2 has an aesthetically pleasing and modern design that appeals to a large audience. **Satisfaction:** Prototype 2 has features that promote cognitive stimulation, achievement and motivation.

5.6 Outputs of Design and Prototyping (Prototype 2)

The construction of Prototype 2 for Korbitec was according to the SCORM standards (Section 5.6.1). The case-specific application of $eLEST_T$ whilst prototyping involved detailing the e-learning components (Section 5.6.2). The practice tasks that were included in the e-learning components were an output of the prototyping activity (5.6.3). Lastly, the mechanisms that were used to assess the level of competency of learners after interacting with the e-learning components are described (Section 5.6.4). The e-learning components that were developed for the Transfers course consist of six modules that are further sub-divided into three units.

5.6.1 Content Construction and Standards for $eLEST_P$

There are a variety of software packages available for authoring e-learning components. Articulate Storyline 2 is software that is simple to use and powerful for e-learning authors with regards to what can be created (Articulate Global, 2016). The software allows the content developer to build interactive features into products which include clicking and hovering over or dragging an object to trigger a response. Articulate Storyline 2 made it possible to incorporate interactive elements (Section 3.8) into the learning content for the Transfers course. Articulate Storyline 2 enables content developers to incorporate features aimed to test a learner's knowledge by providing a platform to create assessment and decision-making activities. These activities determine whether learners can apply what they have learnt from the e-learning components. At the time of writing, Articulate Storyline 2 is proprietary software and requires a license to use it. There is a substantial community supporting the use of Articulate Storyline 2 to author e-learning components (Articulate Global, 2016).

Another popular content authoring software package for e-learning is Adobe Captivate 9 (Adobe, 2016). Adobe Captivate 9 is useful if content developers currently use other Adobe products or plan on using Adobe products in the future. Many content developers prefer using Camtasia which is a video editing and screen recording tool developed by TechSmith (2016). The features in Camtasia include applying video effects, drag-and-drop editing and adding interactive elements. The e-learning components for the real-world solution, $eLEST_P$, were developed using the Articulate Storyline 2 content authoring software and were published as SCORM packages, which is a construction format that the KOTW accepts, thus making it possible for the e-learning components to be uploaded to the system. The SCORM standard

enables the multimedia elements of the e-learning components to be structured so that instructions determine how the multimedia components execute. This is in agreement with the theory regarding e-learning content construction and standards (Section 3.7.3).

5.6.2 e-Learning Components of eLEST$_P$

Due to the scope of this study, it was not possible to develop e-learning components for all of the courses supplied by Korbitec and therefore, it was decided to focus on the Transfers course (Section 1.6). The Transfers course e-learning components are sub-divided into six modules which are: opening a new transfer file, transfer details, financial, SARS, electronic rates and message/diary centre (Figure 5-6).

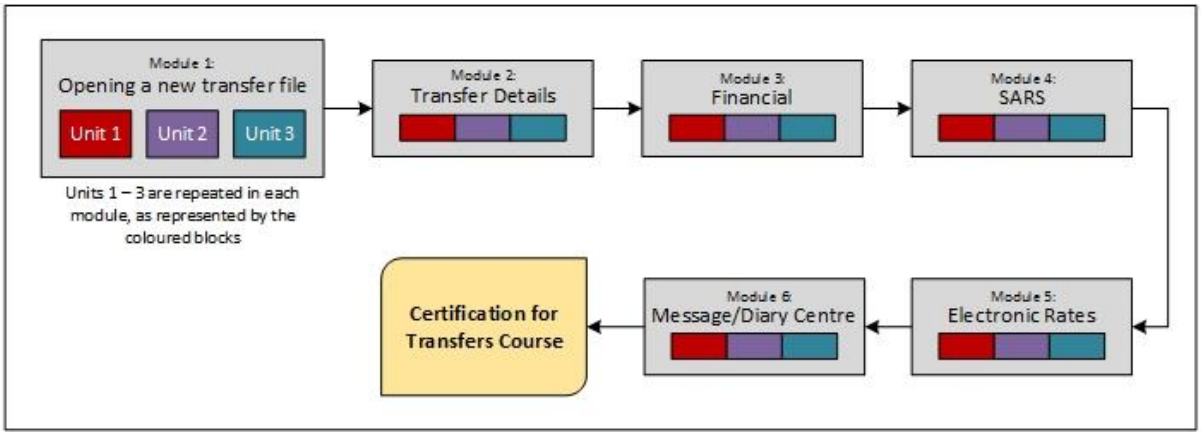

Figure 5-6: Transfers Course Breakdown

The e-learning components developed for the case study comply with the Korbitec aesthetic requirements with regards to the utilisation of the colour palette, font and multimedia specifications (Section 5.2.2). All units for the Transfers course commence with a welcome screen to indicate the subject matter contained in the unit and to orientate the learner (Figure 5-7).

The instructions screen is where the learning process is described. The Korbitec colour palette is used to emphasise important information and the lightbulb is introduced to the learner to indicate additional information (Figure 5-8). It is important to note that the e-learning components have been implemented to have a player feature at the bottom of the screen, as well as previous and next buttons that can be used by the learner to toggle between screens.

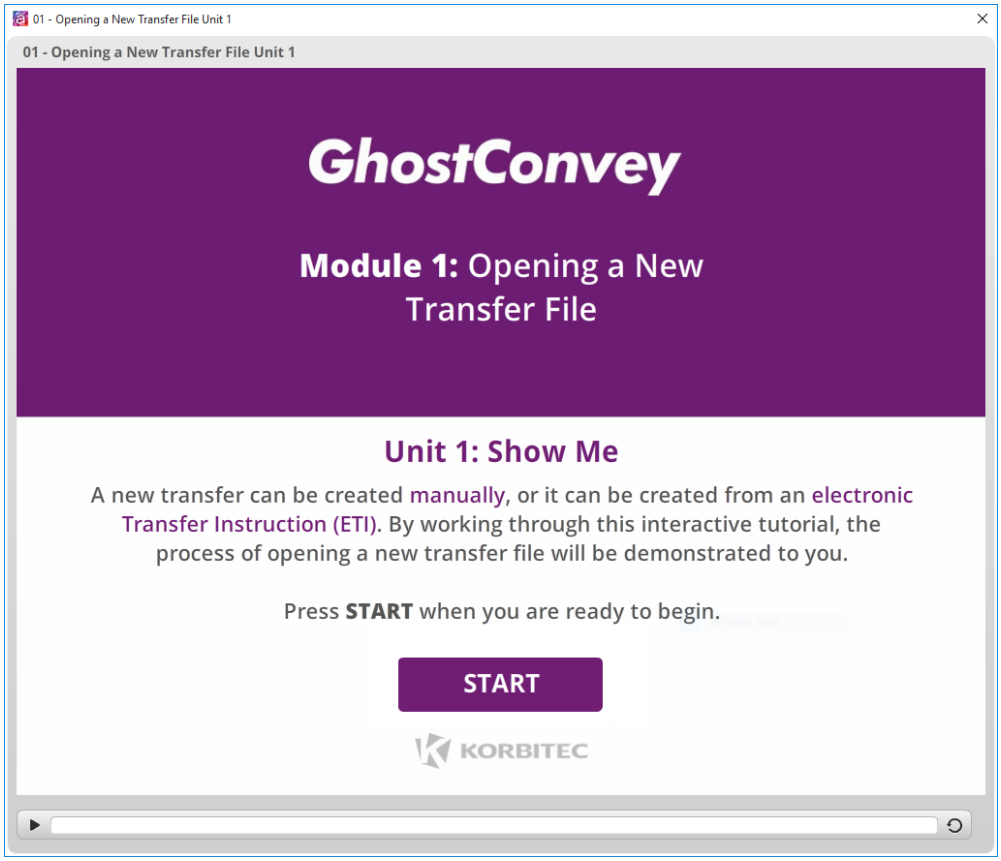

Figure 5-7: Unit 1 Welcome Screen (Module 1)

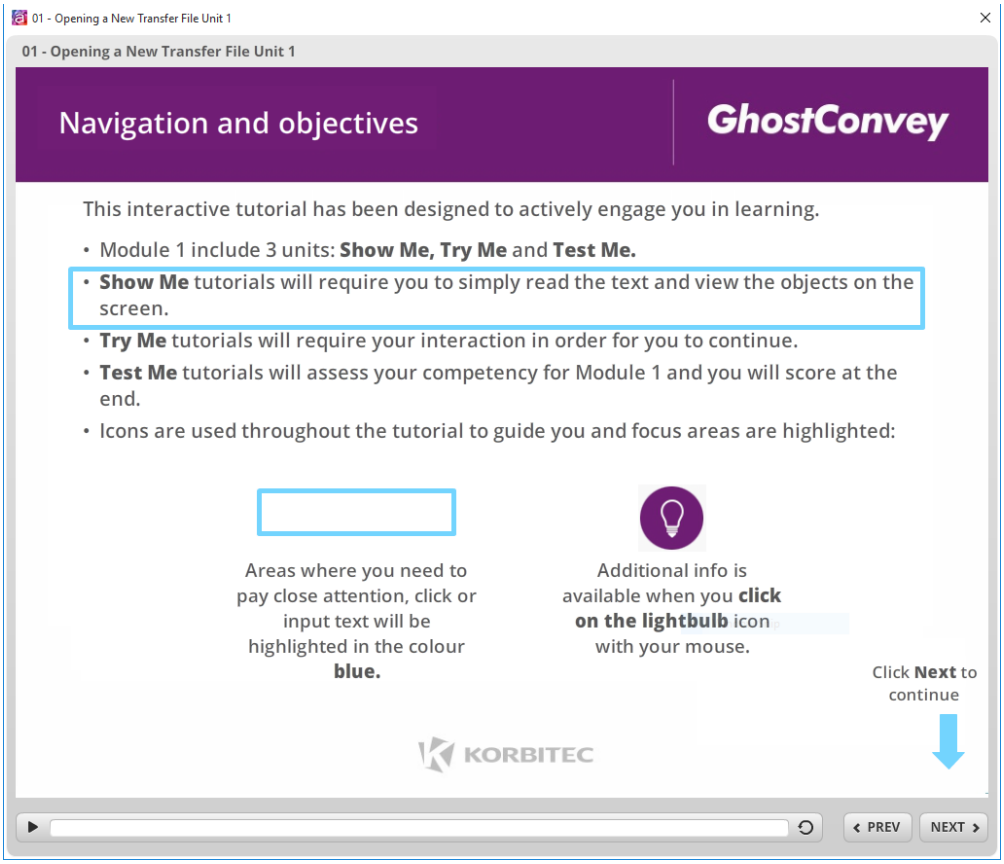

Figure 5-8: Unit 1 Instructions Screen (Module 1)

The use of video was implemented in the e-learning components to demonstrate the use of the GhostConvey system to perform tasks and was predominantly used in the Show Me units (Table 5-5) where learners are required to observe (Figure 5-9). The player feature allows the learner to pause, play and repeatedly watch videos as many times as required by the learner. This feature is in agreement with the theory related to the sequencing multimedia principle (Section 3.10.1.2). There are a number of barriers that the intended learners may face, such as Internet speed and availability (Section 4.4). The videos incorporated into the e-learning components are concise and the duration is as short as possible so as to spare the bandwidth required to interact with the e-learning components.

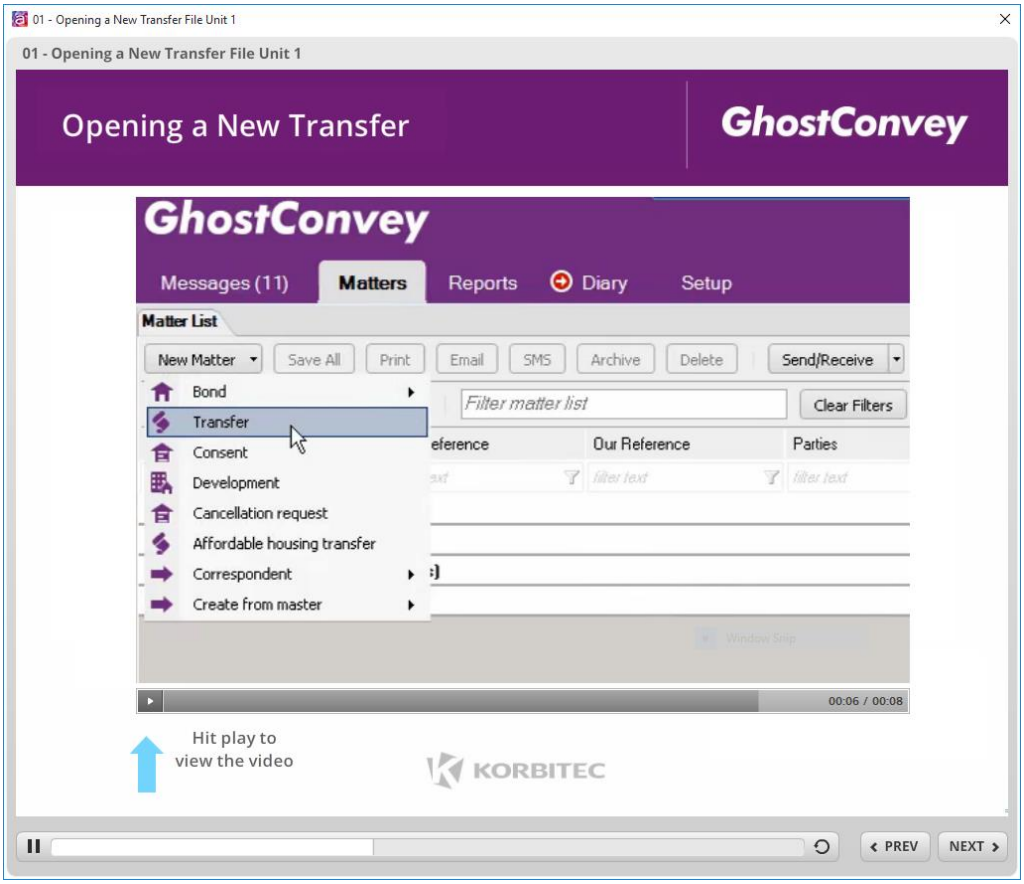

Figure 5-9: Unit 1 Video Screen (Module 1)

An indication of how the colour palette was used to accentuate important information is shown (Figure 5-10). An example of how the lightbulb icon displays additional information when clicked is also shown.

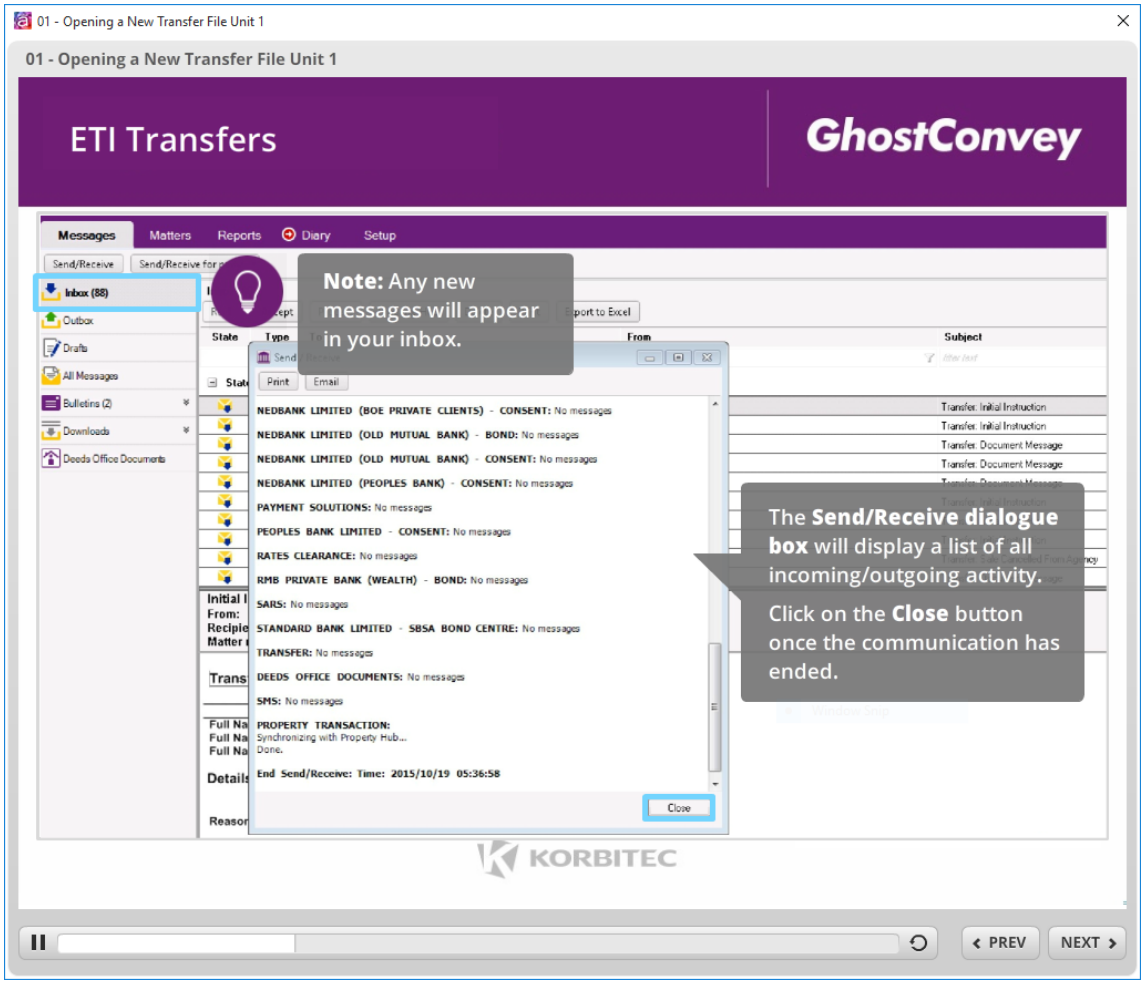

Figure 5-10: Unit 1 Additional Information Screen (Module 1)

5.6.3 Practice Tasks for eLEST$_P$

During the application of eLEST$_T$ to the case study, practice tasks for learners were developed. This relates to the theory concerning the need for learners to exercise the tasks that they learnt from the e-learning component (Section 3.7.2). It is important for learners to practice the tasks in Unit 2 of Module 1, related to what has been presented in the Show Me unit (Table 5-5 and Section 5.6.2). The practice tasks were prototyped for Korbitec by providing instructions for learners on the screens of the e-learning components, which were consistently placed in Unit 2 (Figure 5-11). The learner is required to read the instructions and to then perform a task based on what has been learnt. In some circumstances where tasks are either complex or if certain functionality did not work, a note would be provided for learners on the same screen as the task so as to consider the temporal and spatial split-attention cognitive processes of learners.

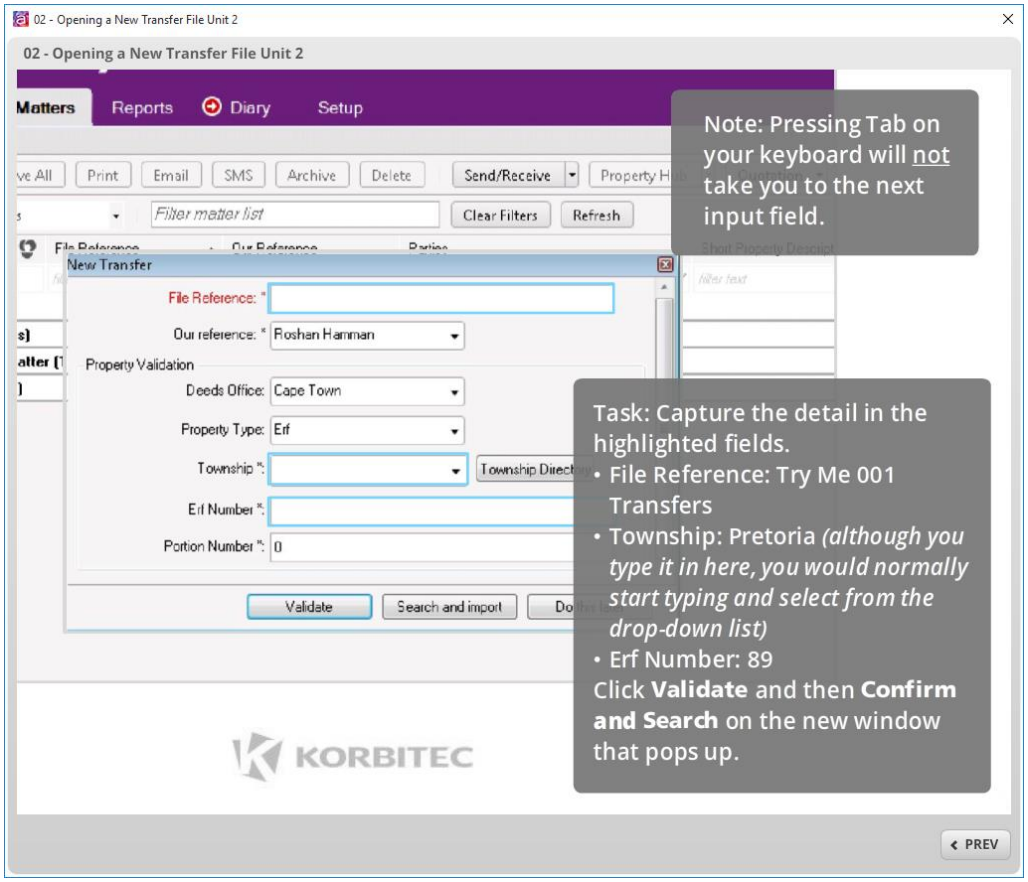

Figure 5-11: Unit 2 Task Instruction Screen (Module 1)

5.6.4 Learner Assessments for Certification for eLEST$_P$

A crucial aspect of learners interacting with e-learning components is the feedback generated from the learning process in order to measure the knowledge and competency acquired by the learner (Section 3.3.3 and 3.7.2) and is a consideration of eLEST$_T$ which was applied to the case study. To meet the organisational-specific criteria of Korbitec, each module requires a learner to complete three units which are: Show Me, Try Me and Test Me (Table 5-5). Upon completion of the modules, a learner would have completed six Test Me units which would assign marks to the learner's profile, based on assessments, which is in agreement with the theory (Section 3.3.3). Based on pre-defined standards for the average mark set by Korbitec, a learner will either pass or fail the course. If the learner passes the course, a certificate is issued by the system to state that the learner is competent to use the GhostConvey software to perform transfers in the conveyancing field.

When learners are comfortable with the tasks presented in Units 1 and 2, they may progress to the third Unit, Test Me, where they will be assessed based on the material presented previously. There are a variety of assessment methods and the incorporation thereof varies

from module to module (Section 3.3.3). In the case that learners are required to know the individual tasks that comprise a process as well as the order in which the tasks must be performed, a dropdown question may be asked (Figure 5-12). Learners may not submit an answer until an option is chosen for all fields provided. The marks assigned to the questions vary between modules. Assessments may also consist of multiple choice questions (Figure 5-13) and true or false questions (Figure 5-14). There is only one correct answer in these assessment methods.

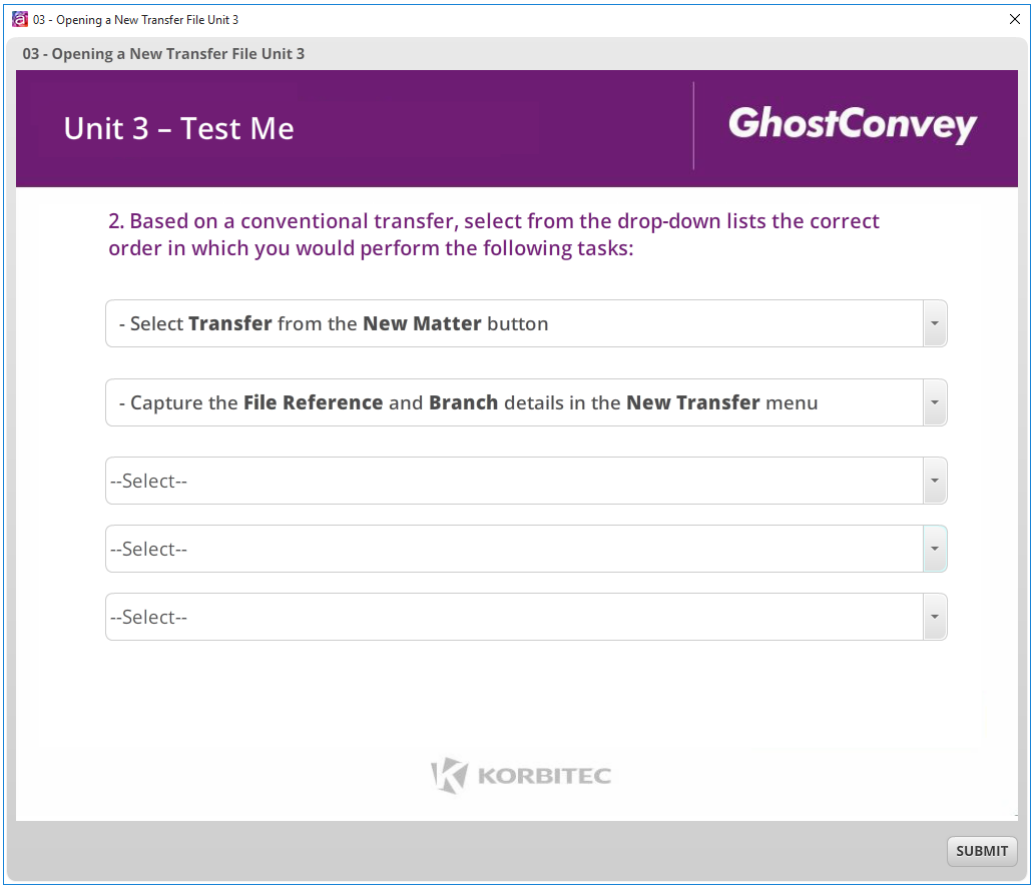

Figure 5-12: Unit 3 Dropdown Question Screen (Module 1)

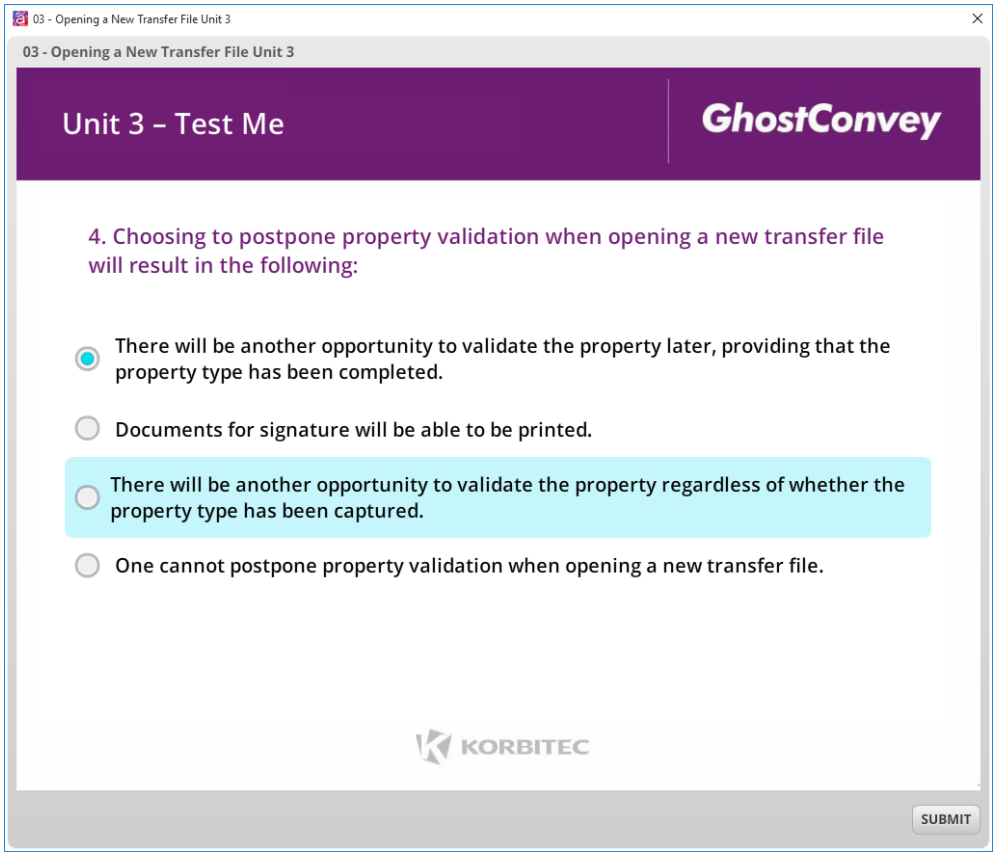

Figure 5-13: Unit 3 Multiple Choice Question Screen (Module 1)

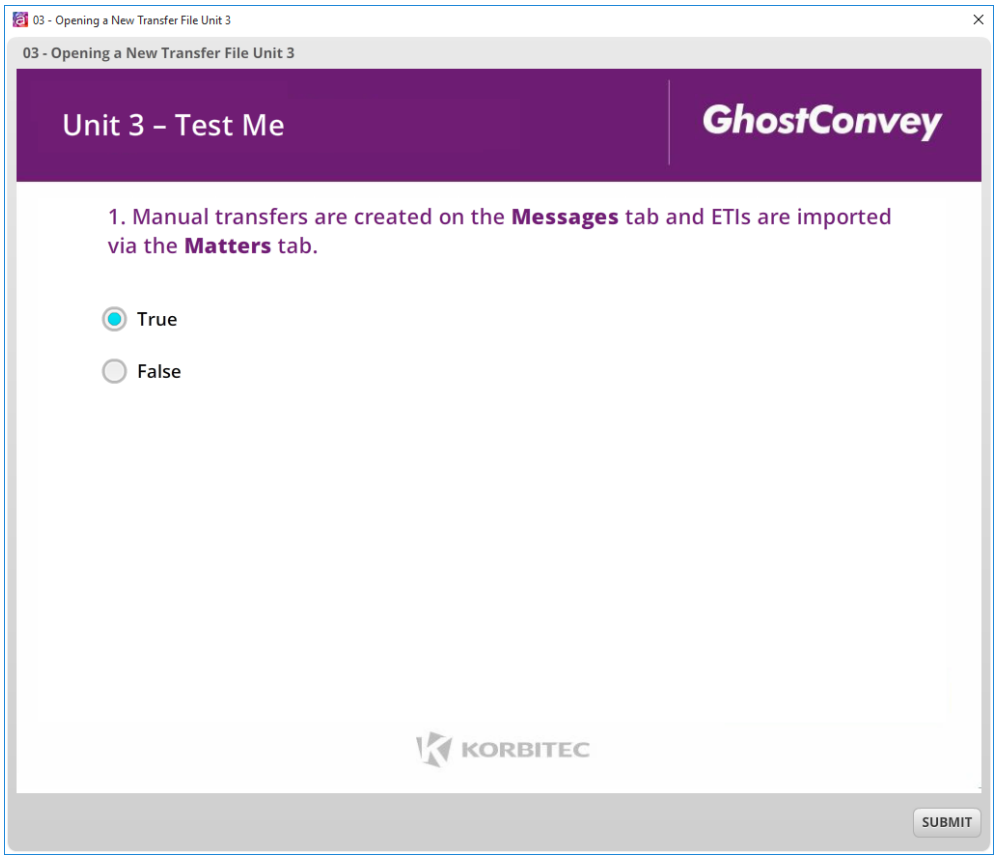

Figure 5-14: Unit 3 True or False Question Screen (Module 1)

Hotspot-type questions were used to assess whether learners know where to find conveyancing software features. When learners click on the screen where they think the answer lies, a target is presented on the screen and will save their answer to be marked (Figure 5-15). The learner's answer, indicated using the target, will be compared to the hotspot where the correct answer lies.

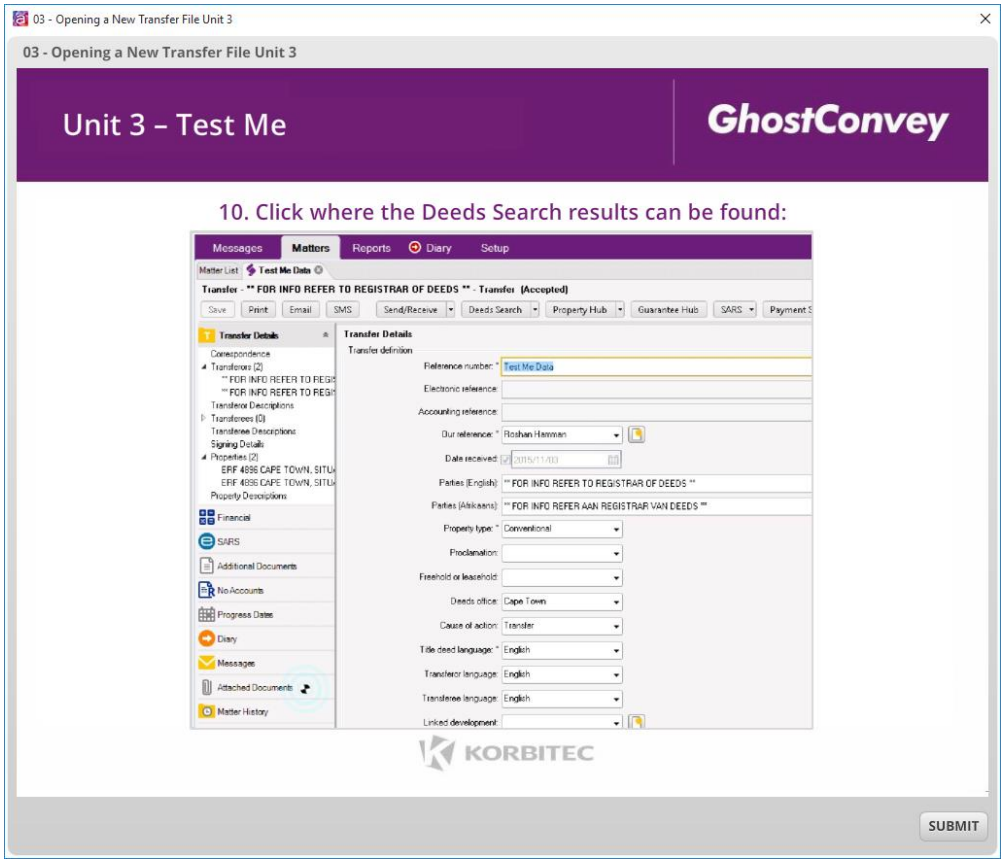

Figure 5-15: Unit 3 Hotspot Question Screen (Module 1)

Upon completion of the assessment e-learning components, a results screen is presented where learners can view their score and the passing score, and can choose to review the quiz (Figure 5-16). To conclude the first and second units in all modules, an exit screen is presented (Figure 5-17). The exit screen for the third unit is the results screen. The exit screen directs learners to the subsequent unit or module in the learning path and provides information in the event that additional help is required. There are features that allow learners to continue to the next unit or module and enable the unit to be replayed from the beginning.

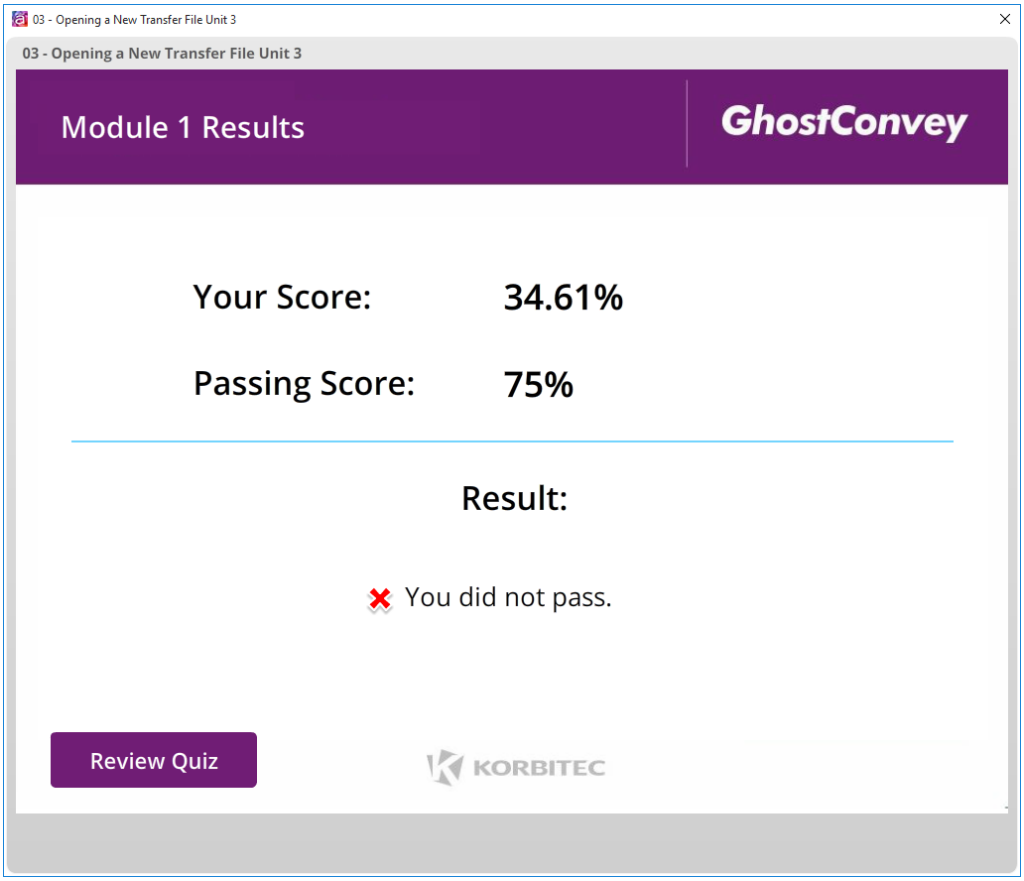

Figure 5-16: Unit 3 Results Screen (Module 1)

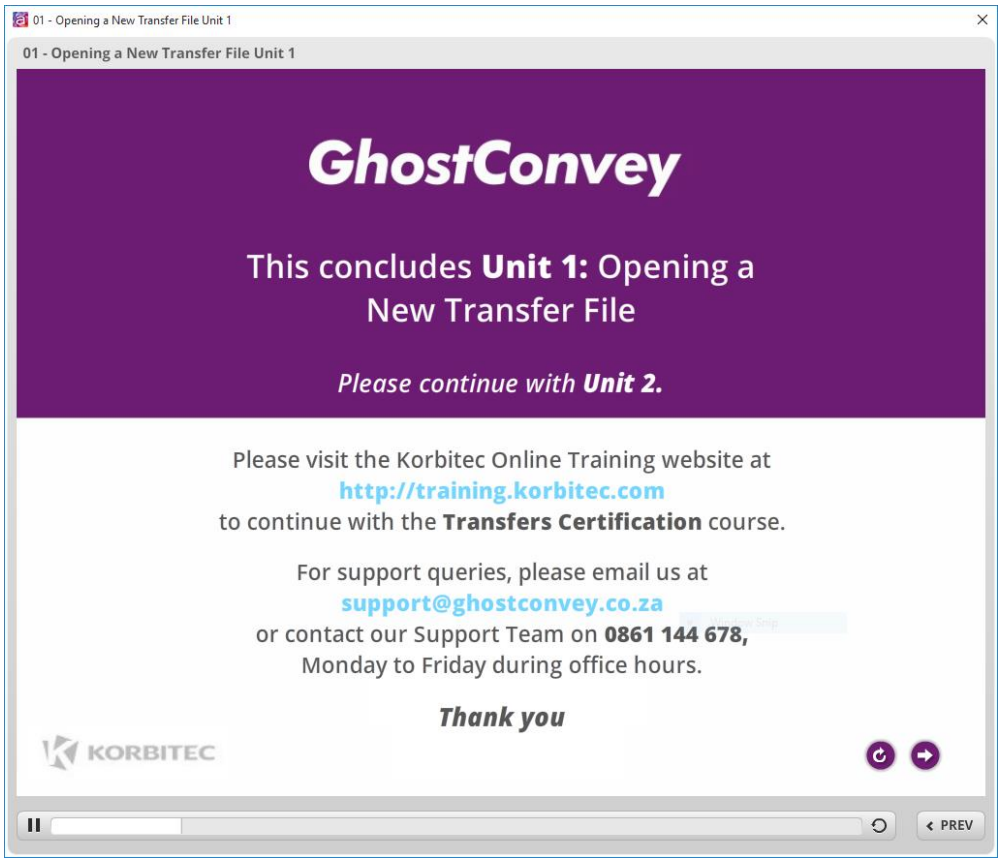

Figure 5-17: Unit 1 Exit Screen (Module 1)

5.7 Conclusions

The design and prototyping of Prototype 1 in Cycle 2: *Design Alternative 1* was reported on in this chapter. The design alternatives for this study are: Prototype 1 which is the KOTW before the commencement of this study and Prototype 2 which is the proposed e-learning components forming an output of $eLEST_P$. Both prototypes were considered with regards to cognitive processes, multimedia principles and e-learning heuristics from the MUUX-E framework. There were shortcomings identified in Prototype 1 which included a lack of user interactivity, the inability to simplify complex information and not accommodating an advanced learner. The design of these shortcomings as well as specific organisational requirements were then used to inform the design guidelines of Prototype 2. Prototype 2, consisting of the practice tasks, assessments, content construction and e-learning components (ILOs, multimedia and dynamic visuals) was described. An elaboration of the use of the SCORM standard and content construction in the design and implementation of Prototype 2 was discussed. All three stages of the theoretical contribution, $eLEST_T$, were successfully applied to the case study in order to solve a real-world problem.

This chapter, along with the theory from Chapter 3, has answered the fourth research question ***RQ_4:*** *Which e-learning process can be used for developing a best practice e-learning environment for software training?* This chapter has partially answered the following research question:

RQ_5: *What design guidelines can be used for e-learning environments in a software training context?*

The following chapter will report on the evaluation of the practical artefacts proposed in this study. The design and prototyping of Prototype 2, forms the first aspect of Cycle 3: *Design and Evaluate Alternative 2*. Chapter 6 will continue reporting on Cycle 3 with regards to the evaluations. Several sub-cycle iterations of testing and refinement occur in the formative evaluations and is considered the second aspect of Cycle 3: *Design and Evaluate Alternative 2*. It can be noted that in this study, $eLEST_T$ has been applied to the case study as a new instantiation, namely $eLEST_P$, and it became more detailed and contextualised to the real-world problem of this study. ***RQ_5*** and ***RQ_6*** will be answered in full in Chapter 6.

Chapter 6. e-Learning Evaluation and Reflection

6.1 Introduction

The DBR methodology adopted in this study has an iterative nature and progression is made from the complex problem to the proposed solution (Section 2.6). In this study, DBR is adopted with three cycles (Figure 2-6). The theoretical artefact or solution of this study is the proposed theoretical e-learning environment for software training ($eLEST_T$). The implementation in practice, or real-world context, was achieved by adopting $eLEST_T$ at the case study, which is the Korbitec context, and results in the practical artefact or solution ($eLEST_P$).

This chapter will answer the following research questions:

> **RQ_5:** What design guidelines can be used for e-learning environments in a software training context?
>
> **RQ_6:** What is the predicted success of the proposed environment at Korbitec for the Transfers course?

The design guidelines referred to in RQ_5 were identified in theory in Chapter 3 and are elements of the requirements and design, prototyping and evaluation stages of $eLEST_T$. Chapter 4 reported on the outputs of the requirements stage as a result of applying $eLEST_T$ to the case study. Chapter 5 addressed the application of $eLEST_T$ to the requirements, design and prototyping stage to provide these elements of the proposed solution for $eLEST_P$. Chapter 5 also described the application of the design guidelines in RQ_5 to practice in Cycle 2: *Design Alternative 1*.

This chapter addresses two research objectives (RO_5 and RO_6) and produces a set of deliverables (Figure 6-1). This chapter goes beyond Chapter 5 by also reporting on Cycle 3: *Design and Evaluate Alternative 2*. Whilst each DBR cycle consists of all of the five phases to differing degrees, the main focus of this chapter is on the evaluation and reflection phases (Section 6.2). The chapter reflects on the application of the design, prototyping and evaluation stage of $eLEST_T$, with a focus on the aspect of evaluation, to the Korbitec case study. This chapter also evaluates Design Alternative 2, also referred to as Prototype 2, which is the full $eLEST_P$. The iterative design, feedback and improvement of four iterations of the e-learning

components was conducted by experts from Korbitec (Section 6.3). The results of the elements of eLEST$_P$ that were further evaluated are reported on (Section 6.4). A number of conclusions from this cycle can be made (Section 6.5).

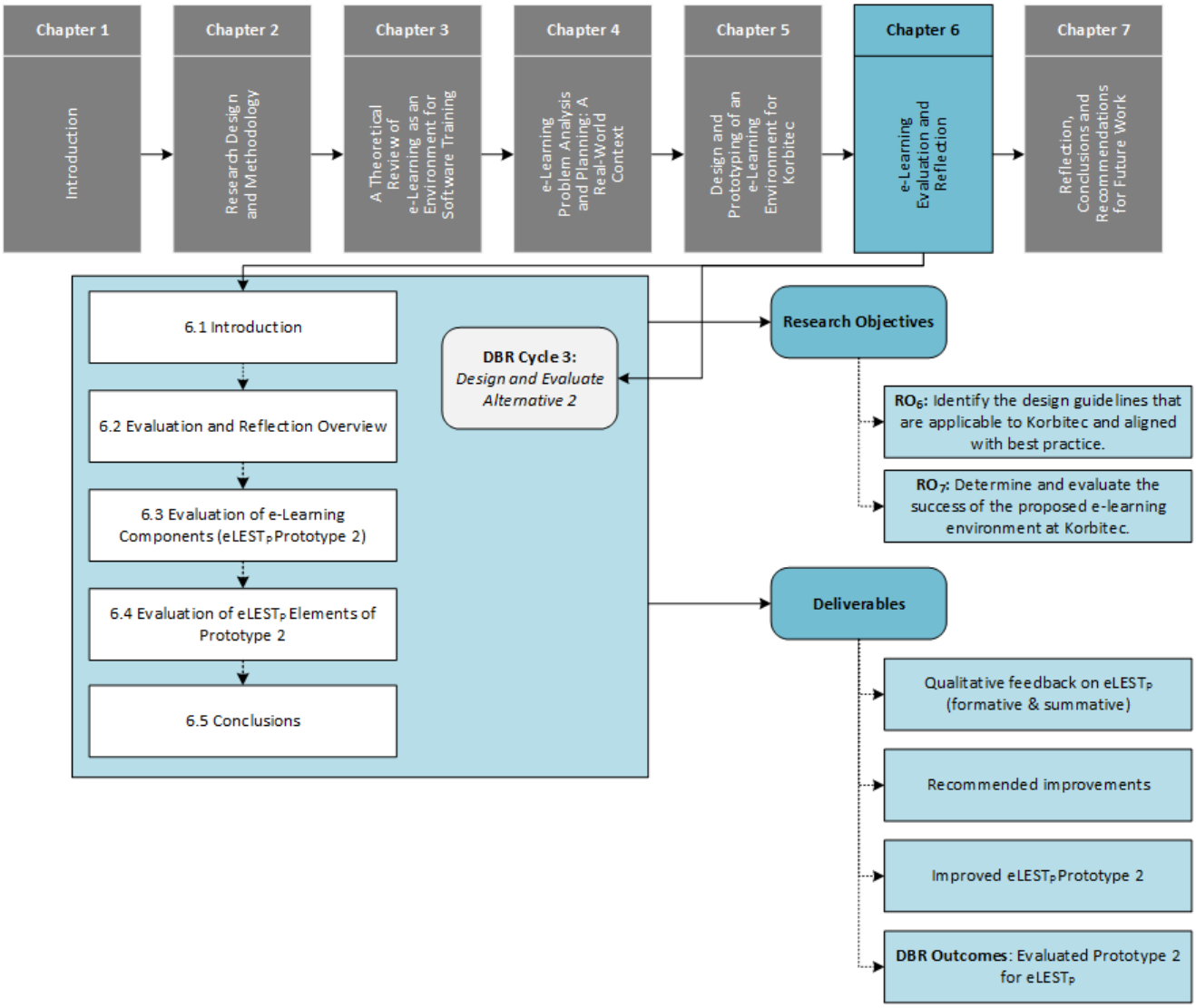

Figure 6-1: Chapter 6 Layout and Deliverables

6.2 Evaluation and Reflection Overview

DBR encourages researchers to work in collaboration with participants in order to manage research activities and to control practical and theoretical factors that may affect practice (Wang & Hannafin, 2005). DBR draws from multiple fields as it requires researchers to take the roles of both designer and researcher. An overview of the DBR cycles of this study and how the artefacts were evaluated and reflected on in each cycle is provided in Table 6-1. The developer of the artefact is indicated either as the researcher or that the artefact pre-existed at the commencement of this study. Cycle 1: *Problem Investigation and Proposal* was concerned with the theoretical artefacts proposed in this study which are the e-learning barrier framework and the model for e-learning success in the theoretical environment, $eLEST_T$. Cycle 2: *Design Alternative 1* and Cycle 3: *Design and Evaluate Alternative 2* related to the practical artefacts of this study which are Prototypes 1 and 2 of the final practical environment, $eLEST_P$. Prototype 1 is not a contribution of this study because the artefact was developed by Korbitec.

Table 6-1: Evaluation Overview

THEORETICAL ARTEFACT				
DBR cycle	**Artefact**	**Research Method**	**Evaluation Criteria**	**Data Analysis**
1	$eLEST_T$: e-Learning barrier framework	Literature review	Barriers	Qualitative (thematic)
	$eLEST_T$: e-Learning success model (intention & satisfaction)	Survey	Intention, satisfaction, enjoyment, computer anxiety, self-efficacy	Quantitative

PRACTICAL ARTEFACT						
DBR cycle	**Artefact**	**Developer**	**Research Method**	**Criteria/Metrics**	**Data Analysis**	**Evaluation Type**
2	Prototype 1	Korbitec (pre-existing)	Usability evaluation (R)	Cognitive design implications, multimedia principles, e-learning (MUUX-E) heuristics ($eLEST_T$)	Qualitative	Summative
3	Prototype 2: e-learning components	Researcher	Usability study (K)	Organisational-specific criteria	Qualitative (Iterations 1, 2, 3 & 4)	Iterative Formative
	Prototype 2: full environment and final artefact ($eLEST_P$)	Researcher	Interview (K) Reflection of success (R)	Successful adoption of elements	Qualitative	Summative

In the DBR process model, Phase 4 involves evaluation and according to De Villiers and Harpur (2013) and The Design-Based Research Collective (2003), evaluation can take place by formative means as well as summative means. A formative evaluation is characterised by the iterative nature of its testing process and when it occurs (Tullis & Albert, 2013). The main objective of a formative evaluation is to make improvements to the artefact prior to the final version. The artefact is analysed with a set of criteria to identify shortcomings and make recommendations, and to repeat this process iteratively until no more improvements for the artefact can be identified. There are cost and time savings implied with conducting formative evaluations yet some practitioners do not see the need for such an evaluation. The goal of summative evaluation is to evaluate the extent to which a given artefact meets its objectives (Tullis & Albert, 2013).

Both formative and summative evaluation methods were used in this study for the two prototypes, namely:

- Prototype 1 evaluation – summative (Section 5.4); and
- Prototype 2 ($eLEST_P$) – formative and summative (Sections 6.3 and 6.4).

Prototype 1 Evaluation:

Cycle 2: *Design Alternative 1* consisted of the evaluation of the pre-existing Prototype 1 which was reported on in Chapter 5. The criteria that were used for Cycle 2 were derived from the theoretical artefact and the design considerations and guidelines. The evaluator was the researcher. The researcher identified that there were shortcomings in Prototype 1 in terms of interactivity, its ability to simplify complex information and its ability to accommodate advanced learners (Section 5.4). These shortcomings presented an opportunity for refinement and improvements to be made and thus, Prototype 2 was designed and developed.

Evaluations of Prototype 2 ($eLEST_P$):

The second set of evaluations took place in Cycle 3: *Design and Evaluate Alternative 2* and were both formative and summative. There was one evaluator for the second set of evaluations (Evaluator E_4). These evaluations are reported on in this chapter and consisted of:

- Evaluations of e-learning components of Prototype 2 (four iterations of formative evaluations); and
- Evaluation of the $eLEST_P$ elements of Prototype 2 (summative).

6.3 Evaluation of e-Learning Components (eLEST$_P$ Prototype 2)

The aim of the formative evaluations of Prototype 2, which is the artefact evaluated, was to identify the areas of improvements iteratively where the feedback from one iteration formed the input for the next iteration. Four iterations of formative evaluations of the e-learning components of Design Alternative 2 (Prototype 2) took place in this study. The main aim of this artefact is to assist users in learning to use the GhostConvey software and to be certified to use it. It was decided that the content developers and the subject matter expert (Table 4-3) of the design team at Korbitec should be the evaluators for the formative evaluations of Prototype 2. These evaluators were selected based on their expert knowledge of the Korbitec requirements as well as of their e-learning knowledge and experience. The limited population size of possible evaluators with the correct expertise available for these evaluations meant that all possible evaluators had to participate. There were three evaluators for the first set of evaluations (Evaluators E_1 to E_3).

The evaluated outputs of eLEST$_T$ for this evaluation was the e-learning components (simulations of GhostConvey software, ILOs and learner assessment methods). Features to measure learner competency were incorporated into the e-learning components for Prototype 2 and a variety of assessment methods were used (Section 5.6.4). A total of four formative iterations were conducted and the recommended improvements were made to the artefact after each iteration resulting in a refined Prototype 2 (Figure 2-4). The evaluations were conducted in the respective evaluators' offices using their personal computers at Korbitec. An Internet connection was required for the participants to access the e-learning components and to provide feedback to the researcher. Due to the need for Korbitec to train users to use the GhostConvey software in a high-fidelity setting, the need for simulations arose. In the prototyping of the e-learning content, the simulations were developed so that they represented the GhostConvey software as closely as possible.

The evaluators were asked to evaluate the e-learning components and provide qualitative feedback in terms of the criteria. The design guidelines and organisational-specific criteria were specified as an output of planning in eLEST$_T$ and were derived from interviews with Korbitec (Roshan Fillies, Joanne Jones & Marcia Kitshoff, personal communication, 26 May 2015) as a result of eLEST$_P$ (Section 5.2.2). The final set of criteria used were based on a subset of the design guidelines from Chapter 3 and the organisational-specific criteria:

- Corporate suitability;
- Visual appeal;
- Time suitability;
- Consistency of e-learning components;
- Ability for e-learning components to encourage active learning;
- Accuracy of e-learning components; and
- Appropriate assessment mechanisms.

6.3.1 e-Learning Components (Iteration 1)

The evaluation data for Iteration 1 was collected using an online tool known as Google Forms. A questionnaire (Appendix J) was distributed electronically to the two content developers at Korbitec (Evaluator E_1 and E_2). The results of Iteration 1 indicated that the criteria concerning the time suitability, the consistency of e-learning components and the ability of e-learning components to encourage active learning were considered acceptable by evaluators and no further improvements were recommended in this iteration for these criteria. However, improvements needed to be made to Prototype 2 regarding issues related to the following criteria (Table 6-2):

- Corporate suitability;
- Visual appeal;
- Accuracy of e-learning components; and
- Appropriate assessment.

Table 6-2: Prototype 2 Evaluation (Qualitative Feedback – Iteration 1)

Criteria	Evaluator	Content Developer Feedback	Improvements required?
Corporate suitability	E_1	I like it. Might need to look at the wording of some of the tasks, though, as I had to puzzle a bit over what I should do next.	Yes
	E_2	Very suitable in my opinion - may frustrate older users, but a perfect way to teach new users the ropes and for existing users to refresh their knowledge.	
Visual appeal	E_1	Looks good, nice and fresh. I must agree with Rosh though, the images are a bit unclear and maybe the slide is too small for comfortable reading. Might be worth looking at the layout of the information slides - I think the left align looks a bit off if only one word is on the next line.	Yes
	E_2	The screenshots are of a poor quality, it is best to capture original screenshot directly from the UI. The Open Sans font is great but looks a bit too light - either darken the grey or use regular.	
Time suitability	E_1	No issues. Short, sweet and succinct.	No
	E_2	No issues with time - it worked for me.	
Consistency of e-learning components	E_1	No issues picked up.	No
	E_2	Good.	
Ability of e-learning components to encourage active learning	E_1	The Show Me, Try Me, Test Me approach is effective.	No
	E_2	Very engaging.	
Accuracy of e-learning components	E_1	Pretty accurate, however just a couple of things: 1. On the validation dialogue their mandatory fields indicated by an asterisk - may be useful to point this out. 2. Also when asking the users to capture data, I prefer using this for blank fields only and not for fields ending in a dropdown arrow. It may be best to have then click the dropdown, display the contents and select an item.	Yes
	E_2	No issues picked up - Judy might comment here, she knows GC better than I do.	
Appropriate assessment mechanisms	E_1	I like the variation of types of questions.	Yes
	E_2	Might need to reword the question that says "drag the appropriate answer" to "select from drop down".	

Evaluator E_1 recommended that the poor visual appeal of Prototype 2, relating to the slide size, be rectified by increasing the slide size of the e-learning components. This improvement, along with the correction of the text alignment was completed. The text font was darkened according to the recommended improvement by E_2. Both evaluators commented on the resolution of the screenshots in the e-learning components. A problem faced in the development of Prototype 2 involved the deterioration of the screenshots to the extent

where the features were unrecognisable. This loss in image quality was a result of taking screenshots directly from the GhostConvey software application and transferring those images into Articulate Storyline 2. Alternative methods, such as using the print screen keyboard feature instead of the Snipping tool; downloading specialised software such as 7capture; and using editing software such as Photoshop, were explored.

Evaluator E_1 felt that some of the instructions created confusion and thus, affected the corporate suitability of Prototype 2. The accuracy of content, according to Evaluator E_1, needed improving and E_2 felt that the subject matter expert at Korbitec might be able to provide more feedback on this criterion. E_2 noted a correction that needed to be made to the assessments regarding the wording of instructions.

6.3.2 e-Learning Components (Iteration 2)

The evaluation data for Iteration 2 was collected using a questionnaire consisting of open-ended questions relating to the aspects of Prototype 2 that needed improving related to criteria in Iteration 1. The questionnaire was distributed electronically to one content developer at Korbitec (E_2) and the second content developer was unfortunately unavailable. Unlike Iteration 1 that elicited improvements of the Show Me, Try Me and Test Me units in general, Iteration 2 enabled more detailed feedback to be generated by requiring the evaluator to provide feedback for the criteria according to the units (Table 5-5).

The evaluator of Iteration 2 was required to review the refined Prototype 2, which had the recommended improvements incorporated from Iteration 1. The main issues identified in Iteration 1 were linked to four criteria and therefore these four criteria were the only criteria used for the evaluation in Iteration 2. Qualitative feedback was required for each unit in terms of the following criteria derived from eliciting requirements for $eLEST_P$ (Section 5.2.2) as well as Iteration 1:

- Corporate suitability;
- Visual appeal;
- Accuracy of e-learning components; and
- Appropriate assessment mechanisms.

The results of Iteration 2 indicated that more improvements needed to be made to Prototype 2 (Table 6-3). The criterion involving appropriate assessment mechanisms was deemed

acceptable by the evaluator in all three units of Prototype 1. The visual appeal and corporate suitability of Unit 2 required no changes to be made. The criterion of accuracy of e-learning components was acceptable for the evaluator concerning Unit 3.

Table 6-3: Prototype 2 Evaluation (Qualitative Feedback - Iteration 2)

Prototype 2 Unit	Criteria	Content Developer Feedback	Improvements required?
Unit 1: Show Me	**Corporate suitability**	• Can we remove the music from the video, please?	Yes
	Visual appeal	• Also, the slide automatically progresses, can we pause it so the user needs to click next? • GC Deeds Search – After search has been imported, the screenshot once you have returned to your matter is very blurry. This one if definitely the worst I have seen so far. Will need to be improved. • So far all Deeds Search images need to be enlarged… they are getting lost and are very unclear.	Yes
	Accuracy of e-learning components	• First video slide – There is nothing to indicate that the user needs to hit play… can we add in an instruction? It took me a while to figure out what I was supposed to do. • There is a quotation mark missing after "New Matter".	Yes
	Appropriate assessment mechanisms	None	No
Unit 2: Try Me	**Corporate suitability**	None	No
	Visual appeal	None	No
	Accuracy of e-learning components	• Manual Transfers – After search has been completed and results have been imported: The wording is a bit ambiguous. Could it rather say something like "Click Attached Documents to view your Search results"?	Yes
	Appropriate assessment mechanisms	None	No
	Consistency of e-learning components	None	No
Unit 3: Test Me	**Corporate suitability**	• You will receive a mark…. Does this maybe sound better as you will receive a grade at the end?	Yes
	Visual appeal	• First slide – Blue highlight should be around Test Me	Yes
	Accuracy of e-learning components	None	No
	Appropriate assessment mechanisms	None	No

The concern surrounding the quality of the screenshots obtained from the GhostConvey software was identified as an issue again and it was clear that the alternative methods for obtaining screenshots explored in Iteration 1 were ineffective and produced a blurry image.

A solution to the problem was discovered and involved using the Magnifier tool to zoom in on the GhostConvey software and then using the Snipping tool to take the screenshot. An example of a screenshot from Prototype 2 prior to the application of the new method (Figure 6-2) shows the effects when using new screenshot method for Prototype 2 (Figure 6-3). This method provided the highest quality screenshot from the GhostConvey software. The recommended improvements were made to Prototype 2 for Units 1, 2 and 3.

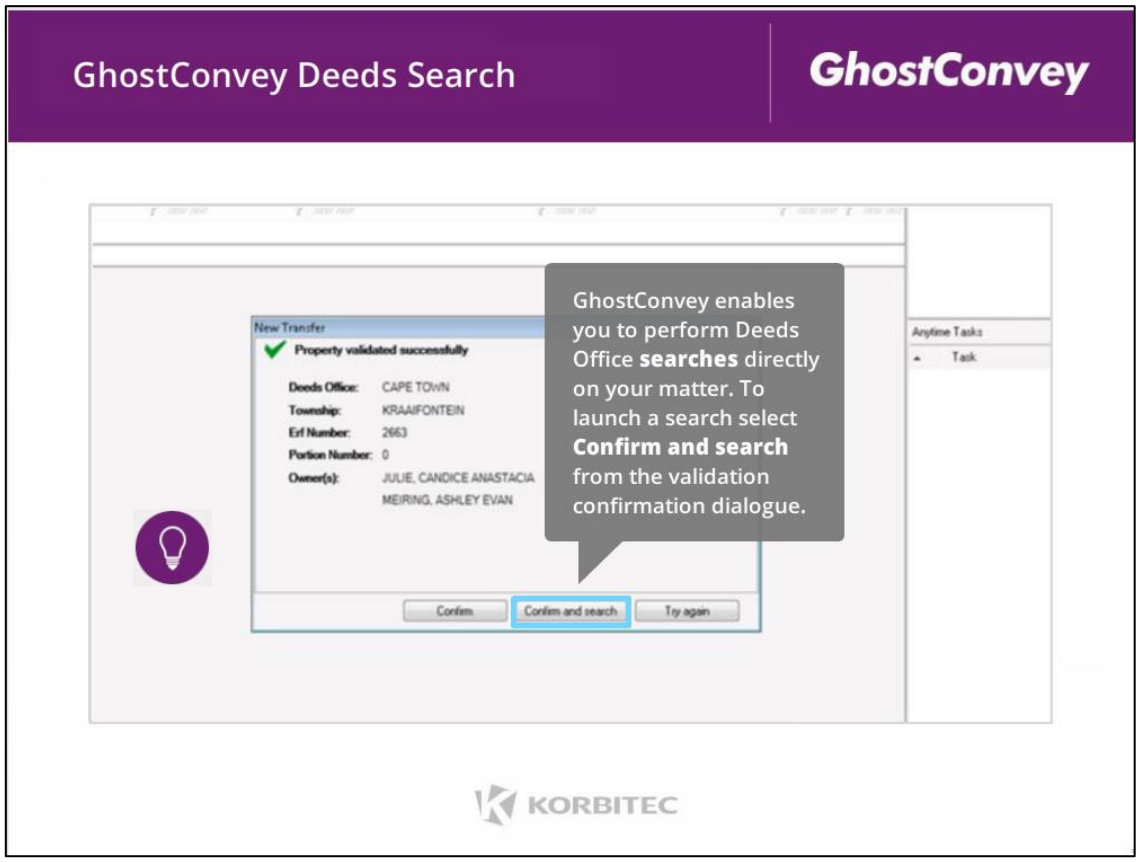

Figure 6-2: Poor Quality Screenshot Prior to Application of New Method (Prototype 2)

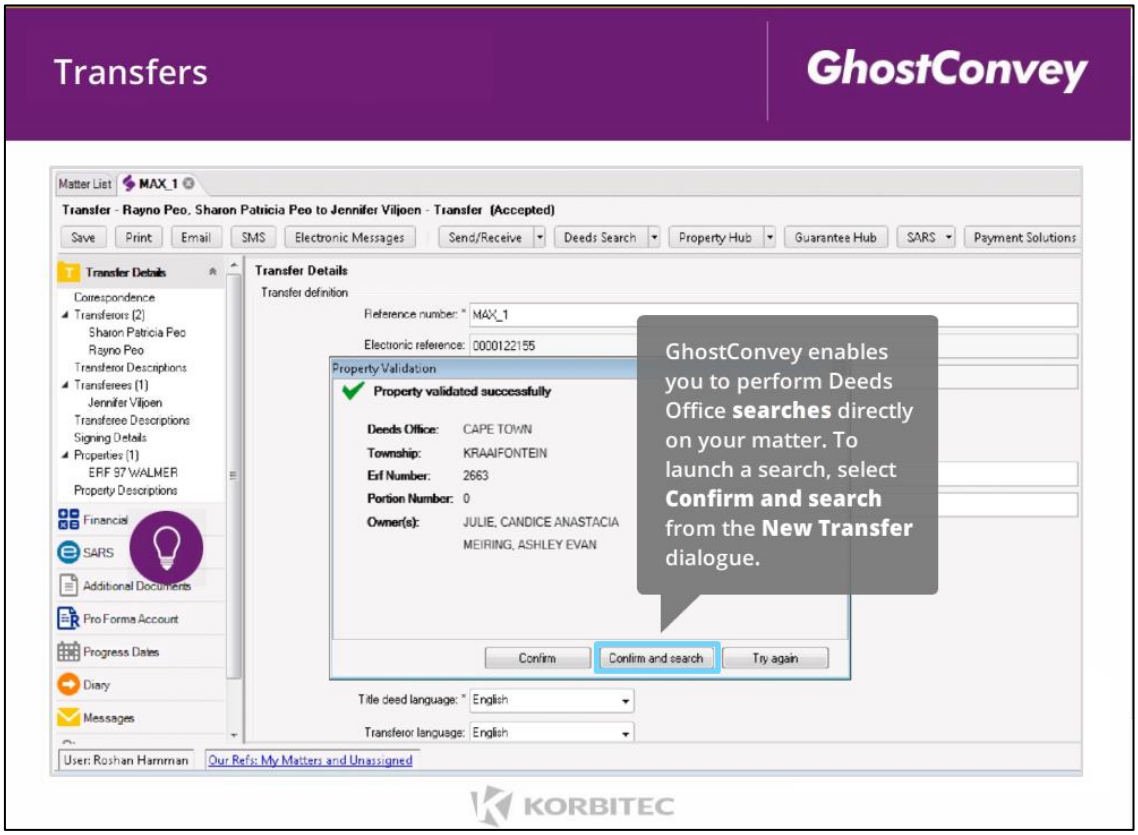

Figure 6-3: High Quality Screenshot after Improvements (Prototype 2)

6.3.3 e-Learning Components (Iteration 3)

The evaluation data for Iteration 3 was collected from the same evaluator (E_2), using the same method as Iteration 2. The evaluator of Iteration 3 was required to review Prototype 2 a third time, with the recommended improvements incorporated from Iteration 2. The main issues identified in Iteration 2 were linked to three criteria and therefore these three criteria were the only criteria used for the evaluation in Iteration 3. Qualitative feedback was required for all units (Table 5-5) in terms of the following criteria derived from $eLEST_P$ (Section 5.2.2) as well as Iteration 2:

- Corporate suitability;
- Visual appeal; and
- Accuracy of e-learning components.

Table 6-4: Prototype 2 Evaluation (Qualitative Feedback - Iteration 3)

Prototype 2 Unit	Criteria	Content Developer Feedback	Improvements required?
Unit 1: Show Me	**Corporate suitability**	Navigation and Objectives slide: Test Me: Not sure about the wording "you will score at the end". Is it not "you will receive a score at the end"?	Yes
	Visual appeal	Accept new instruction slide: • The bigger project size is so much better! It really makes a huge difference! GC Deeds Search – transferor details validated slide: • Not sure if it's just me, but the blue highlight box around the transferors looks very thick in this slide.	Yes
	Accuracy of e-learning components	None	No
Unit 2: Try Me	**Corporate suitability**	None	No
	Visual appeal	Confirm and Search slide: • After the task where you say Validate and Confirm and Search – just edit the Bold text please of Validate and Confirm and Search ☺ (it's wrong and is in bold)	Yes
	Accuracy of e-learning components	None	No
Unit 3: Test Me	**Corporate suitability**	None	No
	Visual appeal	None	No
	Accuracy of e-learning components	None	No

It can be noted that the recommended improvements suggested had focused less on suggestions for general improvements and more on specific slides of the e-learning components in Prototype 2. The three suggestions for improvements for Iteration 3 were implemented.

6.3.4 e-Learning Components (Iteration 4)

It was established that the content developers possibly lacked some expertise with regards to the subject matter. It was decided that Iteration 4 would entail obtaining feedback from the subject matter expert at Korbitec (Section 4.2.2). The evaluator (E_3) for Iteration 4 was the subject matter expert at the company who also has an expert command of the English language and thus, the grammar of the information portrayed in Prototype 2 was corrected and feedback was given according to the units of study and the slide number whilst considering the seven organisational-specific criteria. The feedback generated from Iteration 4 related mostly to the criteria of visual appeal and accuracy of learning components. All of

the suggested changes were implemented and an improved Prototype 2 was produced. The feedback obtained from E_4 can be found in Appendix K and a few of the sample comments are as follows:

Visual appeal:

- Typically, in training materials, button/field/dialogue names are written in bold – should this not continue through to this material? (**New Matter** instead of "New Matter");
- Can you add a little space before the first line in the white section – it looks a little cramped; and
- Paragraph spacing in the second textbox needs updating (or remove paragraphs).

Accuracy of learning components:

- **Confirm and search** or **Search and import** (capitalisations to match the buttons themselves);
- For some reason, I was looking for the "submit" button on the New Transfer screen. I think it might be clearer to make the navigation button say "Next" as on other slides so that the user is clear where to look for the button; and
- Nothing happens when I click the Confirm and search button as my answer – the instruction should say that you have to click your selection and then click submit.

The criteria used in each iteration of the formative evaluations of Prototype 2 differed based on feedback from a preceding iteration (Table 6-5). The first iteration commenced using all seven organisational-specific criteria derived from interviews with Korbitec (Section 4.2.1). Prototype 2 required no improvements to be made regarding the criteria of *time suitability* and ability of e-learning components to encourage active learning and therefore, these criteria were excluded from the second iteration. The third iteration required improvements to be made to Prototype 2 concerning the criteria of corporate suitability, visual appeal and accuracy of e-learning components and therefore the criteria that were excluded are consistency of e-learning components and appropriate assessment mechanisms. The feedback from the first three iterations suggested obtaining feedback from the subject matter expert and the results were generated for each unit in Prototype 2.

Table 6-5: Results of Formative Evaluations of Prototype 2 (Iterations 1 to 4)

	Iteration 1	**Iteration 2**	**Iteration 3**	**Iteration 4**
Evaluator	Content developers (n = 2)	Content developers (n = 1)	Content developers (n = 1)	Subject matter expert (n = 1)
Organisational-specific Criteria	Corporate suitability	Corporate suitability	Corporate suitability	Feedback given per Prototype 2 unit (Show Me, Try Me, Test Me)
	Visual appeal	Visual appeal	Visual appeal	
	Time suitability	Accuracy of e-learning components	Accuracy of e-learning components	
	Consistency of e-learning components	Appropriate assessment mechanisms		
	Ability of e-learning components to encourage active learning			
	Accuracy of e-learning components			
	Appropriate assessment mechanisms			

6.3.5 Analysis and Discussion

Evaluators E_1 and E_2 identified the criteria in Iteration 1 related to Prototype 2 that needed improving and they were visual appeal, corporate suitability, accuracy of e-learning components and appropriate assessment (Section 6.3.1). In Iteration 2, Evaluator E_2 identified that further improvements needed to be made to Prototype 2 in terms of corporate suitability, visual appeal and the accuracy of e-learning components (Section 6.3.2). In Iteration 3, three suggestions for improvements were identified by Evaluator E_2 and concerned the corporate suitability and visual appeal criteria (Section 6.3.3). Iteration 4 of this study generated feedback from E_3 for Prototype 2 according to the Show Me, Try Me and Test Me units regarding the subject matter (Section 6.3.4).

6.4 Evaluation of eLEST$_P$ Elements of Prototype 2

The theoretical artefact, namely eLEST$_T$, which was proposed in Chapter 3 was applied to the case study to produce the real-world solution, which is an e-learning environment for software training for Korbitec (eLEST$_P$). Due to scope and time limitations, some of the elements of eLEST$_P$ could not be evaluated by the stakeholders at Korbitec. Two types of evaluation and reflection were undertaken as follows:

- R – Researcher reflection of success of application of $eLEST_T$ to produce $eLEST_P$; and
- K – Korbitec feedback on $eLEST_P$ elements.

Table 6-6 lists all the elements in the proposed theoretical artefact, the related section in which the element was successfully applied ($eLEST_P$) and reported on in Chapters 4 and 5. Table 6-6 also indicates the type of evaluation and reflection (K, R or both). The R therefore evaluated $eLEST_P$ by applying it to the case study and the application indicated that some elements of the environment were already proven to be successful because the desired outcome was achieved. A K refers to the four evaluators that were asked to evaluate the elements of $eLEST_P$ (Evaluators E_1, E_2, E_3 and E_4). Evaluators E_1, E_2, E_3 were asked to evaluate the e-learning components (Prototype 2). The stakeholder at Korbitec who has the most interest in and relevance to this study regarding strategic aspects is the national training manager (Table 4-3) and was asked to give feedback on the selected elements of $eLEST_P$ (E_4). As is evident in the table, all of the elements were successfully applied to the case study.

Table 6-6: The Application of $eLEST_T$ to Korbitec ($eLEST_P$)

$eLEST_T$ Element	**Section ($eLEST_P$)**	**Evaluator**
Outputs of all activities:		
• Learner competency	Section 5.6	R
• Certification of learner		R
Planning		
Organisational considerations and guidelines	Section 4.2	R + K
○ Organisational culture and context	Section 4.2.1	R + K
○ Policies and standards	Section 4.2.1	R + K
○ Organisational-specific criteria	Section 4.2.1	R + K
○ Roles in e-learning	Section 4.2.2	R
○ e-Learning dimensions (content, pedagogy, technology)	Section 4.3	R
• Barriers to e-learning	Section 4.4	R + K
• Critical success factors for e-learning	Section 4.5	R
• Intention to use e-learning	Section 4.10	R
• Satisfaction with e-learning	Section 4.11	R
Requirements outputs		
• Roles in e-learning	Section 5.2.1	R
• e-Learning dimensions (content, pedagogy, technology)	Section 5.2.1	R
• Required e-learning components	Section 5.2.1	R + K
• The learning objectives (educational goals)	Section 5.2.1	R + K
• Competencies/skills acquired	Section 5.2.1	R
• Prerequisite knowledge	Section 5.2.1	R
• Desirable and undesirable UX goals	Section 5.2.2	R
e-Learning design requirements	Section 5.2.2	R
Design, prototyping and evaluation		
Inputs:		
Design implications of cognitive processes	Section 5.5.1	R
Multimedia principles	Section 5.5.2	R
e-Learning (MUUX-E) heuristics	Section 5.5.3	R
Outputs:		
• Content construction and standards	Section 5.6.1	R
• e-Learning components (For example, learning objects, interactive learning objects, multimedia and dynamic visuals)	Section 5.6.2	R + K
• Assessments for measuring learner competency	Section 5.6.4	R
• Set of practice tasks	Section 5.6.3	R
• Evaluation results (recommended improvements and feedback from users)	Chapter 6	R

Theory	**Section ($eLEST_P$)**	**Evaluator**
• Social identity theory	Section 5.3	R + K
• Self-determination theory		R + K
• Cognitive evaluation theory		R + K
• Theory of planned behaviour		R + K
• Theory of reasoned action		R + K
• Media richness theory		R + K

The summative evaluation was conducted by means of a semi-structured telephonic interview where questions were prepared. The elements of $eLEST_P$ that were evaluated by one stakeholder (Evaluator E_4) other than the researcher in this study are:

- The organisational culture, context and organisational criteria (Section 6.4.1);
- The learning objectives (Section 6.4.2);
- The e-learning components (Section 6.4.3)
- The underlying theories and assumptions (Section 6.4.4).

6.4.1 Planning: Organisational Culture, Context and Organisational Criteria

It was important that the real-world solution that was presented to Korbitec accurately reflected their culture, context, policies and standards (Section 4.2.1). The evaluator (Evaluator E_4) was asked the following question:

> "*Do the ILOs adhere to the design guidelines, corporate culture and standards of Korbitec?*"

Evaluator E_4 agreed that $eLEST_P$ met these considerations and guidelines, and stated that:

> "*It is something that, believe it or not, the few people that have seen it, they are wanting their staff to use it on the development side. It looks like we are going to incorporate some of it into our induction methods. So for example, if you are new to the GhostConvey development team, the product owner may just decide to allow the staff to do that particular online course. Especially in cases where staff need to know how the application works and seeing it from a training and end-user perspective. Developers start and they get thrown into a team and have no context of the system they're working with.*"

Therefore, it was deduced that $eLEST_P$ met the organisational considerations and guidelines of Korbitec as they are planning to use it for both customer training and induction methods. Evaluator E_4 was asked the following question: "*To what extent do you believe that the barriers identified in the focus group and survey conducted last year can help you plan for future projects?*" A future goal for the implementation of e-learning at Korbitec is to investigate whether it would be feasible to have a dedicated coach who is there to assist learners, according to Evaluator E_4, who stated:

> "*I like the idea of having a dedicated coach which is something I'm definitely looking into and having an interactive forum or some sort of way for learners to collaborate. I think that's something that is very important. So that they're not feeling so isolated*."

This statement confirmed that it is important to identify barriers to e-learning as well as ways of managing these barriers, such as using a forum to overcome isolation. The barrier of isolation identified by the evaluator is in agreement with the literature reviewed (Section 3.4) as well as the focus group that was conducted where the theme of "Social Interaction" was identified as a potential barrier to e-learning (Section 4.4.3).

6.4.2 Requirements: Learning Objectives

Evaluator E_4 was asked the following question:

> "*Are the instructions and learning objectives made clear enough in the ILOs?*"

Evaluator E_4 stated:

> "*I think so, yes. Again, bearing in mind, we also know that you are not a subject matter expert and your intervention was very much in the early stages and so we've obviously built on them but based on your limited knowledge and understanding and never having done this before, I think it really was a good attempt. Our content developers work alongside the subject matter expert, so you are not expected to be one*."

This statement agreed with the literature concerning the multiple roles that are evident in e-learning environments and how e-learning environments should be considered a collaborative effort (Section 3.3.1). Evaluator E_4 agreed that $eLEST_P$ provides a close link between the GhostConvey simulations and the actual GhostConvey software and this related to the fidelity multimedia principle concerning the need for learners to train to use software in high-fidelity settings (Section 3.10.1.2).

6.4.3 Design, Prototyping and Evaluation: e-Learning Components

In addition to the formative evaluations (Iterations 1 to 4), summative feedback was generated for the e-learning components in $eLEST_P$. Evaluator E_4 was asked the following question:

> "*Is Korbitec going to use $eLEST_P$? If so, how? Perhaps a template for creating further ILOs?*"

Evaluator E_4 confirmed the value added for Korbitec by having $eLEST_P$ made available to the company:

> "*So the interactive tutorials were used as a template going forward. So what the content developers did was they built on that. So we definitely used what you put together for us as setting the tone going forward*."

e-Learning components have been developed by Korbitec, using Prototype 2 as a template, according to Korbitec's needs and best practice. Evaluator E_4 stated that:

> "*We haven't ended up using all three units, and it was a bit of an overkill. But I know that in certain instances it was a bit of a mix and match option… In some cases, the Show Me and Try Me units were grouped together to form a combination*".

However, Korbitec nevertheless decided to make the e-learning components available in manageable chunks of information which agreed with the literature (Section 3.5) regarding what constitutes a successful online course (Moon *et al.*, 2005).

There are a variety of e-learning components available in $eLEST_P$ and some are interactive (Figure 3-6). According to Evaluator E_4, learner preference between ILOs and pdf documents depends on the resources available to the learner as well as the type of learner concerned. Evaluator E_4 stated that:

> "*Where there are customers that don't have Internet access, I don't think they will move away from pdf documents which may be a limitation, for example, being able to look at YouTube videos or being able to look at the video content or maybe it's not being displayed properly. So I don't see us moving away from pdf documents anytime soon because of the nature of what it is that our customers do. Some secretaries like to print out the pdfs and have something tangible on their desks for something they can refer to. The problem with that is that if they don't refer to online training, they won't get the latest version and some features may change.*"

Evaluator E_4 perceived $eLEST_P$ as a supplement to F2F training, as seen in the following statement:

"*I see the interactive tutorials and videos over and above the pdfs, as an addition to the training solution that we offer F2F so if you feel you don't want to send your staff to a training session and you want them to develop skills, there is this alternative.*"

6.4.4 Underlying Theories and Assumptions

An in-depth literature review identified the need to underpin e-learning environments with underlying theories and assumptions which may have pedagogical considerations (Sections 3.3 and 3.3.4). These theories were used to design some of the questions for the final evaluation interview. An interview was conducted with the national training manager at Korbitec in order to derive qualitative feedback on the six underlying theories and assumptions of this study and $eLEST_T$ which are:

- The MRT (Section 6.4.4.1);
- The TPB (Section 6.4.4.2);
- The TRA (Section 6.4.4.3);
- The social identity theory, self-determination theory and cognitive evaluation theory (Section 6.4.4.4).

6.4.4.1 Media Richness Theory (MRT)

Evaluator E_4 was asked the following question:

"*Do the ILOs provide immediate feedback (Test Me units)?*"

Evaluator E_4 agreed that the e-learning components in $eLEST_P$ provide immediate feedback, particularly in the Test Me units, and that this meets the needs of Korbitec. Evaluator E_4 stated that:

"*Yes it gives you a score at the end of the assessment and not after each question has been answered, which is what we wanted."*

This statement agreed with the criteria of the MRT as proposed by Daft *et al*. (1987) regarding the capacity of media to provide immediate feedback to encourage the comprehension of rich information (Section 3.10.3). Evaluator E_4 was asked the following question: "*Do the ILOs convey interpretation and meaning through more than just information, data or text (for example, through graphical representations and media)?*" Evaluator E_4 agreed with the way in which the e-learning components in $eLEST_P$ conveyed meaning through a variety of media, and stated that:

> "*With regards to text, in some cases there is a lot of information but it is needed for some things, depending on what it is you are trying to explain and what you are trying to get the user to understand, it's not something you will get away from. I like the hints and tips embedded in the tutorials with the use of the lightbulb*."

This feedback confirmed that the e-learning components met the MRT criteria concerning the ability to convey meaning through multiple cues (Section 3.10.3). The use of the lightbulb icon to convey additional information in the e-learning components also related to the spatial split-attention multimedia principle where mutually referring images and text are used (Section 3.10.1.2). Evaluator E_4 was asked the following question: "*Is the language in the ILOs acceptable and understandable?*" The MRT criteria related to the ability of e-learning components to convey abstraction through natural language was met according to Evaluator E_4:

> "*Yes, especially because we did a few run-throughs with regards to the grammar and quality.*"

6.4.4.2 Theory of Planned Behaviour (TPB)

Evaluator E_4 was asked the following question:

> "*Do you think the proposed ILOs will encourage learners to continuously partake in learning in order to be certified?*"

Evaluator E_4 was positive with regards to the ability of $eLEST_P$ to encourage learners to continuously partake in learning in order to be certified, and said that:

> "*I think that if their experience is positive, then yes. And that is what we are endeavouring to do, to make sure that their first experience is a positive one. It's not over complicated, it's straightforward, and it works.*"

This response related to the TPB and user behaviour that can be linked to people's perceptions of their ability to complete a given task, which is also referred to as self-efficacy. Self-efficacy was an antecedent included in the model derived from literature (Section 3.6) and was used to determine e-learning success at Korbitec by measuring intention and satisfaction (Sections 4.5.1 and 4.8).

Evaluator E_4 was asked the following question:

"*Will customers intend using ILOs?*"

Based on the e-learning components that are already available to Korbitec's customer base, Evaluator E_4 felt positive regarding the intention of customers to use $eLEST_P$. This feeling is evident in the following statements made by Evaluator E_4:

"*I definitely see that because we don't just have it in the certification courses, we have some interactivity in the website and it is something that we want to do even more of, with more video and interactive tutorials. And what we want to do is to take some of the modules that we have already incorporated in this e-learning course and slot it into online training where it is appropriate. So some customers may just want to learn about one feature of software but not necessarily complete the course to be certified, so that content is available to them. But you would obviously need to tweak it so that it doesn't look exactly the same*".

6.4.4.3 Theory of Reasoned Action (TRA)

Evaluator E_4 was asked the following question:

"*Will the ILOs motivate learners to complete the tasks included in the e-learning environment ($eLEST_P$)?*"

Due to the TRA having a strong emphasis on user attitude and motivation, it was important to determine Evaluator E_4's feelings toward the ability for $eLEST_P$ to motivate learners to complete tasks. Evaluator E_4 stated that:

"*I have no idea, but what I will be tracking is the amount of people that register and the amount of people that complete. So I will be looking at the amount of people that initially register with the intention of completing versus the amount of people that actually complete the course. That would be a very good metric to have. From that, we can investigate why people lost interest. Is it maybe the way the content is displayed and those are things I would need to investigate, hence me not being able to fully answer the question.*"

Therefore, regardless of Evaluator E_4's ability to estimate the user's attitude towards $eLEST_P$, an actionable outcome was obtained for Korbitec regarding their strategy for managing dropout rates which can be considered either an organisational policy or a way to manage barriers, according to $eLEST_T$ (Figure 3-8). Evaluator E_4 was asked the following question "*Do*

you think customers will have a positive attitude to e-learning/KOTW?" Evaluator E_4 was hopeful about the customers' attitudes toward $eLEST_P$:

> "*I'm hoping that will be the case. Especially because it is new and our competitors don't have it*".

6.4.4.4 Social Identity Theory, Self-Determination Theory and Cognitive Evaluation Theory

Evaluator E_4 was asked the following question:

> "*Will customers go through the certification process because of self-motivation, or because they have to (company policy/management)?*"

This question is related to self-determination theory as well as the cognitive evaluation theory, which is a sub-theory of self-determination theory (Section 3.3.4), as it involves investigating the reason for customer motivation. Evaluator E_4's response was:

> "*I think initially we may find that there will be people that want to do it on their own accord and will want to do it by themselves. There may be one or two of our Tier 1 or Tier 0 staff that want to make it compulsory for all staff in conveyancing departments, particularly in transfers but I don't foresee that being a lot of them that would force it on staff, initially."*

This response was a positive result concerning Evaluator E_4's perceptions of $eLEST_P$ and the ability of the e-learning environment to motivate users in taking control of their learning. Evaluator E_4's perception of the long-term interest in the e-learning environment was:

> "*The more people see the value in it, it may grow. And the more our CRM and branch consultants drive it, that will probably increase the usage and the way that it is used may change.*"

This perception confirmed the social identity theory (Section 3.3.4) concerning training being able to increase self-image due to potential users wanting to test the effects of the environment first, before deciding to adopt it (Tajfel & Turner, 1986). This response also spoke to the intrinsic motivation that is conceptualised in self-determination theory where learners will want to use the e-learning environment because they see a genuine intangible benefit for themselves in participating (Deci *et al*., 1999).

6.4.5 Overall Perceptions and Future Plans

Evaluator E_4 was asked the following question:

> "*What is the implementation plan for the project?*"

Evaluator E_4 was positive about the future prospects for $eLEST_P$:

> "*It's been a massive learning curve for our department and I would rather take longer to put something together and get it 100% right and be super critical before I roll it out. You will most probably find that the next one we do will be a lot quicker because we would already have put the guidelines in place with how we want it to look.*"

Evaluator E_4 stated:

> "*The people I have shown it to and demoed it to are very excited and that is from the call centre side to the branch consultants to various product owners within the business. So they are very excited to see the uptake in the market. And we have already started talking to other product owners about rolling this project out with their customers.*"

This statement confirmed that $eLEST_P$ has met the requirements of Korbitec for an e-learning environment.

Evaluator E_4 confirmed that $eLEST_P$ has successfully met Korbitec's requirements in terms of their organisational culture, context and organisational criteria (Section 6.4.1). According to Evaluator E_4, the identification of the e-learning barriers that learners may face was useful in planning for ways to overcome these barriers, such as with the introduction of an interactive forum to support learners when feeling isolated. Evaluator E_4 confirmed that the learning objectives specified in $eLEST_P$ were clear and that there was a close link between the GhostConvey simulations and the actual GhostConvey software (Section 6.4.2). With regards to Prototype 2, it has been used as a template at Korbitec to develop further e-learning components, according to Evaluator E_4 and they have decided to combine the Show Me and Try Me Units (Section 6.4.3). Evaluator E_4 does not foresee that the interactive learning components would replace the customers' use of pdf documents, but that the interactive learning components would be a supplement to the training process. Evaluator E_4 was in agreement with the considerations of the six underlying theories and assumptions in $eLEST_P$ (Section 6.4.4). Taking everything into account, Evaluator E_4 feels that $eLEST_P$ was successful

in meeting the needs of Korbitec and will help the company in their future e-learning endeavours (Section 6.4.5).

6.5 Conclusions

The success of the practical and case study-specific eLEST$_P$ was determined by conducting formative and summative evaluations and reporting on these evaluations in this chapter. This chapter focused on how Cycle 3: *Design and Evaluate Alternative 2* was followed in the study and where opportunities for improvements could be made to eLEST$_P$. The recommended improvements suggested in the formative evaluations were implemented and this iterative process of testing and refinement is considered as a sub-cycle of Cycle 3: *Design and Evaluate Alternative 2* for this study.

Despite the positive feedback received in the formative evaluation iterations, respondents identified many areas of improvement for Prototype 2. A significant challenge of the refinement of the artefact was the improvement of the quality of the screenshots in the e-learning components of Prototype 2. After exhausting a number of possible methods to solve the problem, a reliable method was discovered to ensure the high resolution of the GhostConvey software screenshots. The summative evaluation results indicated that eLEST$_P$ met the needs of Korbitec and Prototype 2 will be used as a template for further development of e-learning components at the company. The results also revealed that the Show Me, Try Me and Test Me units were found to be excessive and redundant for Korbitec and that best practice at Korbitec involves combining the Show Me and Try Me units.

This chapter was able to fully answer research questions five and six:

> **RQ$_5$:** What best practice e-learning environment can be used for software training contexts?
>
> **RQ$_6$:** What is the predicted success of the proposed environment at Korbitec for the Transfers course?

It was determined that eLEST$_P$ is a success based on the results reported on in this chapter. It was confirmed that eLEST$_P$ considers the CSFs of e-learning (Section 3.5) and takes into account the metrics related to success, such as intention and satisfaction (Section 3.6). Chapter 7 is the final chapter of this study and summarises the findings of this research. The chapter will review the research objectives and will convey the research contributions, problems experienced and the recommendations for future work.

Chapter 7. Reflection, Conclusions and Recommendations for Future Work

7.1 Introduction

This study investigated software training and various contributing factors, particularly in corporate contexts. The main aim of this study was to solve a real-world complex problem which concerns the identification of e-learning environment best practice for software training settings. Phase 5 of DBR entails reflection (Figure 1-2) and the focus of this chapter is on the reflection of this study. The main research question (RQ_M) for this study is: "***What is a best practice e-learning environment for corporate organisations that train users to use software?***" and the main research objective (RO_M) for this study is: "***To determine best practice for organisations implementing e-learning in a corporate software training context***".

This chapter will convey what the findings are from the study (Figure 7-1). The research objectives are reviewed in order to determine whether the study was successful (Section 7.2). The dual outcomes of this study are the theoretical and practical research contributions that are made (Section 7.3). A few issues of this study are conveyed as well as the limitations of this research (Section 7.4). It is important to make recommendations for future work which can elaborate on how this work can be applied to other contexts and expanded (Section 7.5). The entire study is summarised (Section 7.6).

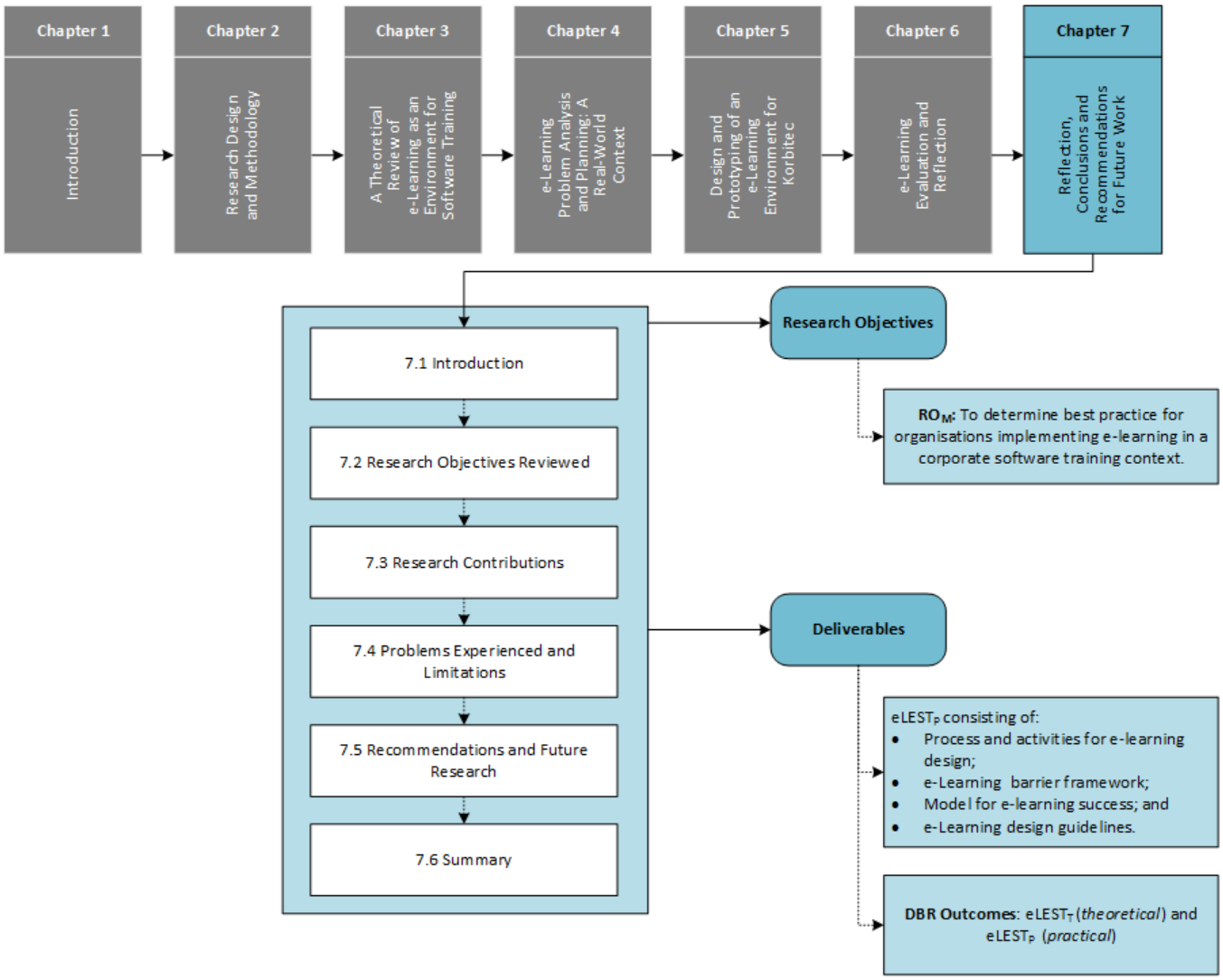

Figure 7-1: Chapter 7 Layout and Deliverables

7.2 Research Objectives Reviewed

In this study, a real-world problem was analysed and solved by designing and developing an artefact in order to produce design principles and technological innovations (Amiel & Reeves, 2008; Van Wyk & De Villiers, 2014). An iterative cycle of testing and refinement was conducted and improvements were made to enhance the implementation of the solution, based on recommendations. The study culminates in a reflection on the outcomes of the study (Table 7-1), resulting in the production of dual outcomes which are the theoretical e-learning environment for software training as well as a practical contribution in the form of an applied and evaluated e-learning environment.

Table 7-1: Research Objectives Met

Research Objective	Description		Source
RO_1	Identify the factors that determine the success of e-learning environments.	Six dimensions of CSFs for e-learning were used to classify 40 CSFs. These CSFs are able to give clarity to whether e-learning implementations are performing successfully or not.	Section 3.5, Figure 3-5
RO_2	Determine the barriers that affect the adoption of e-learning.	A total of 15 barriers were categorised into a relevant barrier dimension, of which there were five. These barriers are important to identify in e-learning projects as they will give a good indication as to any possible issues that could be managed. These barriers were then explored further in a focus group setting where it was revealed that barriers related to assistance, social interaction, personal and external factors may impact the participants.	Table 3-1, Figure 3-4, Sections 3.4 & 4.4
$RO_{3.1}$	Identify the metrics influencing the intention to use e-learning environments.	The literature revealed that intention to use e-learning and satisfaction with using e-learning are two metrics that can be used to determine e-learning success. It was further discovered that enjoyment, computer anxiety and self-efficacy are antecedents of these metrics. A case study was used to investigate these metrics in the form of a survey where it was revealed that there is a relationship between the metrics of enjoyment and self-efficacy, as well as between enjoyment and satisfaction.	Sections 3.6, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11 & 4.12
$RO_{3.2}$	Identify the metrics that affect the satisfaction with using e-learning environments.		
RO_4	Establish an e-learning process that can be followed when developing a best practice e-learning environment for software training.	A process consisting of three activities was derived from the literature. These activities were establishing requirements, designing alternatives and prototyping and evaluating. This process was successfully applied to the case study.	Section 3.11, Chapter 5, Tables 3-4 & 6-6
RO_5	Identify the design guidelines that are applicable to Korbitec and aligned with best practice.	The application of the e-learning process to the case study enabled guidelines to be identified, such as those related to cognitive processes, multimedia principles and e-learning heuristics.	Chapters 5 & 6
RO_6	Determine and evaluate the success of the proposed e-learning environment at Korbitec.	Evaluations were conducted to determine the success of the e-learning environment. The results revealed that the proposed e-learning environment for software training at Korbitec incorporates all of the elements proposed in the theoretical environment.	Chapter 6

The first objective (RO_1) was to identify the factors that could determine the success of e-learning environments. The literature enabled the CSFs focusing on developing countries, e-learning adoption, e-learning sustainability and corporate e-learning to be classified according to Bhuasiri *et al*.'s (2012) six dimensions of e-learning (Figure 3-5). The e-learning dimensions are: *learner characteristics*; *instructor characteristics*; *institution and service quality*;

infrastructure and system quality; *course and information quality*; and *extrinsic motivation*. The dimension of learner characteristics consisted of CSFs related to computer self-efficacy, Internet self-efficacy and attitude towards e-learning. The instructor characteristics dimension concerned CSFs associated with a timely response, self-efficacy, technology focus, attitude towards students and interaction fairness. The institution and service quality dimension related to computer training, program flexibility, Internet quality, relative advantage, service quality, operational support, e-learning policies and technical support CSFs. The aforementioned dimension also related to CSFs concerning autonomy-supportive techniques, computer usage training programs and set performance targets.

The infrastructure and system quality dimension related to CSFs which were reliability, ease of use, system functionality, system interactivity, system response, system quality, security, availability and continuity ability of system. The dimension of course and information quality was associated with course quality, the extent of relevant content, course flexibility, complexity, information quality, completeness, accuracy and comprehension CSFs. The last dimension of extrinsic motivation related to CSFs which were perceived usefulness, clear direction and social influence.

The second objective (RO_2) was to identify the barriers that could affect the adoption of e-learning. Several barriers were identified from the literature investigated and an e-learning barrier framework was derived (Figure 3-4). The barriers were classified using the following categories: *lack of resources*, *infrastructure issues*, *technical issues*, *organisation management* and *social interaction*. The barriers concerning a lack of financial support, e-learning development costs, computer ownership and availability, Internet access, computer competency and unreliable electricity supply fell under the dimension of a lack of resources. The Digital Divide and an insufficient infrastructure support were barriers related to the dimension of infrastructure issues. A barrier that fell under the dimension of technical issues was security and privacy concerns. The lack of implementation expertise, exclusive technology focus and limited continued managerial support were barriers falling under the dimension of organisation management. Lastly, the social interaction dimension consisted of the lack of social interaction, lack of cultural interaction and isolation and decreased motivation barriers.

These barriers were then further investigated in a real-world context by using a case study research strategy where a focus group was used to identify some of the barriers faced by e-learning users and to determine if those barriers were the same or similar to those identified in literature (Section 4.4). The majority of the barriers found in the literature were confirmed by the focus group participants.

The next set of objectives ($RO_{3.1}$ and $RO_{3.2}$) were to identify the metrics influencing the intention to use e-learning and the metrics affecting the satisfaction with using e-learning. A thorough review of literature revealed that the concept of *success* should be determined by measuring the intention to use and satisfaction with using e-learning, and the antecedents of these metrics are *enjoyment*, *computer anxiety* and *self-efficacy* (Section 3.6). The intention to use and satisfaction with using were then further investigated in the case study through the administration of a survey research strategy (Section 4.5).

The fourth objective (RO_4) was to establish a process that can be followed when developing a best practice e-learning environment for software training. The literature review enabled a process to be derived consisting of the activities of establishing requirements, designing alternatives, prototyping and evaluating, amongst other elements (Section 3.11). This process was applied to the case study in order to develop an e-learning environment for software training incorporating best practice, $eLEST_P$ (Table 6-6).

The fifth objective (RO_5) was to identify the design guidelines that are applicable to Korbitec and aligned with best practice. The application of the theoretical environment ($eLEST_T$) to the case study enabled the design guidelines specific to Korbitec to be identified (Chapter 5). These design guidelines were confirmed by evaluating the environment and e-learning components proposed for Korbitec and determining the extent to which these artefacts met the case-specific needs (Chapter 6). The sixth objective (RO_6) was to determine and evaluate the predicted success of $eLEST_P$ at Korbitec, which was done by conducting evaluations (Chapter 6). According to D'Agustino (2012), if best practice for e-learning environments is identified and implemented, the chances of e-learning success and user adoption are higher.

The main research objective (RO_M) involved determining the best practice for organisations implementing e-learning for corporate software training purposes. The three DBR cycles of this study enabled best practice regarding e-learning environments for corporate software training to be identified. The literature identified best practice for e-learning environments

(D'Agustino, 2012) and this best practice has been incorporated into $eLEST_T$ (Table 7-2). The $eLEST_P$ can thus be considered best practice as it has been proven to be successful. The main research question has therefore been answered as a result of this study.

Table 7-2: Best Practice Adopted in $eLEST_T$

Best practice	Applied to $eLEST_T$
Having a design team	✓
Performing a context analysis	✓
Identifying objectives and learning outcomes	✓
Taking a modular approach to content organisation	✓
Rapid prototyping	✓
Student-centeredness	✓
Accommodating multiple learning modalities	✓
Effective uses of media and technology	✓
Providing alternative assessment opportunities	✓

Table 7-3: Reflection of the Study and DBR Characteristics

DBR Characteristic	Application to the study
Artefacts	e-Learning components were developed for a case study, based on a set of requirements.
Contextualisation	The case study of this research is described and analysed in detail and the success of the e-learning environment for Korbitec is determined.
Dual outcomes	Theoretical contributions are made by presenting a process and activities for e-learning design, an e-learning barrier framework, a model for e-learning success and e-learning design guidelines which together, are the main theoretical contribution ($eLEST_T$). Practical contributions in the form of innovative artefacts (Prototype 1 and 2) are made and together, form the main practical contribution ($eLEST_P$).
Grounding and intricate problems	A strong pedagogical underpinning forms the basis upon which $eLEST_T$ was derived and then applied to the case study in a real-world setting.
Innovative	Interaction design is investigated and applied to the design, prototyping and evaluation of interactive e-learning components. The e-learning components consist of simulation, ILOs, assessment methods and SCORM standards and construction.
Integration	A number of research methods were used in this study, namely interviews, a focus group, a survey, a formative and summative evaluation. The design principles derived from literature are included in the elements of $eLEST_P$.
Iteration, reflection and flexibility	Prototype 2 is iteratively tested and refined in order to identify opportunities for improvement and redesign. The iterations enabled a high quality prototype to be produced that are appropriate for the competitive nature of the industry in which Korbitec operates.
Pragmatic and theoretical approaches	This study draws on relevant theories and design principles to deliver an all-inclusive theoretical environment for e-learning in software training contexts.
Solution-based and problem-focused	A real-world complex problem is investigated and solved in this study by applying theory to a case study.
Synergy	The fields of e-learning and design influence this study and the way in which theory is connected to practice.
Transferability	$eLEST_T$ can be applied to and reused in other contexts related to research or practice.
Collaborative and transparent communication	Input from designers, practitioners, participants and researchers was vital in the DBR phases of this study and influenced the decision-making process.

7.3 Research Contributions

The dual outcomes of this study, according to DBR (De Villiers & Harpur, 2013) can be categorised into a theoretical contribution that is reflected on (Section 7.3) and a practical solution that is implemented (Section 7.3.2). The contributions of this study relate to the best practice e-learning environment for software training derived from literature ($eLEST_T$) and the real-world solution ($eLEST_P$) along with the accompanying e-learning components. This research study can be characterised as one that followed DBR (Table 7-3).

7.3.1 Theoretical Contributions

An investigation and synthesis of the literature concerning this study enabled a number of theoretical contributions to be made (Figure 7-2). The key theoretical contributions of this research are:

$eLEST_T$: A theoretical best practice e-learning environment for software training (Figure 3-8), consisting of:

- The process and activities for e-learning design (Section 3.10);
- The e-learning barrier framework (Figure 3-4);
- The model for e-learning success (Figure 3-5); and
- The e-learning design guidelines (Section 3.10.1).

The e-learning barrier framework that was proposed (Figure 3-4) was used when planning the e-learning environment to ensure that barriers are considered from five different dimensions. It was confirmed that by identifying the potential barriers that could be faced by learners, the barriers could be better managed by Korbitec. For example, the introduction of a dedicated coach in a forum setting could alleviate the feelings of isolation. The main deliverable of this study is a best practice e-learning environment for software training ($eLEST_T$) consisting of interaction design activities; underlying theories and assumptions; and the inputs and outputs of the environment.

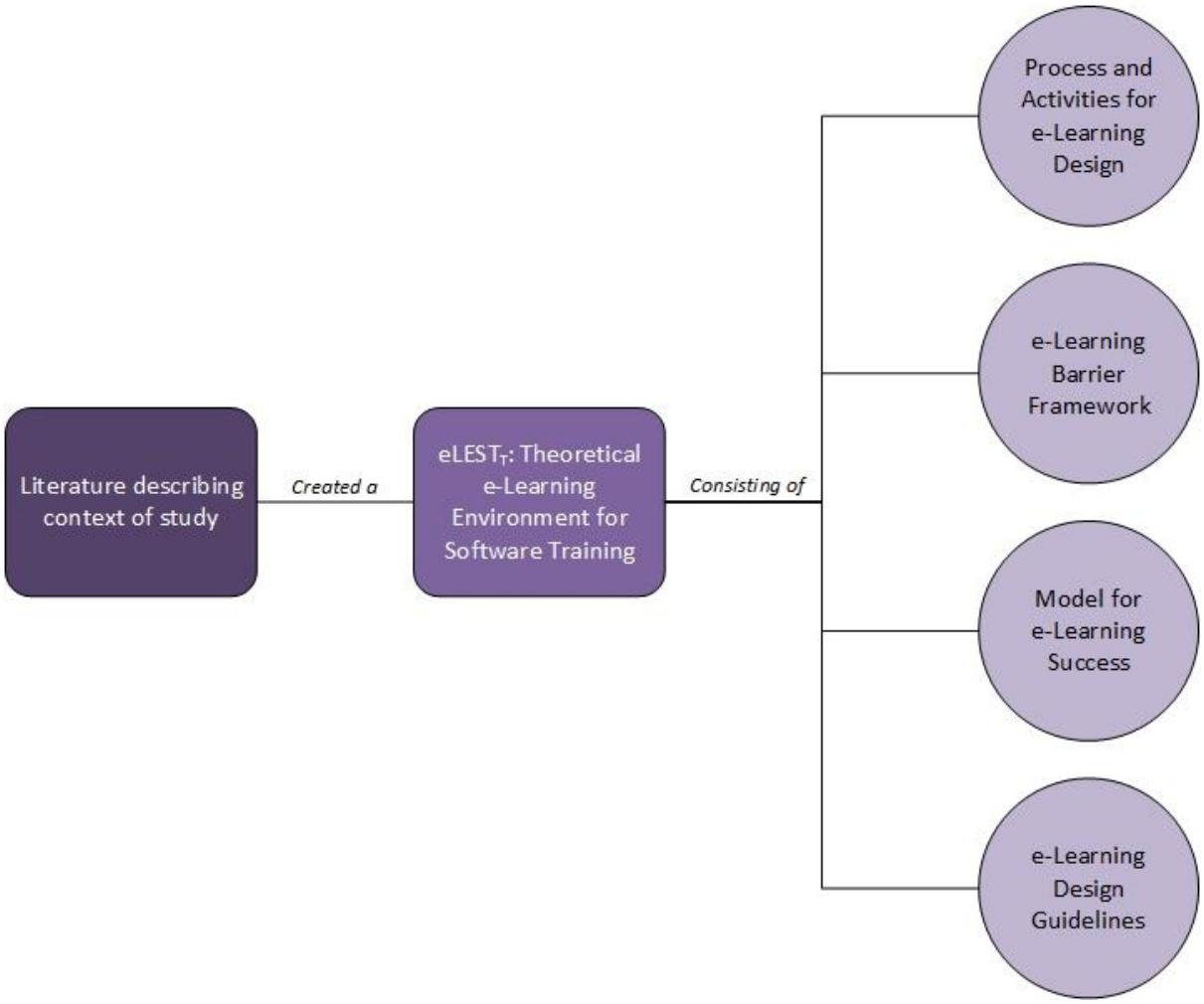

Figure 7-2: Theoretical Contributions of Study

CSFs were synthesised from the literature focusing on developing countries, e-learning adoption, e-learning sustainability and corporate e-learning (Figure 3-5). The broad viewpoint from which CSFs are considered means that organisations are more likely to identify all CSFs applicable to specific contexts. This study has identified important metrics, such as intention to use e-learning (Section 3.6.1) and the satisfaction with using e-learning (Section 3.6.2) which may be affected by enjoyment, self-efficacy and computer anxiety. These metrics can be used by organisations to determine the potential success of e-learning and these metrics should be prioritised in online training strategies in order to ensure trainee satisfaction and intended future usage. Positive intention to use and satisfaction levels can provide Korbitec with the evidence that e-learning is worth investing resources in so that the chances of benefiting from the many advantages of e-learning is higher.

The theoretical contributions can be applied to other research in the field of e-learning. The e-learning barrier framework and CSFs that have been proposed can guide the construction

of future e-learning initiatives. Although this study focused on software training in corporates, the main principles focus on e-learning in general and can therefore be applied to other e-learning studies that may focus on a different type of industry or subject matter, by applying $eLEST_T$ (Figure 3-8).

Various research findings were investigated in literature and then further empirically researched in a real-world context at Korbitec. The literature review conducted together with the empirical field studies and evaluations were then considered and compared. This study contributes to the bodies of knowledge of e-learning, interaction design, and co-creation.

7.3.2 Practical Contributions

The artefacts that are the practical contributions of this study are:

$eLEST_P$: A practical best practice e-learning environment for software training at Korbitec, comprising of e-learning components, namely Prototype 1 evaluation feedback (Section 5.4) and Prototype 2.

Prototype 2 consists of one module and three units, namely:

- Show Me (Section 5.6.2);
- Try Me (Section 5.6.3); and
- Test Me (Section 5.6.4).

The e-learning components that were designed, prototyped and evaluated for the case study are referred to as the initial Prototype 2. The results from the feedback generated from the formative evaluations prompted the refinement of Prototype 2. The e-learning components were developed as ILOs (Section 3.7.2) and conform to the SCORM standard of construction, which is considered best practice (Section 3.7.3). Prototype 2 consists of assessment mechanisms (Section 3.3.3) that enable the measurement of competency, and ultimately enable Korbitec to award certification. The interviews, the focus group and the survey conducted in this study enabled results to be generated and these mixed-methods can be used in similar research settings in order to investigate the complex problem to be solved. A comprehensive report detailing the results of the survey was compiled for Korbitec and can be found in the electronic version of Appendix I. The final evaluated Prototype 2 and the elements of $eLEST_P$ will be used by Korbitec for future e-learning projects. This study undertook both the **technology-centred approach** to multimedia design, where the

construction of interactive multimedia was considered, and the **learner-centred approach**, where multimedia was designed to aid human cognition and information processing (Mayer, 2014).

7.4 Problems Experienced and Limitations

During the prototyping for eLEST$_P$, significant problems were encountered with regards to remotely accessing the Korbitec GhostConvey software due to a number of security protocols that were blocking authorisation to use the software. This problem resulted in the delay of the prototyping of the e-learning components but was accounted for and managed by focusing the study on other matters of concern. Another limitation is that whilst the e-learning components for this study were being prototyped based on the assumption that Korbitec had not yet implemented any interactive e-learning components, Korbitec was concurrently working on "interactive tutorials". Consequently, their style guide for all software products developed for Korbitec was updated to focus exclusively on interactive tutorials and some of the guidelines changed (Figure 7-3). It was deemed too late in the study to incorporate the new style guide into the e-learning components and the discrepancies between the versions of the style guide related only to cosmetic features, (for example, the lightbulb icons used to convey additional information or hints and tips) and not fundamental learning aspects (for example, the need for certification features).

Figure 7-3: Initial Lightbulb Icon (left) and Latest Lightbulb Icon (right)

The small sample size used to evaluate the e-learning components in eLEST$_P$ can be seen as a limitation of this study. There is only one national training manager in the training division at Korbitec and two content developers and therefore, the study was limited with regards to obtaining more evaluators from an already limited sample group. Although the evaluations were undertaken with a small sample size of evaluators, the results are still useful in providing an in-depth understanding of whether the e-learning environment for software training is successful. It can be considered a limitation that this study focused on only one company.

7.5 Recommendations and Future Research

The field of e-learning is considered an emerging field of research and it is for this reason that there are many opportunities that can be recommended for future research. A particularly interesting approach to researching e-learning is to investigate it alongside other domains, such as interaction design. Since the interactive e-learning components of $eLEST_P$ were well received according to the evaluation results, future work incorporating additional e-learning components, such as animations, could be investigated. Animations could be particularly appealing for induction training when Korbitec hires new employees and can be used to instil a sense of excitement amongst new employees which reflects the organisational context and culture (Section 3.2).

Karaali *et al.* (2011) determined CSFs for e-learning adoption in the corporate context (Section 3.5) and managers wanting to encourage the adoption of e-learning by employees should consider the following:

- Managers should positively endorse the use of e-learning as it motivates employees to use e-learning;
- Managers should implement autonomy-supportive techniques by making the effort to understand the learners' perspective;
- Management should offer training programs to employees who lack training or confidence in computer and Internet usage; and
- Managers should assign performance targets to employees related to the use of e-learning platforms.

A suggestion for future research was derived from the summative evaluation where the interviewee mentioned Korbitec's interest in implementing forums for additional learner support. An interesting study for future work would entail investigating the learner perceptions of being certified through interacting with the e-learning components and their experiences of the process, in order to generate lessons learnt. There are aspects of e-learning research beyond the scope of this study such as gamification, m-learning and virtual reality trends but if $eLEST_T$ were to be applied to different contexts, these trends could be explored. There may also be additional criteria for planning, establishing requirements, designing,

prototyping and evaluating the e-learning trends which could be investigated for future research and added to $eLEST_T$ that is applied to the case study ($eLEST_P$).

This research could be extended to other contexts such as companies operating in construction, manufacturing or banks in order to broaden the research of e-learning in the corporate context, which is currently limited. A recommendation for future work could entail a comparison between the results of this study and that of another study in a different South African or international company. Future work could also involve evaluating all of the elements of the $eLEST_T$ environment. The implementation of the proposed solution in educational contexts where software training is conducted as part of the curriculum is also a recommendation for future research.

7.6 Summary

This study has produced the theoretical artefact, namely $eLEST_T$, which can be customised and used as a template to guide researchers in other e-learning for software training contexts. $eLEST_T$ can also be applied by practitioners to software training projects in industry to ensure that all of the necessary aspects of e-learning environments are considered and to increase the probability of success through best practice. Resnick and Vaughan (2006) state that best practice refers to the ideas that show superiority to others and have been adopted by well-regarded practitioners. The elements of $eLEST_T$ are derived from literature where adoption amongst practitioners is high. $eLEST_T$ consists of a number of elements that work together in order to achieve two common goals, which are learner competency and the certification of the learner. The planning, establishing of requirements and design, prototyping and evaluation of $eLEST_T$ support the production of e-learning environments.

The creation of the environment involves identifying the CSFs that will increase the e-learning adoption rates of learners. The barriers that could be faced by learners that may hinder the use of e-learning should be identified when applying the environment to specific contexts. $eLEST_T$ suggests that organisational-specific considerations and guidelines be identified when planning for an e-learning environment. There are a variety of outputs from establishing requirements when implementing the environment and they involve: e-learning roles; e-learning dimensions; required e-learning components; learning objectives; competencies and skills acquired; prerequisite knowledge; desirable and undesirable UX goals; and e-learning

design requirements. The inputs for design, prototyping and evaluating are the cognitive design implications, multimedia principles and e-learning heuristics from the MUUX-E framework. The outputs of design, prototyping and evaluating are a set of practice tasks; learner competency assessments; content construction and standards; e-learning components; and evaluation results. During the gathering of requirements and the design, prototyping and evaluating of artefacts, there are relevant underlying theories and assumptions that must be considered.

$eLEST_T$ is comprehensive in its approach to establishing best practice e-learning environments for software training and is therefore easy to adapt to other contexts. The $eLEST_T$ environment, including the e-learning components, helps to solve many of the barriers faced by learners such as a lack of motivation, fear of using computers and dependence on help facilities. The real-world solution, $eLEST_P$, was evaluated by the relevant stakeholders at Korbitec using mixed methods and the results indicated that $eLEST_T$, along with its associated e-learning components, was positively received by the evaluators and meets the requirements of the case study. The study can therefore be concluded by stating that organisations wanting to introduce best practice in online software training, can apply $eLEST_T$ as an e-learning environment.

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Appendices

Appendix A: Ethics Approval Letter

• PO Box 77000 • Nelson Mandela Metropolitan University
• Port Elizabeth • 6031 • South Africa • www.nmmu.ac.za

Nelson Mandela Metropolitan University
for tomorrow

Chairperson: Research Ethics Committee (Human)
Tel: +27 (0)41 504-2235

Ref: [H15-SCI-CSS-007 /Approval]

Contact person: Mrs U Spies

29July 2015

Dr B Scholtz
Faculty: Science
Department: Computing Sciences
Embizweni Building, Room 01-01c
South Campus

Dear Dr Scholtz

BEST PRACTICES FOR E-LEARNING ADOPTION IN THE CORPORATE ENVIRONMENT

PRP: Dr B Scholtz
PI: Ms M Esterhuyse

Your above-entitled application served at Research Ethics Committee (Human) for extension.

We take pleasure in informing you that the extension was approved by the Committee.

The ethics clearance reference number is **H15-SCI-CSS-007** and is valid for three years. Please inform the REC-H, via your faculty representative, if any changes (particularly in the methodology) occur during this time. An annual affirmation to the effect that the protocols in use are still those for which approval was granted, will be required from you. You will be reminded timeously of this responsibility, and will receive the necessary documentation well in advance of any deadline.

We wish you well with the project. Please inform your co-investigators of the outcome, and convey our best wishes.

Yours sincerely

Prof C Cilliers
Chairperson: Research Ethics Committee (Human)

cc: Department of Research Capacity Development
Faculty Officer: Science

Appendix B: IDIA 2015 Conference Paper

Barriers to e-Learning in a Developing Country: An Explorative Study

Maxine Esterhuyse
Nelson Mandela Metropolitan University
South Africa

Brenda Scholtz
Nelson Mandela Metropolitan University
South Africa

Abstract

Education in the context of Information and Communications Technology for Development (ICT4D) and particularly in South Africa is in a critical state and has been known to be dysfunctional. The problems of education in South Africa are predominantly evident in the science and technology subjects. There has been a paradigm shift in the delivery of education with the introduction of e-learning. The need to realise the barriers to e-learning faced by end-users has become apparent. There are numerous factors that can negatively or positively affect the success of e-learning in developing countries. The purpose of this study is to propose a barrier framework for e-learning in corporations derived from a synthesis of literature. A case study research strategy was used to verify the framework in a real world context and to understand the problems in more detail. The case used was a South African software development company. The findings of the study revealed that the most prominently perceived barriers to e-learning include the personal sacrifice of time required, Internet speed and the lack of on-demand assistance available when learning through the use of electronic media in isolation. The contribution of this study is knowledge regarding the barriers to e-learning software training success and the intention of trainees to use e-learning as an alternative to F2F training.

Keywords

Corporate training, e-learning barriers, ICT4D, exploratory research method, F2F training, developing countries

1. Introduction

Despite the changes made in the field of education in South Africa since the 1994 democratic elections, major challenges still exist in terms of access to and delivery of quality education (Collins & Millard, 2012; Kanjee & Sayed, 2013). It was predicted in 1997 that technology-enhanced education would be the future of the education system of South Africa (Pistorius & Van Harmelen, 1997). Education and training research in developing countries is key to developing insights into the Information and Communications Technology for Development (ICT4D) domain (Van Biljon & Alexander, 2014). Organisations in developing countries are being compelled to adopt strategies that enable more flexibility in order to cope with the fluctuating environment of technology-enhanced education. The training methods of

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organisations have evolved from traditional face-to-face (F2F) lessons to the use of the Internet for learning content delivery (Akaslan, Law & Taşkin, 2012). Various types of organisations such as companies, schools and universities are making use of e-learning as a training, learning and professional development tool (Berkani & Chikh, 2010). The increasing adoption of e-learning in such organisations is due to the Internet offering new opportunities to restructure the learning and knowledge transfer environment (Abbad, 2012). e-Learning also offers such organisations the opportunity to leverage the various advantages that this approach provides (Hani, Hooshmand & Mirafzal, 2013).

Innovation is fostered with the implementation of e-learning because organisations can offer new educational and training programs (Cui, Fu, Li, Wen & Zhang, 2010). e-Learning is considered an attractive complement or even an alternative to traditional training methods for companies (Bergeron, Gauvin, Raymond & Uwizeyemungu, 2012). It is a fundamental need for companies to increase the level of training and knowledge amongst employees because it is evident that education increases the capacity to innovate and fosters the adoption of new technologies (Gallié & Legros, 2012). Employees can contribute to sustained competitive advantages for companies in terms of the skills, expertise and readiness to work (Hart, Lenihan & McGuirk, 2014).

Although organisations that implement e-learning systems have the ability to benefit from e-learning, there may also be barriers that affect the use thereof (Hani et al., 2013). Several factors have been reported to impact the ability for learners to gain value from e-learning and can cause more damage to the learning process in an already eroded education system (Dimitracopoulou, Fessakis, George & May, 2012). Limited research has been conducted regarding the barriers to e-learning in developing countries that can result in the delay of e-learning adoption (Mirza & Al-Abdulkareem, 2011). The majority of existing studies surrounding the adoption of e-learning are conducted in university contexts and not in the corporate context within the ICT4D domain (Baelden & Van Audenhove, 2015; Cui et al., 2010; Haron & Suriyani, 2010; Islam, 2013). The availability of new technologies, such as e-learning, remains unequally distributed between developing and developed countries and can affect the growth of a country (Baelden & Van Audenhove, 2015). There is therefore a need to investigate e-learning in the ICT4D research domain.

This paper contributes to the ICT4D body of knowledge by:

- Analysing related literature in order to present a barrier framework for developing countries, specifically for the corporate context, and
- Adopting an exploratory research method to analyse rich qualitative data gathered from a focus group conducted in a developing country.

The structure of this paper involves describing the important concepts relevant to the study as well as the barriers to e-learning in the ICT4D context and proposes an e-learning barrier framework for developing countries. The research methodology adopted in this study is conveyed and is followed by a discussion of the results of the study. The paper is then concluded with a suggestion for future research.

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2. Barriers to e-Learning

The corporate environment is increasingly recognising the benefits of implementing e-learning systems to provide cost-effective training for employees and customers (Chen, 2010). The corporate e-learning field was predicted several years ago to undergo a paradigm shift from an emerging market with substantial potential to an established industry (Barron, 2002). There is a changing perception of e-learning in companies in that it was once seen as a recurring cost and is now seen as an investment. It is imperative that the factors affecting the possible failure of e-learning initiatives be identified before embarking on such implementations. The excessive costs associated with e-learning failures and education system processes including time wasted may be eliminated by being aware of the factors of success or failure of e-learning (Akaslan et al., 2012). By explicitly making the factors influencing the success or failure of e-learning systems known, a more advanced e-learning environment can be provided for the users (Hani et al., 2013). An advanced e-learning environment according to Hani et al. (2013) is one that maximises the efficiency of the education system, reduces student dropout rates, increases student pass rates, enhances the success of the students, increases learning outputs of students and reduces the costs associated with education system processes.

Organisations need to be aware of the barriers to e-learning and need to develop a coherent strategy that will address these barriers. There is a strong correlation between a lack of e-learning user adoption research by the implementing organisation and failure of such e-learning initiatives (Akaslan et al., 2012). Organisations must consider the structure of e-learning initiatives to avoid some of the issues. An educational environment can be conceptualised as comprising of three dimensions: content, pedagogy and technology (Braz, Melo & Siqueira, 2007). By structuring e-learning according to the environment proposed by Braz et al. (2007), organisations can improve the management of e-learning initiatives and the information relating to learning courses.

It has been argued that there are more dropout rates in e-learning courses compared to traditional learning courses. The effectiveness of e-learning has been questioned and sometimes fails to meet learning objectives (Xu & Wang, 2006). A substantial number of e-learning initiatives still suffer from a lack of perceived future success, however, when the systems are designed and implemented effectively, they may have similar outcomes to those achieved in F2F settings (D'Agustino, 2012). A gap in research related to barriers to e-learning experienced by learners may hinder the use of e-learning to its full potential (Akaslan et al., 2012). One of the problems is that it is not clear as to whether e-learning has the ability to develop and improve learners' hands-on skills.

There are a variety of barriers that can hinder the success of e-learning initiatives. Implementing organisations in developing countries may have a lack of implementation expertise, a one-directional technology focus and once-off funding with limited continued support (Gewald & Jacob, 2013). Dimitracopoulou et al. (2012) identified that the use of technology causes security and privacy concerns for learners. Due to the fact that e-learning systems need to track learners' activities and outputs, there is the opportunity that the information can be exploited and used for

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purposes other than what the learners intended it to be used for. Learners that have doubt about the security and privacy of their information may be deterred from using the e-learning system. Organisations should ensure that learners are informed of any tracking process when accessing e-learning platforms and that learners should approve of such tracking on the system.

The development costs of e-learning material, insufficient infrastructure and a lack of social and cultural interaction are seen as barriers to the success of e-learning initiatives and may hamper the ability for organisations to benefit from e-learning (Akaslan et al., 2012). It has also been noted that learners feel isolated and disheartened about their studies without F2F interaction. Alzahrani and Ghinea (2012) stress the importance of prompt feedback for learners due to the fact that e-learning can prevent learners from having access to tutors, academic staff, career advisors and technical help.

The study of Ahlan and Atanda (2014) focused on the barriers affecting the success of e-learning in developing countries from a Nigerian perspective. The results of the study showed that infrastructure issues are prominent in developing countries. One issue is the prominence of the Digital Divide where there is one group of people with access to technology and another group with no access to technology. Other factors affecting e-learning success in developing countries are fluctuating and unreliable electricity supply; computer ownership and availability; Internet access and Internet experience in terms of the frequency of Internet usage by the learner as well as the computer competency of the learner.

Stoffregen, Pawlowski and Pirkkalainen (2015) developed a barrier framework for open e-learning in public administrations. The barriers to e-learning were classified into three dimensions, namely context, social and technical barriers. The context barriers are a lack of resources; management coordination or policy; managerial culture which include practices and structure; and the perceived technology fit. The social barriers dimension involved values on a national level; values on an organisational level and individual concerns including communication, collaboration and language issues. The social barriers dimension consists of the value of information and knowledge; the quality of information; ICT skills; lack of knowledge in open e-learning; and cognitive personal backgrounds. The technical barriers incorporate availability; interoperability; technical conceptual differences; and concerns about privacy and security. The technical barriers are perceived functionality; usability and system quality; and the Digital Divide.

After a detailed literature review of e-learning barriers, an extended e-learning barrier framework for developing countries was derived by the authors (Table 1). The e-learning barrier framework was adapted from the framework designed by Stoffregen et al. (2015) by replacing the context dimension with three of the sub-categories namely Lack of Resources, Infrastructure and Organisation Management. These three new dimensions were considered significantly relevant in developing countries. The framework can be used by organisations in order to plan for e-learning initiatives and improve the chances of a successful project. The authors of studies identifying barriers specific to developing countries have been indicated using an asterisks.

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Barrier dimension	Barrier category	Authors
Lack of resources	Lack of financial support (initial and continued funding)	Akaslan et al. (2012)*; Bere, Silvestri and Nemes (2013); Gewald and Jacob (2013); Gunn (2010); Klobas, McGill and Renzi (2014); Mridha, Nihlen, Erlandsson, Khan and Islam et al. (2013)*; Omidinia, Masrom and Harihuddin (2011)*
	e-Learning content development costs	Akaslan et al. (2012)*; Klobas et al. (2014)
	Computer ownership and availability	Ahlan and Atanda (2014)*; Klobas et al. (2014); Mridha, Nihlen and Erlandsson et al. (2013)*
	Internet access	Ahlan and Atanda (2014)*; Bhuasiri, Ciganek, Rho, Xaymoungkhoun, and Zo (2012)*; Klobas et al. (2014); Mridha, Nihlen and Erlandsson et al. (2013)*; Stefanick and LeSage (2005); Witdono (2013)*
	Computer competency	Ahlan and Atanda (2014)*; Bere et al. (2013); Bhuasiri et al. (2012)*; Butler, Feller, Pope, Emerson and Murphy (2008); Mridha, Nihlen and Erlandsson et al. (2013)*
	Fluctuating and unreliable electricity supply	Ahlan and Atanda (2014)*; Mridha, Nihlen and Erlandsson et al. (2013)*
Infrastructure issues	Digital Divide	Ahlan and Atanda (2014)*; Mridha, Nihlen and Erlandsson et al. (2013)*
	Insufficient infrastructure support	Akaslan et al. (2012)*; Bhuasiri et al. (2012)*; Mridha, Nihlen and Erlandsson et al. (2013)*
Technical issues	Security and privacy concerns	Ahmed, Buragga and Ramani (2011)*; Alias, Aziz, Ismail and Zakariah (2012)*; Dimitracopoulou et al. (2012)
Organisation management	Lack of implementation expertise	Gewald and Jacob (2013)*; Mridha, Nihlen and Erlandsson et al. (2013)*, Omidinia et al. (2011)*; Talbot (2009)
	Exclusive technology focus	Gewald and Jacob (2013)*; Omidinia et al. (2011)*
	Limited continued managerial support	Ercoli, Leo and Sannia (2009); Gewald and Jacob (2013)*; Talbot (2009)
Social interaction	Lack of social interaction	Akaslan et al. (2012)*; Alzahrani and Ghinea (2012)*; Bere et al. (2013); Ercoli et al. (2009)
	Lack of cultural interaction	Alzahrani and Ghinea (2012)*; Akaslan et al. (2012)*; Bramati and Conci (2007); Talbot (2009)
	Isolation and decreased motivation	Akaslan et al. (2012)*; Alzahrani and Ghinea (2012)*; Bhuasiri et al. (2012)*

Table 1. Barriers to e-learning in developing countries

The framework is divided into five dimensions of barriers which are: lack of resources, infrastructure issues, technical issues, organisation management and

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social interaction (Figure 1). The barriers have further been sub-categorised and the lack of resources category comprises of a lack of financial support; e-learning content development costs; computer ownership and availability; Internet access; computer competency of learners; and the fluctuating and unreliable electricity supply. The dimension of infrastructure issues consists of the Digital Divide which is more relevant in developing countries than developed ones; and insufficient infrastructure support. The dimension of technical issues consists of security and privacy concerns. The organisation management dimension has four categories which are the lack of implementation expertise; a one-directional technology focus; and limited continued managerial support. Lastly, the social barrier category consists of the lack of social interaction, the lack of cultural interaction and the isolation and decreased motivation of learners.

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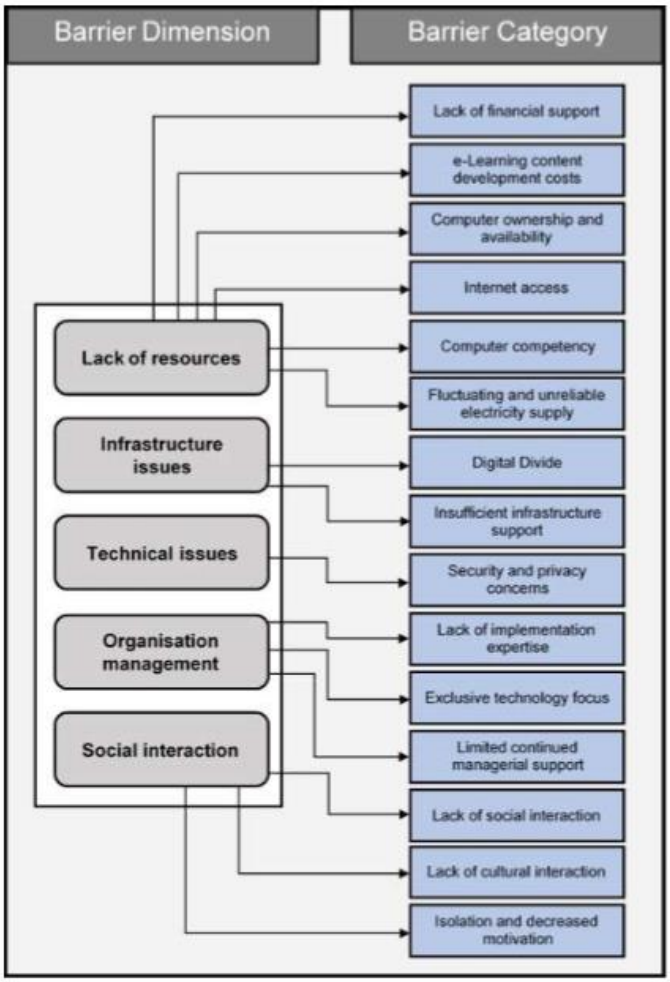

Figure 1. Barrier framework for e-learning

3. Research Methodology

The purpose of this paper is to investigate and report on the barriers to e-learning in a developing country in the context of ICT4D. The main research question of this paper is *"What are the current barriers to e-learning faced by organisations in developing countries?"*. In order to address the main research question, three research objectives need to be realised, namely:

RO1: Identify barriers to e-learning in organisations particularly in developing countries; and
RO2: Analyse the existing problems of F2F training.

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An in-depth literature review of studies related to the barriers for e-learning was undertaken and a framework of barriers to e-learning was derived (Table 1). Therefore RO1 has been met. In order to empirically validate the framework by providing a link between literature and practice, a qualitative exploratory research study was deemed appropriate to provide additional clarification of the research questions. Exploratory research is conducted from a broad perspective initially and as it progresses, results are manifested (Adams & Schvaneveldt, 1991). A case study research strategy was used and the case is a South African software development company. For purposes of anonymity, the company will be referred to as DevCo. The sample for the study was drawn from participants attending a corporate F2F software training course at DevCo. Qualitative data analysis was used since it is able to provide more detailed and nuanced understanding of occurrences (Hargittai, Fullerton, Menchen-Trevino & Thomas, 2010).

DevCo has a management strategy of converting their training provisions from traditional F2F training to an e-learning environment. However, some of the e-learning components in their existing e-learning system are not obtaining the success that was expected. The statistics of the usage of the e-learning system at DevCo is not satisfactory for management and shows that the e-learning system is not being used frequently by customers and employees. The e-learning system at DevCo is currently underutilised and it is being used as mostly as a content management system where training documents are made available to trainees instead of a learning management system, which is ideal. A focus group was conducted at DevCo and eight participants took part, all of whom were clients of DevCo that needed training on the company's software products. The study was described to the participants prior to their involvement and all participants provided informed consent prior to participating in the focus group. The participants were encouraged to express their opinions and contribute aspects that they considered important and applicable to the study. Data were collected from participants through the use of a semi-structured audio-recorded focus group guided by a series of open-ended questions. Audio recordings were transcribed verbatim and themes were identified from the responses by employing thematic analysis techniques (Adams & Schvaneveldt, 1991). The aim of the focus group was to obtain rich data concerning F2F training and to obtain insights into the barriers to e-learning. None of the participants had ever used an e-learning system prior to the study. Therefore, a formal definition of e-learning was conveyed to the participants so that they could contribute to the study based on their perceptions surrounding the idea of e-learning. A more accurate response was ensured because participants were not required to be aware of or understand e-learning.

The focus group was opportunistic as the participants were unaware that a focus group had been planned for the day's activities. There are advantages and limitations of spontaneous focus groups. A shallow understanding may be obtained due to participants being unprepared for the activity, yet if participants were prepared for the focus group, the risk that effort would be made to access an e-learning system prior to the focus group would be evident and this could skew the data collected and a learning curve would be evident (Hrastinski & Aghaee, 2012).

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Summaries of the main responses were made in order to remove the noise present in the focus group such as discussions of topics unrelated to the study. The summaries enabled the researcher to focus on the key points and themes that emulated from the focus group (Saunders, Lewis & Thornhill, 2009). According to Braun & Clarke (2006), there are six phases of thematic analysis. The first phase involves the familiarisation of data whilst the second phase entails the initial coding of the data collected. In this study, the familiarisation of data was achieved by transcribing the focus group recording to text by listening to the recording and reading the data several times to ensure accuracy. The data was then organised into preliminary groups of codes. The search for potential themes and the revision thereof are the steps of the third and fourth phases. The analysis of the data entailed organising the initial codes under broader themes and these themes were verified against the complete data set. The last two phases of thematic analysis involve the identification and reporting of themes.

4. Results and Discussion

The thematic analysis resulted in identifying four principle themes, namely: assistance, social interaction, personal and external factors (Figure 3). The responses that were related to the advantages of and barriers to F2F training will be described in this section. The suggested changes to be made to F2F training by participants will be discussed based on the results. The intention of participants to use e-learning will be discussed and the perceived barriers to e-learning will be conveyed in the findings of the study.

Figure 3. e-Learning barrier themes

4.1 Assistance

The participants agreed that a prominent advantage of F2F training is the ability to ask questions when in the presence of a trainer where answers may be given immediately. It is also to the advantage of the participants that tasks may be demonstrated for learners on the computer. A suggestion for the improvement of F2F training would be to have an assistant at the office after training has been conducted to help with the advancement of tasks when users cannot proceed. One of the participants stated that,

> *"It is a factor of frustration if you are stuck and you try and try and struggle all the time, whereas if there is someone there, you can get help immediately and move on,*

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otherwise you are going to sit there with the same problem, time wasting, counter-productive."

4.2 Social Interaction

Participants stated that they like the ability to learn from the problems that other learners had in a F2F training environment. With regards to suggestions to improve F2F training, participants stated that they enjoy interacting with the trainer and would prefer not to have the F2F courses modified. One barrier to the intended use of e-learning identified related to social interaction. It was stated that at home there are interruptions and demands and this is typically where learners would utilise an e-learning system. Participants also mentioned that they would feel isolated. This feeling of isolation relates to the social interaction barrier dimension (Figure 1) of the barrier framework for e-learning and confirms the studies of Akaslan et al. (2012) and Hajli, Bugshan, Lin and Featherman (2013).

4.3 Personal

Several personal barriers to F2F training were identified such as parking, time sacrifice and being forced to attend training. However, on the other hand, participants realised the benefits of F2F training. One participant stated that "*Barriers are external factors, as with training there is always a positive outcome. You come to get information. Yes there are obstacles, parking issues, time issues, time away from the office which is a bad thing, your boss is forcing you to be here, you don't want to be here but at end of day there is always a positive outcome. So you overcome the barriers to better yourself at the end of the day."*

The perceived barriers to e-learning were that there is a lack of time during office hours to dedicate to e-learning. It was mentioned that if e-learning assists participants in becoming more productive in their careers, then time dedication to e-learning is strongly motivated. However, participants agreed that if sessions were short and manageable, the likelihood of them participating in e-learning is increased. One participant who is an older female made the comment, *"I prefer e-learning, I like being tech-savvy, being technologically oriented, not good at making notes in face-to-face training."* On the other hand another middle-aged female participant stated that, *"At school, we are accustomed to traditional learning, and a change of mind is necessary to go electronic because for us, this is easier. Today's youth have the Internet, they have Whatsapp, Skype and they are used to technology and it is the way forward. We have to adapt, some are slower to adapt than others."* This can be associated with the lack of resources barrier dimension of the barrier framework for e-learning (Figure 1), specifically with the computer competency barrier category.

4.4 External Factors

Participants agreed that having a day away from the office is an advantage of F2F training. However, a barrier to F2F is commuting to the training session and having to wake up earlier than usual if the venue is further away than work would normally be. With regards to the intention to use e-learning, the factor of not having to travel makes e-learning sound appealing to participants. Barriers to e-learning related to external factors such as Internet speed. A statement made by one participant was that he/she felt frustrated by *"Working on a very slow server where content just keeps loading and loading, frustrating."* This confirms the studies on barriers to e-learning in

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developing countries identified by Ahlan and Atanda (2014), Bhuasiri et al. (2012) and Stefanick and LeSage (2005) as well as the barrier categories of fluctuating and unreliable electricity supply and Internet access in the barrier framework for e-learning (Figure 1). A link is therefore established between the literature researched and the results of the study regarding Internet access and the Internet experience of participants in developing countries.

5. Conclusions and Future Research

This study primarily aimed to report on the current barriers to e-learning faced by developing countries. An in depth literature review was used to develop an e-learning barrier framework for developing countries. Once the literature review was completed an explorative research method in the form of a focus group was used to verify the theory and answer the research question. Whilst the focus group was undertaken with only a small sample of participants at a F2F training course, the results are still very useful in providing an in depth understanding of the barriers to e-learning faced by users in the ICT4D realm. From the empirical findings, it is clear that participants can identify potential barriers to e-learning despite not having used e-learning before. Depending on the severity of the barrier to the user, it is clear that barriers have the ability to discourage users from using e-learning and this can in turn affect the success thereof. The infrastructure of organisations in developing countries needs to improve in order to support e-learning initiatives and improve the chances of success. The barriers to e-learning, especially those that affect the intention to use, must be addressed if the success of the initiative is valued.

The study contributes valuable insights into the barriers of e-learning such as the lack of resources (for example Internet speed) and the lack of social interaction that may limit users from utilising e-learning in developing countries. Nonetheless, further research needs to be conducted on the implementation of the e-learning barrier framework in a real-world setting within an ICT4D environment. This study forms part of a larger research study where additional focus groups and surveys will be undertaken. Additional empirical research could extend this study by investigating the adoption of e-learning in developing countries using other case studies and investigating how the barriers identified in this study could be overcome.

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Appendix C: MCIS 2016 Conference Paper

A PROCESS FOR DESIGNING AND DEVELOPING INTERACTIVE LEARNING OBJECTS FOR ORGANISATIONS

Completed Research

Esterhuyse, Maxine, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa, maxine.esterhuyse@nmmu.ac.za

Scholtz, Brenda, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa, brenda.scholtz@nmmu.ac.za

Dafoulas, Georgios, Middlesex University, Hendon, London, g.dafoulas@mdx.ac.uk

Abstract

Organisations are increasingly adopting e-learning environments for employee and customer training projects. These environments use educational technologies and interactive learning objects (ILOs) to increase the quality of digital training experiences. ILOs are growing in popularity because material is multimodal but even more so, interactive which engages trainees and increases motivation to learn. Several studies have proposed processes and guidelines for improving the usability and user experience (UX) of system applications and websites. However, the processes and guidelines for designing ILOs are limited and the majority of these focus on ILOs adopted in educational institutions. Corporations need to consider additional factors, such as the organisational culture and the disparate profile of users when designing their e-learning environment and the ILOs to be adopted. This paper seeks to answer the research question, "What process should be followed when designing interactive learning objects (ILOs) in a corporate context?". The purpose of this paper is to propose a process for designing and developing ILOs (PDILO) that can be used to increase the UX of these ILOs and ultimately, the usage thereof in an e-learning environment for corporate contexts. A case study approach was adopted and the case was a software development company incorporating e-learning into its management strategy. The design process was used to design ILOs that formed part of a module in the company's new e-learning environment. The proposed process can be used to guide content developers with the design of ILOs in e-learning environments and ultimately improve the success thereof.

Keywords: e-Learning, Interactive Learning Objects, Learning Objects, Interactivity, User Experience, LOs, ILOs.

1 Introduction

With the growing demands of learning in a technologically advanced society, e-learning has emerged as the catalyst for training and education (Alsabswy, Cater-Steel and Soar, 2013; Docimini and Palumbo, 2013; Mohammadi, 2015). e-Learning can be defined as a dynamic and immediate learning environment making use of the Internet to improve the learning process by providing learners with access to resources and related services (Docimini and Palumbo, 2013; Jeong and Hong, 2013; Mohammadi, 2015) and to make the learning process flexible (Masa'deh, Tarhini, Mohammed and Maqableh, 2016). Several types of organisations such as companies, universities and schools are implementing e-learning as a training, learning and professional development tool (Chikh and Berkani, 2010). In the workplace, e-learning is proving itself to be a worthwhile investment as a tool for employees to be trained by means of a flexible, accessible, cost-effective and consistent method (Al-Qahtani, Al-Qahtani and Al-Misehal., 2013). The competitive and high-pressure nature of the environments in which corporations operate has created the need for the realisation of leveraging employee knowledge and skills to the advantage of the company (Weng, Tsai and Weng, 2015). However, it can be difficult to prove the monetary return on e-learning investments and project proposers need to motivate the value of such systems (Govindasamy, 2002). In addition, it has been shown that the information quality in digital training experiences can be a barrier that hinders the use of e-learning systems and this can be mitigated by ensuring that the e-learning content is of a high standard (Esterhuyse and Scholtz, 2015; Stoffregen, Pawlowski and Pirkkalainen, 2015).

A key feature of e-learning is the many types of content that can be provided to learners such as text documents, presentations, multimedia, tasks and combined media (Bartuskova and Krejcar, 2014). A recent trend to make use of learning objects (LOs) due to the reuse capability of these resources has emerged (Gordillo, Barra, Gallego and Quemada., 2013). Digital LOs with interactive properties can be referred to as interactive learning objects (ILOs) and are available in a variety of forms such as flashcards, virtual tours, enriched videos and interactive presentations (Barak and Ziv, 2013). In this study the term ILO will be used. The interactive nature of ILOs is said to enrich education and training by providing high quality resources, so therefore, organisations must design ILOs properly to maintain the quality standards of this technology. The question then arises *"How can we ensure quality standards for designing ILOs?"*

User interface design is undeniably important in many fields, including e-learning (Bartuskova and Krejcar, 2014). There is currently a lack of e-learning design guidelines and expertise available due to the uniqueness of the learning process (Wiklund-Engblom, 2015). Knowledge from the fields of user experience (UX) and web design are used when designing for learning, but due to the uniqueness of the learning process, specialised knowledge is also required (Peters, 2014; Wiklund-Engblom, 2015). Design guidelines can differ according to the context and purpose of the e-learning environment (Bartuskova and Krejcar, 2014). Design is one of many facets of the e-learning domain and can be understood as a complex learning strategy involving the presentation of content in e-learning (Bartuskova and Krejcar, 2014; Pelopidas and Kokkinaki, 2014).

With respect to the creation of LOs, design practices have also focused on ILO reusability (Watson, 2010), by ensuring that certain key features are present including (i) ILOs that are designed as building blocks that can be deployed in several courses, (ii) ILOs are self-contained and independent from the specific context of use, (iii) ILOs are created from standardised and separable micro-components and (iv) ILOs that are consistent in size and style.

Whilst interaction design has become an integral part of information systems (IS) design and development, especially for web systems, there is a lack of research related to the design of ILOs, specifically in the corporate context. The purpose of this paper is therefore to investigate and propose a design process that designers can follow when developing ILOs for companies. The structure of the paper is as follows: Section 2 explores existing literature related to interaction design and ILOs and then proposes a set of design guidelines synthesised from theory. In Section 3, the research methodology is described

and then a process for the design and development of ILOs is contributed by the authors, based on the literature review. The case study is described and an analysis of the results is presented in Section 4 and then several conclusions and recommendations are made in Section 5.

2 Literature and Related Work

This section explores general interaction design guidelines and principles that should be considered and followed when developing ILOs. The design of interactive products is discussed first and is followed by an exploration of ILOs. The guidelines for designing components of ILOs is shown and a detailed process of designing ILOs is presented.

2.1 Design of Interactive Products

The process of designing interactive products to support the way in which people communicate in their daily lives is referred to as interaction design (Rogers, Sharp and Preece, 2011). The creative aspect of interaction design can be emphasised by describing it as the art of enabling the interaction between humans and computers (Saffer, 2010). ILOs have inherent multimedia elements and provide immediate feedback to learners and because of this, they have been found to be enjoyable and easy to use when considering the pace of learning (Bradley and Boyle, 2004).

There are four generic activities involved in interaction design (Figure 1) and these activities are intertwined where the output of one activity forms the input of another and activities may overlap (Rogers *et al*., 2011). The first activity involves the establishment of requirements and entails investigating the intended user's needs which will inform subsequent design and development processes. The next activity is where ideas are suggested that could possibly meet the user's needs in the form of conceptual and physical designs. A conceptual design entails an abstraction that models the interaction of the user with the given artefact and the physical design looks at the detail of the artefact such as menu design and colour usage. Prototyping is the next activity and involves the actual design of the interactive artefact which need not necessarily be a working piece of software, it can also be paper-based but should give a sense of the user's interaction with the artefact. The final activity is evaluating and entails establishing the usability and acceptability of the artefact which is measured using a set of criteria.

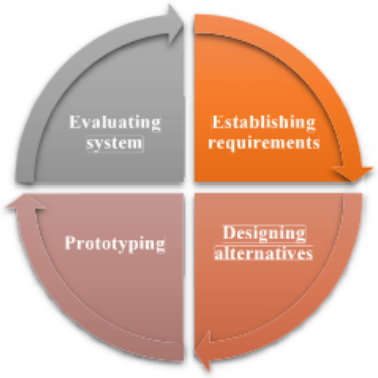

Figure 1. The Process of Interaction Design (Rogers et al. 2011)

When considering interaction design, the UX of the application in question must be accounted for (Rogers *et al*., 2011). UX refers to how a product is used by people and the feelings generated by interacting with that product. There are a number of UX objectives that designers can establish in the form of goals. This should form part of the establishment of the user's requirements. UX goals can be separated into desirable and undesirable aspects which consist of subjective user feelings toward a system. Desirable UX goals can include aspects such as *engagement, cognitively stimulating, motivating, challenging* and *rewarding*. Undesirable UX goals are, for example, *frustrating, childish, patronising, annoying* and *boring*.

It is imperative that designers also consider the user cognition involved with interaction. There are two distinct modes of cognition which are experiential and reflective according to Norman (1993). Experiential cognition involves being in a mindset where we effectively and effortlessly perceive, act and react to events surrounding us. Reflective cognition consists of thinking, associating, comparing and making decisions. The modes of cognition require different technological support and can be accounted for by considering the cognitive processes of people (Rogers *et al*., 2011).

Attention is a cognitive process which involves the method of choosing which items to concentrate on from a set of available items, at a point in time. The way in which information is presented can either positively or negatively affect peoples' attention. Perception is another cognitive process which refers to the way in which information is retrieved by people through the sensory organs, such as through sight, touch and sound, and then transformed into experiences of objects (Roth, 1986). Information should be presented in a way that can be perceived in the intended manner. A third cognitive process is memory which entails recalling knowledge of varying types that enables people to react in an appropriate way (Rogers *et al*., 2011). Learning is another cognitive process which can be described in the field of IS as either the process of learning to use a computer-based system or using a computer-based system to learn to understand certain subject matter. The cognitive processes of reading, speaking and listening are forms of language processing which need to be considered when designing interactive technologies. Finally, the reflective set of cognitive process which are problem-solving, planning, reasoning and decision making, involve thinking about a subject, considering the available options, evaluating the consequences of possible decisions and then choosing the most favourable option. It is best practice to design for the six cognitive processes in interactive systems and content, such as ILOs. According to Rogers *et al*. (2011), there are several design implications linked to the cognitive processes that could be considered as guidelines for designing interactive products (Table 1).

Cognitive Process	Design Implication Example
Attention	Use techniques like animated graphics, colour, underlining, hierarchy and structure of items, ordering of related information and spacing of items to highlight information.
Perception	Text should be legible and distinguishable which can be ensured by using light text on dark backgrounds or vice versa.
Memory	Design interfaces that promote recognition rather than recall by using menus, familiar icons and consistently placed items.
Learning	Encourage exploration with interface design.
Reading, Speaking and Listening	Provide options for enlarging the text on a screen without compromising on formatting.
Problem Solving, Planning, Reasoning and Decision Making	Provide supplementary concealed information or tips that is easily accessed for users who want to know more about carrying out tasks more efficiently.

Table 1. Design Implications for Interactive Products (Adapted from Rogers et al., 2011)

Since the early days of LO design, clear benefits were identified for both developers and instructors, including (i) the use of interoperable and reusable building blocks of e-learning content adhering to widely shared specifications, (ii) improved collaboration amongst developers, (iii) unlimited combinations leading to the construction of collections in the form of lessons, modules, courses and other curricula structures, (iv) increased productivity in the form of e-learning content development and course design and (v) reduced time and cost overheads associated with the development of e-learning content (Clyde, 2004; Parrish, 2004). The design implications for interactive products (Table 1) provide an excellent framework for designing and creating interactive products. These guidelines should be used in line with four goals for the implementation of LOs in educational environments (De Salas and Ellis, 2006). These goals are:

- **Reusability** – the goal is to create manageable units of instruction that can be assembled and reassembled as needed. The proposed guidelines ensure the simplicity of the implementation practice.
- **Interoperability** – the goal is to create learning components that can be used together without any restrictions from the virtual learning environment or learning management system used. Therefore, the design guidelines are created around the learning paradigm and underlying pedagogies rather than the technologies used.
- **Durability** – the goal is to ensure that LOs do not become obsolete due to changes in the way information is presented and delivered or any other shifts in technology. Therefore, the way interactive content that is created is independent of technology and tools used in all design guideline categories.
- **Accessibility** – the goal is to make learning content available anywhere, anytime, in ways that can be discovered and reused. Interactive content from all design classifications should be available for the creation of ILO in various contexts.

2.2 Learning Objects and Interactive Learning Objects

A LO can be defined as an entity which can be digital or non-digital that is used for learning, educational or training purposes according to the official learning object metadata (LOM) standard (IEEE, 2002). Conversely, this definition cannot be considered universal due to the several definitions of LOs observed which depend on the context of the content (Verbert and Duval, 2008). The reason behind creating learning resources in the form of LOs is because of the ability to reuse them instead of having to create new learning resources each time they are needed (Wiley, 2000). The smaller the size or granularity of the LOs, the larger the potential is for reuse (Duval and Hodgins, 2003). LOs can also be grouped to form complex hierarchies, commonly referred to as authoring by aggregation, or combined in a sequence to represent the learning process (Duval and Hodgins, 2003; Gordillo *et al*., 2013). The benefits of reusing LOs reduces the time and the cost associated with developing these learning resources and ILOs, specifically, have the ability to enhance the quality of learning (Mohan and Brooks, 2003; Wiley, 2000). ILOs can be described as web-based tools that support the process of learning by enhancing, strengthening and guiding the cognitive processes of learners by interactive means (Barak and Ziv, 2013; Kay and Knaack, 2008). Since they are by their very nature, interactive, the design implications proposed in Table 1 for interactive products can apply to ILOs. ILOs also need to include explicit objectives and built-in assessment methods as this has become best practice (Barak and Ziv, 2013). AlfredoSanchez, Perez-Lezama and Starostenko (2015) add that ILOs should consist of six components, which are the outputs of the design and development process. The components are:

- The learning objectives;
- The skills or competencies that are acquired after interacting with the ILO;
- Prerequisite knowledge of the learner required before using the ILO;
- The digital educational content;

- A set of practice tasks to be completed by the learner; and
- An evaluation/assessment mechanism to measure learner competency.

The learning objectives describe that which learners must accomplish or knowledge that should be obtained after using the ILO. The goal is the purpose toward which efforts are directed and can consist of several learning objectives. Competencies or skills are the abilities, attitudes and values acquired after interacting with the ILO. Prerequisites refer to the knowledge or competencies the learner should have acquired previously in order to be able to take full advantage of the ILO.

e-Learning often incorporates visual elements, yet the visual design element of e-learning is often overlooked or seen as a minor cosmetic feature (Horton, 2006). Bartuskova and Krejcar (2014) proposed a set of design attributes and requirements for e-learning in general from a synthesis of literature. The five main design requirements concern legibility, design consistency, visual presentation, content arrangement and content adjustment (Table 2). Legibility concerns the ability for learners to read text and recognise pictures and is significantly more important in e-learning due to it being more difficult reading a computer screen than paper (Weinschenk, 2011; Bartuskova and Krejcar, 2014). Visual presentation can help in generating positive attitudes towards the given artefact and entails the use of colour, graphics and the visual hierarchy of content (Bartuskova and Krejcar, 2014). Design consistency refers to two implications of consistency, one concerning the consistency of style and appearance and the other concerning the consistency of meaning and action (Fee, 2009; Lidwell, Holden and Butler., 2010; Bartuskova and Krejcar, 2014). Content arrangement is the organisation and structural positioning of various multimedia content (Bartuskova and Krejcar, 2014). Content adjustment entails the division or grouping of content into logical units as well as the emphasis of important content to aid in the processing of information by the learner.

Requirement	Attributes
Legibility	Typeface, type/font size, tonal contrast, spacing, alignment, line length, media legibility
Visual presentation	Aesthetic design, colour, colour contrast, relevant graphics, supportive graphics, visual hierarchy
Design consistency	Functional consistency, aesthetic consistency, consistency in layout and structure
Content arrangement	Layout, organisation, navigation mechanism, multiple presentation media
Content adjustment	Chunking, white space, emphasis mechanisms, noise reduction

Table 2. Design Attributes and Requirements (Bartuskova and Krejcar, 2014)

The set of design requirements and attributes specified by Bartuskova and Krejcar (2014) were sourced from research based on general design principles, e-learning systems and web design. There is a strong focus on the aesthetics of e-learning with influencing elements of graphic design. The design attributes and requirements are appropriate for ILO design as aspects such as consistency, colour usage and spacing are addressed, which are important in the design of ILOs.

A framework for evaluating m-learning artefacts, which included ILOs, was proposed by Harpur and de Villiers (2015). This framework is for evaluating M-learning environments, emphasising the Usability and User eXperience encountered in mobile Educational contexts (MUUX-E), and is a customisable template that is underpinned by theoretical principles and focuses on the evaluation of m-learning applications. The MUUX-E framework consists of the following five categories of criteria: general interface usability, web-based learning, educational usability, m-learning features and UX.

The general interface usability criteria were derived from Nielsen's classic heuristics for interface usability and emphasises the design of a system that is consistent and meets learner needs (Nielsen, 2005). The second category, web-based learning, concerns the navigation, organisation and format of the system as well as its suitability for the learning process (Harpur and de Villiers, 2015). Educational usability

emphasises learning-specific use and the incorporation of learning objectives or outcomes based on a learning theory. The fourth category is specific to m-learning and entails the affordance of contextual requirements and user-centricity. The m-learning category can be adapted for e-learning purposes since m-learning evolved from the concept of e-learning (Whale, Scholtz and Calitz, 2015; Kumar, 2013) with some additional constraints such as screen size. The last evaluation category is UX which involves measuring the extent to which a user has positive feelings towards the given system. The MUUX-E framework evaluates some elements of the interactive nature of artefacts and also considers the learning element. Since m-learning is a subset of e-learning, the majority of criteria are applicable to other e-learning products, except for those that relate to handheld devices. The five categories of the MUUX-E framework are therefore suitable for designing and evaluating e-learning systems and specifically, ILOs.

3 Research Methodology

The main research question of this study is:

> **RQ_M:** What process should be followed when designing interactive learning objects (ILOs) in a corporate context?

The aim of this study is to propose a process and guidelines that can be used by practitioners and researchers alike for the design of ILOs in the corporate context. In order to answer and address the research question of this study, the following supporting research objectives are identified:

> **RO_1:** To propose a comprehensive process for designing and developing ILOs for corporate usage.
>
> **RO_2:** To apply this process to the design of ILOs in a real-world e-learning context (case study).

The first research objective (RO_1) was answered by conducting an in-depth literature review. From a synthesis of the literature, a comprehensive Process for Designing and Developing ILOs (PDILO) is proposed by the authors, which was based on the four activities involved in the interaction design process (Figure 1 and Section 2.1) and applied to ILOs (Figure 2). The first activity of interaction design and in PDILO relates to the establishment of requirements whereby learning objectives, competencies or skills and the required learning prerequisites are established. During this activity, desirable and undesirable UX goals should be identified and the design guidelines as well as corporate culture and context should be considered. The second activity is the design phase where alternative designs for the ILOs are constructed. The third activity is prototyping, where various interactive artefacts or ILOs are created and the output of this activity is the ILO content.

ILO content consists of the digital resources that make up the ILO, including sequencing and the navigational information on such resources (Rogers *et al*., 2011). It is during the activities of designing and prototyping that designers need to consider four sets of design guidelines and heuristics:

- Organisational considerations and guidelines,
- Interactive design guidelines for cognitive processes,
- e-Learning design attributes and requirements, and
- e-Learning (MUUX-E) heuristics.

ILO Design and Development Process

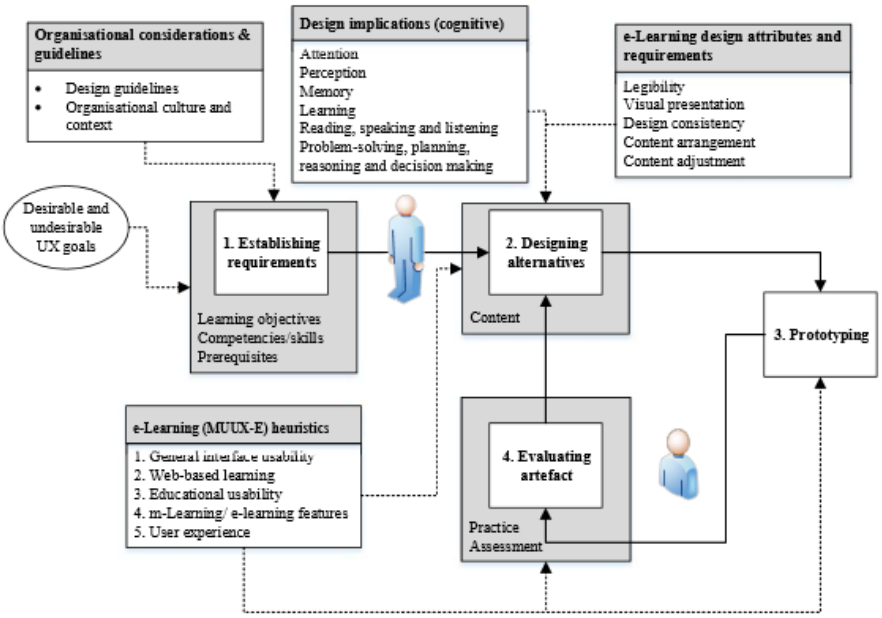

Figure 2. Process for Designing and Developing ILOs (PDILO) - (Author's own contribution)

Organisational culture has been found to be crucial in the way that e-learning is designed and utilised (Czerniewicz and Brown, 2009; Tarhini, Hone and Liu, 2013; Tarhini, Hone, Liu and Tarhini, 2016). Technology in the form of e-learning can be made available in the workplace, however, benefits will not be realised by companies if employees are not willing to adopt such systems (Yoo and Huang, 2015). A learning organisation can be conceptualised as the sharing of knowledge and the provision of growth opportunities at an individual and organisational level (Yoo and Huang, 2015). A learning organisation can be fostered with the use of e-learning and will therefore cultivate an organisational culture which is based on knowledge sharing. The allocation of goals, values and resources in the form of policies can contribute to successful e-learning institutional adoption (Czerniewicz and Brown, 2009). Companies must ensure that the strategic positioning of e-learning is aligned with the learning and development policies of the company (Yoo and Huang, 2015). When designing e-learning systems and content for the workplace, the intended learner's profile in terms of gender, age and computer skills must be considered (Al-Qahtani *et al*., 2013). Guidelines for designing ILOs therefore need to consider the organisational context and culture.

In the final activity, the artefact is evaluated. During the practice activity, the learner practices tasks using the artefact and is then assessed during the assessment activity to measure the knowledge attained through interacting with the ILO. It is important to note that this process is iterative involving continuous improvement in each of the activities of designing alternatives, prototyping and evaluating.

In order to meet the second research objective (RO_2), a case study research strategy was utilised and the guidelines derived from the literature were applied to the case study. The case study strategy can be described as contextualising a phenomenon which typically relies on inductive reasoning and highlights the reader's understanding of the phenomenon being focused on in the study (White, Drew and Hay, 2009; Willis, 2007). According to Willis (2007), a case study research strategy can enable researchers

to gather rich, detailed data in authentic settings. Case study research also enables the understanding of human behaviour which can be interpreted in a social context as a lived experience.

4 Application of Design and Development Process

The case study used for this research is a South African software development company, specialising in the development of software products for the South African property industry. For purposes of anonymity, the company will be referred to as TechDisrupt. The company's vision for e-learning is for it to form an integral part of customers' interaction with their software after purchasing. Prior to the implementation of e-learning at TechDisrupt, customers were trained to use the software products that they had purchased by means of traditional face-to-face courses. TechDisrupt's objective was to transfer these courses to an online environment, in the form of e-learning, in order to reduce costs and to introduce a more effective knowledge acquisition process that is also convenient for customers. At the start of this study, some of the courses were partially available online but usage rates of the courses were low and learning content was made up of documents in the form of instruction manuals. One of TechDisrupt's goals is therefore to improve the quality of the e-learning content and the UX of users that are using the system and interact with the ILOs. In order to do this, a design process is needed so that content developers at TechDisrupt can create ILOs in a standardised way by following this process and the associated guidelines.

The theoretical PDILO framework derived from the literature review (Figure 2) was used to guide the four activities of designing and developing the ILOs for one learning module for TechDisrupt's "Transfers Course" (Table 3, Table 4 and Table 5). As part of establishing requirements, a preliminary study was undertaken where a focus group (Esterhuyse and Scholtz, 2015) and survey (Esterhuyse and Scholtz, 2016) were used to identify the needs and profile of TechDisrupt's customer base. The focus group and survey indicated that their customers' intention to use e-learning was positive. When designing ILOs for TechDisrupt, it was important to obtain feedback from relevant company stakeholders iteratively in order to ensure that the designs adhered to the company's brand, culture and policies. After the ILOs were designed, the wireframes were presented to TechDisrupt where constructive feedback was gathered and implemented, after which a final design of the ILOs was shown to the company again.

Activity 1: Establishing requirements	
Component	**Examples of application to case study**

Learning objectives	• **Interviews** were conducted with management and the users to determine company-specific policies, standards and learning objectives.
	• **Company-specific requirements** were elicited from TechDisrupt by specifying that the company needed ILOs developed for conveyancing software.
	• **Observations** of existing face-to-face course was undertaken.
	• **A focus group** was conducted to determine requirements of users and their profiles. Key findings were that customers of TechDisrupt who had never used e-learning before, are open to the idea of using e-learning but significant barriers to e-learning exist (Esterhuyse and Scholtz, 2015).
	• The two main learning objectives were identified as:
	  ○ The ability to open a new Transfer file using the conveyancing software.
	  ○ Learn new methods to complete tasks more efficiently.
	• **Desirable UX goals:** engaging, challenging, cognitively stimulating and rewarding
	• **Undesirable UX goals:** patronising, boring, gimmicky and frustrating

Competencies or skills	A **survey** was conducted to get more detail on the user profile (Esterhuyse and Scholtz, 2016): Key findings were that customers of TechDisrupt have positive intentions to use e-learning due to high enjoyment and self-efficacy ratings, and low computer anxiety ratings. The skills needed that were identified from the interviews and observations were: • Entering transactions in the Transfer conveyancing software. • Problem solving skills • Low dependence on help mechanisms (e.g. call centres, live chats, colleagues or face-to-face training) will be established.
Prerequisites	The learner should have some knowledge of conveyancing processes regarding transfers as well as intermediate computer experience in terms of being comfortable using a computer and using computers regularly.

Table 3. Application of design process to case study – Activity 1 (Establishing requirements)

Activity 2: Designing alternatives	
Component	**Examples of application to case study**
Content	Each learning module designed consisted of three units: **Show Me:** The software is demonstrated to the learner (learning and attention cognitive processes involved) **Try Me:** The learner attempts to use the software (perception and problem solving cognitive processes involved) **Test Me:** The learner is assessed based on their knowledge of the given module (memory cognitive process involved)
The following MUUX-E categories were used as heuristics to design alternatives of learning modules and ILOs: **General interface usability:** *Aesthetics and minimalism in design* **Web-based learning:** *Suitable course content of a high quality*, *Relevant pedagogical site content* and *high quality video and digital media*	

Table 4. Application of design process to case study – Activity 2 (Designing alternatives)

Activity 3 and 4: Prototyping and evaluating	
Component	**Example of application to case study**
Practice/tasks	The learners practice the tasks using the Try Me unit.
Evaluation mechanism	A quiz is administered in the Test Me units to measure the knowledge acquired from the ILOs by the learner. A mark is awarded to the learner.
The following MUUX-E categories were used for both prototyping and evaluating, specifically the criteria involving: **Educational usability:** *Feedback, guidance and assessment* **e-Learning features:** *Interactivity (Navigational fidelity; multimedia components with high quality lessons and exercises; synchronous and asynchronous communication and collaboration; simple and easy to use system)* **UX:** *Appeal (new impressions; curiosity; insights; visual power; aesthetic factors)* and *satisfaction (pleasure; cognitive likeability; trust; achievements; motivation; goals)*	

Table 5. Application of design process to case study – Activity 3 and 4 (Prototyping and evaluating)

5 Discussion and Reflection

A novel process for designing ILOs for the corporate context, namely PDILO, is presented in this paper and a set of guidelines are proposed. The theoretical framework and design process were generated from the literature, grounding this research as a theoretical contribution to the bodies of knowledge on e-learning and design. This research has a significant contribution to the design bodies of knowledge by introducing an approach to designing ILOs for corporate usage. The research question "What process should be followed when designing interactive learning objects (ILOs) in a corporate context?" was answered by achieving two research objectives, one of which involved proposing a comprehensive process for designing ILOs for corporate needs and the other involved applying this process and the associated guidelines to a real-world corporate context.

Upon reflection, the application of the PDILO framework in the design of the ILOs for TechDisrupt was successful. Factors that may not otherwise have been considered, such as the organisational culture of TechDisrupt and the varying profiles of the customer base, enabled the designers to take an all-inclusive and user-centric approach to design. The iterative nature of the ILO design process enabled a set of ILOs to be designed that were of a high quality and therefore appropriate for the highly competitive nature of the industry in which TechDisrupt operates. A possible limitation of using the PDILO is that it was implemented in only two cases. Since the PDILO was proposed by the authors of this paper, it has not been established if this process is used often enough to be considered best practice, which could be substantiated by empirical results.

It is important to state that although in this paper, the creation of ILOs for corporate scenarios is the primary focus, PDILO is applicable to other educational contexts. The activities proposed by PDILO were followed in higher education settings and addressed the different needs of students. An example from previous work (Saleeb and Dafoulas, 2016) relates to the design of learning experiences in virtual worlds and in particular the creation of learning spaces with emphasis on the activities that must be supported. The Show me, Try me, Test me approach (Activity 2) was applied to the use of virtual worlds for learning activities and helped in the adjustments of architectural features to fit learning needs. This work applied the activities of PDILO and focused both on establishing requirements through the evaluation of the learning experiences of the students and on designing alternatives through the creation of architectural spaces that would support different cognitive processes (for example, team brainstorming versus individual self-assessment).

Furthermore, the application of PDILO in different learning settings has established that it can be applied across a wide range of learning scenarios and educational contexts. The proposed activities and guidelines were used while building learning spaces in 3D virtual worlds, creating interactive learning opportunities in social learning networks (for example, Facebook) and incorporating Optical Head Mounted Devices (OHMD) in the provision of feedback to student presentation and evaluating tutor support (Dafoulas, Maia and Loomes, 2016). The activities were also followed while creating interactive learning scenarios with the use of social learning networks and in particular while using Facebook for facilitating student learning in further and higher education institutions. Previous work of Shokri and Dafoulas (2016) of the use of social media in learning used both cognitive guidelines and UX criteria. The cognitive guidelines were used in a qualitative analysis of learners' contributions, whereas the UX criteria were used in a quantitative analysis of how social media features were used. The results were used to propose design alternatives, thereby leading to enhanced prototypes. Finally, the prototyping and evaluating steps (Activity 3 and 4) were followed in the use of OHMD for the provision of feedback to students delivering presentations, as well as mentoring academics who provided formative assessment feedback to learners.

This study promotes quality standards and best practice for improving ILOs used in corporate e-learning environments. The design process and guidelines proposed can be applied to the corporate context and can also be adapted to suit industries other than corporates. The process is supported by theoretical

principles that can be used when designing ILOs and for quality assurance of such products that are included in e-learning environments. The management strategies of companies wanting to implement and maintain successful e-learning systems should encourage the adherence to the design process and guidelines presented in this paper. It is important that ILOs are aligned with the organisation culture and accommodate the diverse profiles of intended users. Future research could entail the application of the design process to other fields and contexts such as agricultural or government environments. The design process could be extended to include additional factors related to the corporate context or could be standardised for general use. Future research could also investigate relationships between the ILOs designed using the guidelines from this study and the extent to which users enjoy learning using the ILOs and the success of the e-learning initiative.

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Appendix D: The e-Learning (MUUX-E) Framework Criteria

APPENDIX A: FINAL MUUX-E FRAMEWORK

Category 1: General Interface Usability [27 Sub-criteria]

1. *Visibility of system status*
1.1. Feedback is provided by the application.
1.2. The system is responsive to user actions without odd and unexplained events.
1.3. Visible feedback icons communicate what is happening.
2. *Match to the real world*
2.1. Clear everyday understandable language has been used in the application.
2.2. Where metaphors are used they represent real-world objects, ideas and concepts.
2.3. Symbols and icons follow an intuitive pattern in line with tasks.
2.4. Information is seen as sequential, logical and as naturally arranged.
3. *Learner control and freedom*
3.1. Users are able to exert control on the system.
3.2. It is possible to exit at any time even though mistakes might have been made.
3.3. Undo and Redo options exist.
4. *Consistency; adherence to standards*
4.1. Patterns of words, symbols, icons repeat logically throughout the application.
4.2. Platform standards are recognised as similar to PC-oriented standards.
5. *Prevention of usability-related errors*
5.1. Errors are preventable—the system is designed to take care of this.
5.2. An appropriate message is shown if a mistake is made.
6. *Recognition rather than recall*
6.1. Objects are visible and familiar; scrolling is needed occasionally.
6.2. The screen is manipulated to view any information without needing to remember.
6.3. Advice on system use is visible and able to be used whenever needed.
6.4. Simple displays are presented with few or no multiple page display options.
6.5. The zoom feature enables easy enlargement of text for improved reading.
7. *Aesthetics and minimalism in design*
7.1. Distracting material of minimal relevance has been excluded.
7.2. Graphics are used to illustrate a point rather than to decorate the page.
8. *Recognition and recovery from errors*
8.1. Error messages are easy to follow being presented in straight forward language.
8.2. Quick and simple solutions are offered if errors are made.
8.3. Recovery is achieved after constructive help.
9. *Help and documentation*
9.1. A help facility exists, it is easy to find and support the users' needs.
9.2. A search facility makes it easy to find information.
9.3. Support documentation is provided on each page.

Category 2: Web-based learning [19 Sub-criteria]

10. *Simple, well-organised navigational structure*
10.1. The application is easy to navigate on a mobile handheld device.
10.2. There are several paths to and from a chosen destination.
10.3. Related information has been grouped into obvious categories.
10.4. Information is organised hierarchically.
10.5. Links and buttons support navigation throughout the site without cluttering it.
11. *Relevant pedagogical site content*
11.1. The site is interesting and keeps the user's attention focused.
11.2. Site information is clear and relevant.
11.3. No racial or gender biases are noted.
11.4. If material has been copyrighted, this has been made clear.
12. *Information easily accessible*
12.1. Any lesson material or downloadable documents can be reached.
12.2. The videos open with ease.

12.3. All links to external sites provide the required connections to additional information.
13. *Suitable course content of a high quality*
13.1. Additional website links provide suitable content.
13.2. The content is of a high standard.
14. *Easy-to-use system, called easiness*
14.1. No difficulties are experienced reaching site material via the mobile interface.
14.2. It is just as easy to scroll or browse back to the site after visiting another site.
14.3. It is easy to browse back and forth through the many learning options offered.
15. *Excellent video and digital media*
15.1. Text is presented in a legible easy to read format.
15.2. Digital material is of a high quality, no difficulty is experienced during viewing.

Category 3: Educational usability [11 Sub-criteria]

16. *Clarity of goals, objectives and outcomes*
16.1. Goals are clearly set out, objectives and expected outcomes for learning are clear too.
16.2. There is a good reason for the inclusion of each page and this reason is obvious.
17. *Effectiveness of collaborative learning*
17.1. Activities are experienced encouraging collaborative learning in several different ways.
17.2. The discussion forum is fun and operational.
17.3. Chat room facilities are found.
18. *Error recognition, diagnosis and recovery*
18.1. Problem-based learning strategies have been implemented.
18.2. Mistakes can be made affording users the chance to learn from them.
18.3. Help is provided to recover from cognitive errors.
19. *Feedback, guidance and assessment*
19.1. Users receive prompt feedback from the application on assessment and progress.
19.2. Guidance is provided about the tasks and construction of knowledge going on.
19.3. Activities are graded with grades providing instant feedback and correction.

Category 4: m-Learning features [39 Sub-criteria]

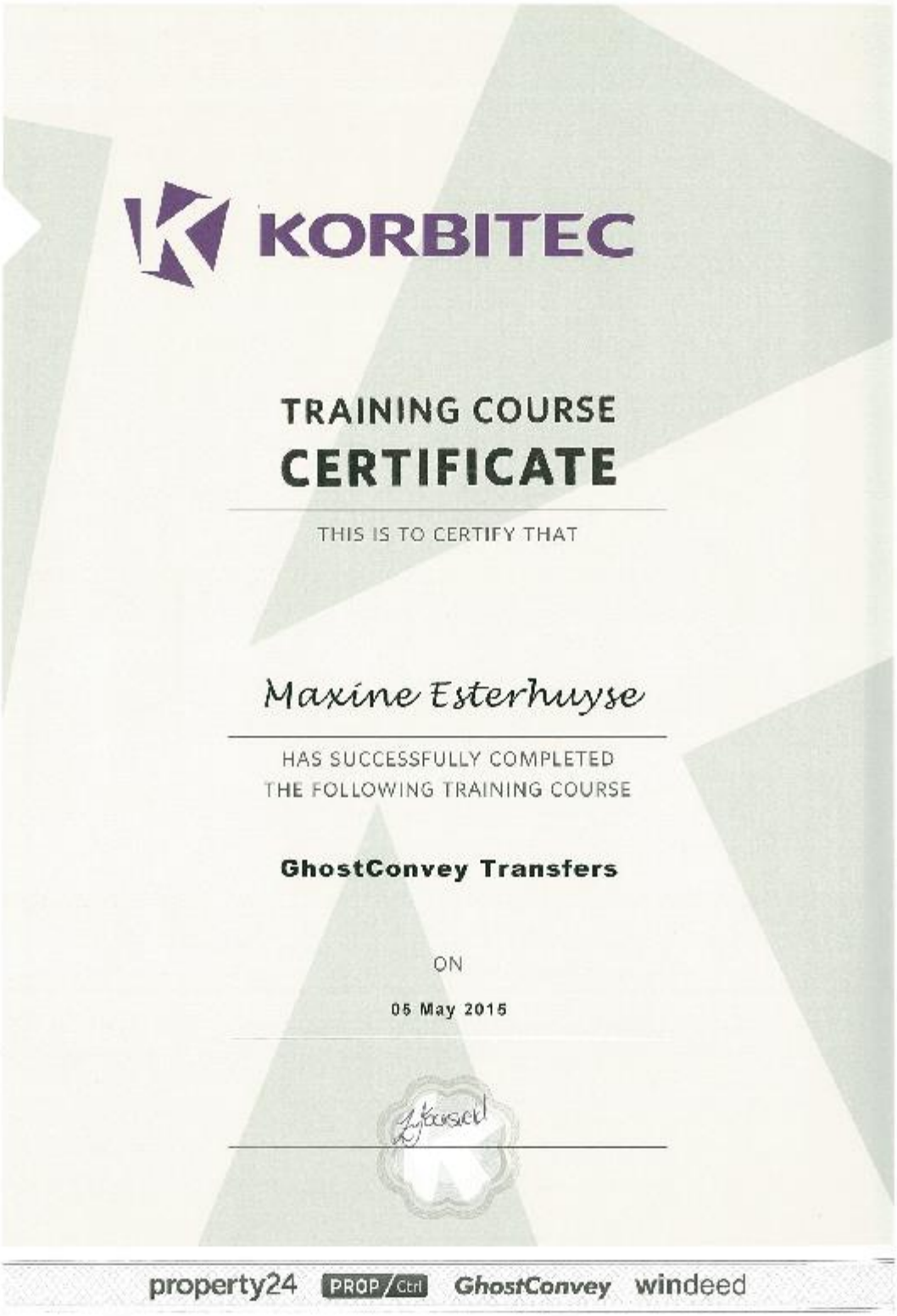
20. *Handheld devices and technology*
20.1. Technology has made mobile learning feasible.
20.2. The mobile handheld device has adequate capabilities to support mobile learning.
20.3. The mobile interface does not hamper working with the application.
20.4. Inserting text and numbers is feasible and achievable.
20.5. The mobile handheld device system is used to its fullest capability.
20.6. Mobile communication channels are provided.
21. *Contextual factors (pragmatic)*
21.1. A physical environment is noted but it does not hinder the lesson experience.
21.2. The lessons in followed where noise and audible interference is experienced.
21.3. Prior mobile handheld device knowledge and exposure makes the task easy.
21.4. User characteristics have been considered as part of the exercise.
21.5. Goals are set and not adjustable.
21.6. The application feels and behaves like a normal working environment.
21.7. During the lesson, awareness of surroundings is evident.
21.8. Users are exposed to rich and complex environments, not limited by the mobile.
22. *User-centricity (pragmatic)*
22.1. Support for personal approaches to learning is offered.
22.2. Experimentation and exploration is possible.
22.3. User requirements have been specified.
22.4. Self-sufficiency is observed.
22.5. Material is presented in a clear, student-centred format.
22.6. Focus is enhanced in that students spend longer times doing tasks.
22.7. Personalised learning format has been provided.
22.8. Students are personally aware of all content with control being given to users.

22.9. Students can customise, applying their own preferences.
22.10. Active learning promotes critical thinking: users compare, analyse, classify, deduce.
22.11. Users are able to direct their own learning with a sense of ownership.
23. *Flexibility*
23.1. The lesson may be done at any personal moment in time.
23.2. An adaptable environment has been created.
23.3. Lesson information may be viewed in any order.
23.4. The system can be adjusted to individual needs.
23.5. The systems can be used anytime and anywhere.
24. *Interactivity*
24.1. Navigational fidelity is experienced.
24.2. Multimedia components are appropriate.
24.3. Multiple kinds of exercises have been provided.
24.4. Synchronous communication is possible.
24.5. Asynchronous communication is possible.
24.6. Interaction happens in varying ways.
24.7. Interaction with the application is smooth.
24.8. Support is provided for interactivity with the application.
24.9. Interactivity has been encouraged in creative ways.

Category 5: User experience [21 sub-criteria]

25. *Emotional issues*
25.1. The lessons are motivating and fun.
25.2. The application encourages participation with a longer time trying to process the lesson.
25.3. The experience is enjoyable.
25.4. It is new technology yet it is interesting and an acceptable form of learning.
25.5. This way of learning software engineering is exciting.
26. *Contextual factors (hedonic)*
26.1. Knowledge of mobile technology makes this way of learning a pleasure.
26.2. The need for this type of learning suits the current mobile learner environment.
27. *User-centricity (hedonic)*
27.1. Personalised learning is encouraged.
27.2. The student is able to customise the learning environment.
28. *Social value*
28.1. The application is social, encouraging media sharing
28.2. The m-learning approach provides both synchronous and asynchronous interaction.
29. *Needs*
29.1. The student is encouraged to express personal opinions.
29.2. The learning environment is stimulating.
29.3. A sense of security is achieved.
30. *Appeal*
30.1. New impressions of the learning content create an appealing space.
30.2. The student is motivated to explore.
30.3. The experience is visually appealing.
31. *Satisfaction*
31.1. The experience adds fun to the learning opportunity.
31.2. This way of learning is motivating.
31.3. A satisfying sense of achievement is felt.
31.4. The student is encouraged to engage with the course material.

Appendix E: Transfers Course Certificate



KORBITEC

TRAINING COURSE
CERTIFICATE

THIS IS TO CERTIFY THAT

Maxine Esterhuyse

HAS SUCCESSFULLY COMPLETED
THE FOLLOWING TRAINING COURSE

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Appendix F: Conf-IRM 2016 Conference Paper

The Intention to Use e-Learning in Corporations

Maxine Esterhuyse
Nelson Mandela Metropolitan University (NMMU)
Maxine.Esterhuyse@nmmu.ac.za

Brenda Scholtz
Nelson Mandela Metropolitan University (NMMU)
Brenda.Scholtz@nmmu.ac.za

Abstract

The introduction of e-learning has allowed companies to re-engineer the process in which training is conducted, whilst realising the benefits that e-learning has to offer. It is important to identify and understand the driving forces behind users' behavioural intention to use ICT and e-learning in order to improve the chances of success of these projects. The purpose of this paper is to explore the intention to use e-learning in a corporate context. A case study approach with a survey strategy was used and the case was a South African software development company that has identified e-learning as part of its management strategy. A theoretical model of the intention to use e-learning is proposed and is used to guide the research. The results showed that the respondents have positive intentions to use e-learning and positive computer self-efficacy whereas they rated their computer anxiety negatively. From these results and the theoretical model it can be deduced that respondents will have positive intentions to use e-learning. Possible limitations of this study are that it only investigates one company and it does not investigate the relationship between the three constructs and the intention to use.

Keywords

e-Learning, Intention to Use, Self-efficacy, Enjoyment, Computer Anxiety, Survey, and Case Study.

The Intention to Use e-Learning in Corporations

1. Introduction

There has been a transformation in the field of education and learning due to the introduction of the Internet (Akaslan, Law, & Taşkin, 2012). Information and Communication Technology (ICT) has been a prominent driving force behind the economic, commercial and socio-political industry changes (Alias, Zakariah, Ismail, & Aziz, 2012). ICT has also influenced the educational industry substantially by the way in which learning is facilitated. The teaching and training methods of institutions have changed from formal lectures to the use of ICT for learning content delivery (Akaslan et al., 2012). However, some of the characteristics of developing countries can make the diffusion of ICT more challenging (Grazzi & Vergara, 2012). These characteristics include elevated ICT prices, a lack in supporting infrastructure and cultural perceptions of technology.

The introduction of e-learning has created a new paradigm for modern education in a fluctuating technological environment (Alias et al., 2012). Studies show that there are a number of e-learning implementation issues which can lead to e-learning failure (Akaslan et al., 2012; Alias et al., 2012; May, Fessakis, Dimitracopoulou, & George, 2012). E-learning initiatives are subject to the rapid pace of technology change which contributes to the risk of e-learning failure and the need for implementing organisations to be flexible. e-Learning can be defined as the implementation of Internet technologies in order to deliver an extensive array of solutions to enhance knowledge acquisition and learner performance (Haron & Suriyani, 2010; Liaw, Huang, & Chen, 2007). Various types of organisations such as companies, schools and universities are making use of e-learning as a training, learning and professional development tool (Chikh & Berkani, 2010). The increasing adoption of e-learning in such organisations is due to the Internet offering new opportunities to restructure the learning and knowledge transfer environment (Abbad, 2012). e-Learning also offers such organisations the opportunity to leverage the various advantages that e-learning provides (Hani, Hooshmand, & Mirafzal, 2013).

It is important to establish the behavioural intention to use e-learning because system use is an important indicator of the system's success (Mohammadi, 2015). Behavioural intention can be described as an immediate predecessor of usage behaviour and provides an indication of when a user is prepared to perform a specific behaviour (Tarhini, Hone, & Liu, 2013). Chen and Tseng (2012) found that motivation and self-efficacy both had significant positive effects while computer anxiety had a significant negative effect on the intention towards the usage of e-learning.

The adoption of e-learning initiatives has become one of the most researched topics in prior literature (Haron & Suriyani, 2010; Islam, 2013; Zhang, Wen, Li, Fu, & Cui, 2010). However, most studies that are related to the adoption of e-learning are conducted in university contexts. The purpose of this paper is to investigate the intention to use e-learning in corporate organisations. The structure of the paper is as follows: Section 2 explores the background to e-learning and the intention to use technology and e-learning. In Section 3 the case study and

survey design adopted in the study is explained. The analysis of the results is presented in Section 4 and several conclusions and recommendations are made in Section 5.

2. Intention of e-Learning

The corporate environment is progressively realising the potential benefits of e-learning such as its ability to provide cost-effective training for employees and customers (Chen, 2010). The field of e-learning, specifically in the corporate context, was predicted a number of years ago to undergo a paradigm shift from an emerging realm with considerable potential to an established industry with much attention (Barron, 2002). Within the workplace, e-learning has been considered a popular approach to training due to its attributes of flexibility, ease of access, just-in-time delivery, low costs, consistency and customer value (Al-Qahtani, Al-Qahtani, & Al-Misehal, 2013). When operating in highly competitive markets, corporations have to realise the importance of human capital and knowledge in order to be able to leverage employees' skill sets as competitive assets (Weng, Tsai, & Weng, 2015).

The factors associated with e-learning failure must be identified before embarking on such initiatives. There are excessive costs that can be linked to e-learning failures including time wasted as well as monetary expenses which can be avoided by being aware of learner usage intention (Akaslan et al., 2012). A more advanced e-learning environment can be provided for users by being aware of metrics that may increase users' behavioural intention to use such systems (Hani et al., 2013). An advanced e-learning environment according to Hani et al. (2013) is one that maximises the proficiency of the education system, decreases student dropout rates, increases student pass rates, enhances the success of students related to their education, increases scholarly outputs of students and reduces the costs associated with education system processes (Figure 1). If the aforementioned metrics are catered for in e-learning environments, the success of such systems may drive the intention to use the technology. The study by Hani et al. (2013) was conducted in a university environment and the corporate environment would benefit from more research in the e-learning field.

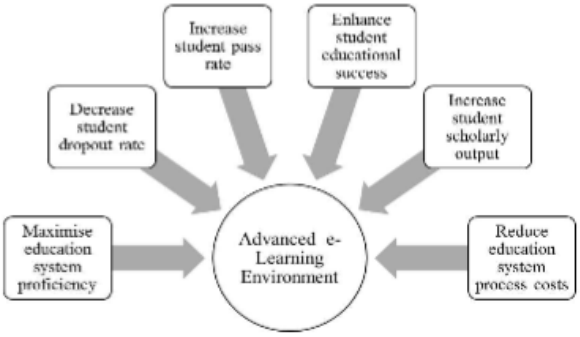

Figure 1: An Advanced e-Learning Environment
Source: (Hani et al., 2013)

3

The success of an e-learning environment can be determined by the intention to use e-learning (Mohammadi, 2015). Companies that want to avoid the underutilisation of technology and resources wastage must focus on developing effective strategies to ensure the continued intentions of usage or participation (Weng et al., 2015). Smith and Sivo (2012) revealed that by determining the metrics that influence the intention to use educational technologies, educational leaders, designers and facilitators can more easily promote both the application and development thereof. Chatzoglou, Sarigiannidis, Vraimaki and Diamantidis (2009) propose a model for determining the intention to use e-learning. This model incorporates three metrics that can be used for determining the intention to use e-learning, namely:

- computer anxiety;
- self-efficacy of learners; and
- the enjoyment of e-learning.

Intention describes one's subjective probability that one will perform some behaviour (Fishbein & Azjen, 1975). When referring to ***enjoyment*** in the field of IS, it can be defined as the extent to which the task of using the technology or system is perceived to be pleasing, regardless of any performance consequences that may be anticipated (Davis, Bagozzi, & Warshaw, 1992). Higher enjoyment of using a system positively influences the intention to use a system (Chatzoglou et al., 2009; Davis et al., 1992). ***Computer anxiety*** describes the obstruction of the intention of one to use a system, due to the anxiety stemming from the use of a computer, which in turn hinders one from being able to complete tasks using a computer (Igbaria & Parasuraman, 1989). When users have computer anxiety, they may experience feelings of uneasiness, apprehensiveness or fear when thinking about current or future use of computers. Due to computers being the essential tool of e-learning, anxiety which stems from the use thereof, would obstruct the intention to use such a system (Chatzoglou et al., 2009). The intention to use e-learning was used as the outcome variable in this study because it has been found to be a reliable predictor of actual technology use (Azjen, 1991; Teo & Zhou, 2014; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). ***Self-efficacy*** relates to the belief in one's capabilities to initiate one's motivation, cognitive resources and courses of action required to meet the demands of a given situation (Filho & Isoni, 2013; Wood & Bandura, 1989). Bandura (1986) further explained that self-efficacy is not associated with the skills one has, but rather with the judgements and belief of what one can do with those skills possessed. Self-efficacy has a negative effect on computer anxiety as the sense of enjoyment of using a system can reduce the anxiety of using computers (Chatzoglou et al., 2009; Yi & Hwang, 2003).

3. Research Methodology

The purpose of this paper is to investigate and report on the intention to use e-learning in a corporate context. The main research question to be answered in this paper is "What is the intention to use e-learning in a corporate context?". An in-depth literature review of studies related to the intention to use e-learning was undertaken. The theoretical model derived by the authors (Figure 2) was based primarily on the model proposed by Chatzoglou et al. (2009). It has been decided to exclude the metrics of learning goal orientation, management support, perceived usefulness and perceived ease of use from the model due to the irrelevance of these metrics to

the case study. The intention to use e-learning can be determined by measuring three metrics, namely: computer anxiety, self-efficacy and enjoyment.

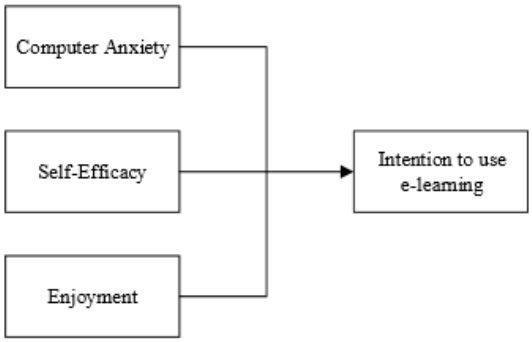

Figure 2: Intention to use e-Learning Model

3.1 Case Study

A case study research strategy was used and this strategy can be described as being about real people and contexts which usually rely on inductive reasoning and highlight the reader's understanding of the phenomenon being focused on in the study (White, Drew, & Hay, 2009; Willis, 2007). Willis (2007) also describes case study research strategies as allowing researchers to gather rich, detailed data in authentic settings. Case study research also enables the understanding of human behaviour to be interpreted in a social context as lived experience and can be done without predetermined hypotheses.

The case study is a South African software development company, specialising in the development of technological solutions for the South African property industry. For purposes of anonymity, the company will be referred to as SysCompSA. The company's vision for e-learning is for it to form an integral part of customers' interaction with their software. Prior to the implementation of e-learning, customers were trained to use the software by means of face-to-face courses. SysCompSA would like to migrate these courses to an e-learning environment in order to reduce costs and to introduce a more effective learning process. Some of the courses are partially available online but usage of these courses is low. One of SysCompSA's goals is therefore to improve the usage of the current e-learning system. In order to do this the intention of customers to use e-learning needs to be investigated so as to devise a strategy to convince employees and customers to move from traditional face-to-face training to using e-learning.

In order to answer the research question a survey was conducted to measure the intention of SysCompSA's customers to use e-learning where the variables of computer anxiety, self-efficacy and enjoyment were measured. The variables of the model were adapted from the study conducted by Chatzoglou et al. (2009) in order to meet the requirements of this study. The e-Learning survey was used to source data using an online survey tool known as Google Forms. The structured survey was distributed electronically to the customers that are using

SysCompSA's software. There were 94 respondents. Of the 94 respondents, 52 respondents answered a section related to intention and 42 respondents answered a section related to the satisfaction of using e-learning, however, satisfaction will not be reported on as it is beyond the scope of this paper. These respondents have varying levels of expertise and familiarity in the field of e-learning in the corporate context. The items in the survey were measured using a variety of techniques including five-point semantic differential scales where there were opposing levels such as *Least preferred* and *Most preferred*.

3.2 Survey Validity

The validity of the survey was established through a survey pre-testing process (Zikmund, 2003). Two academic expert users and three industry expert users were asked to make remarks regarding the research survey instructions and to point out any drawbacks or lack of clarity of the items observed. Academic Expert 1 made comments to ensure that the survey items would produce the results that the study aimed to measure, namely internal validity and to ensure that the survey is aligned with the literature surrounding the problem at hand. Academic Expert 2 was an experienced statistician and assessed the statistical validity of the survey items and suggested a few changes be made to the structural model of the survey. Industry Expert 1 analysed the survey from the perspective of SysCompSA to ensure that the survey was aligned with the brand image and was appropriate to be distributed to their customer base. Industry Experts 2 and 3 analysed the survey from the perspective of the customers of SysCompSA so as to ensure that the customers would complete the survey and all the survey items were clear.

3.3 Profile

A variety of descriptive statistics were calculated based on the five items of Section A of the survey, namely Demographic Information (Table 1). Respondents were classified according to their gender, home language, age, highest level of education and computer experience. The proportion of female respondents in relation to male respondents was notable.

Demographic	Frequency	Percent
Gender:		
Male	0	0
Female	100	100
Home Language:		
Afrikaans	30	58
English	18	35
Xhosa	0	0
Other African	3	6
Other European	1	2
Age:		
18-24	0	0
25-39	33	63
40-49	10	19
50+	9	17

Highest Qualification:		
Some High School	1	2
High School or equivalent	38	73
Vocational/Technical School	9	17
Bachelor's Degree	3	6
Honour's Degree/4-year equivalent	1	2
Master's Degree	0	0
Doctoral Degree	0	0
Computer Experience:		
Novice user	1	2
Intermediate user	24	46
Expert user	27	52

Table 1: Demographic Information (n = 52)

The proportion of female respondents in relation to male respondents is notable. Of the 52 respondents, none of them are male and 100% are female which can be a possible limitation, however, this ratio is representative of the actual customer base of SysCompSA. With regards to home language, the majority of the respondents speak Afrikaans (58%) with English being spoken by 35% of the respondents and 6% of the respondents speak another African language such as Zulu, Pedi or Tswana whilst 2% speak another European language, namely German and there were no Xhosa-speaking respondents.

The majority (63%) of the respondents fall within the 25 to 39 age group and 19% of the respondents are between the ages of 40 and 49. Some of the respondents are over the age of 50 (17%) and 0% of the respondents fall within the 18 to 24 age group. The frequency distribution of the highest level of education obtained by respondents shows that the majority (73%) of respondents have a high school level of education or a qualification of equal standard. Of the 52 respondents, 9 stated that their highest level of education is at vocational or technical school. From this it can be deduced that the majority of respondents do not have tertiary education. The frequency distribution of computer experience shows that 52% of respondents believe that they are expert users and can troubleshoot problems and work without assistance to complete tasks. Of the respondents believing that they have intermediate computer experience, 46% are comfortable to use computers to complete end-user tasks.

4. Results and Discussion

Respondents were asked four questions related to their self-efficacy and were required to rate their responses on a semantic differential scale where 1 indicates *Strongly Disagree* and 5 indicates *Strongly Agree*. The mean ratings can be statistically classified as negative [1 to 3.6), neutral [3.6 to 4.4] or positive (4.4 to 7]. When asked about the degree to which respondents agreed with feeling confident using a computer without assistance, the majority (81%) stated that they strongly agreed whilst 10% were neutral with their response (Table 2). With regards to the respondents' agreement with finding it easy to adapt to new software versions, 62% of

respondents stated that they strongly agree and 19% were neutral with their response. Of the 52 respondents, 67% strongly agreed that when faced with a problem computer-related, they try and solve the problem first before asking for assistance and 19% agreed with the statement. When respondents cannot solve a problem on the first attempt whilst using a computer, 63% strongly agree that they would try again whilst 23% agree that they would try again. All four items of the self-efficacy metric were rated in the positive range. The highest rated item was "I feel confident using a computer without any assistance" ($\mu = 4.75$). The lowest rated item was "I find it easy to adapt to new software versions" ($\mu = 4.33$). From this it can be deduced that the respondents rated their self-efficacy positively.

Item	Mean	Standard Deviation	Strongly Disagree		2nd Option		Neutral		4th Option		Strongly Agree	
	μ	σ	n	%	n	%	n	%	n	%	n	%
I feel confident using a computer without any assistance.	4.75	0.62	0	0%	0	0%	5	10%	3	6%	42	81%
I find it easy to adapt to new software versions.	4.33	1.04	0	0%	4	8%	10	19%	4	8%	32	62%
When faced with a problem whilst using a computer, I try solving it myself before calling for assistance.	4.65	0.65	0	0%	1	2%	2	4%	10	19%	35	67%
If I cannot solve a problem on my first attempt whilst using a computer, I try again.	4.56	0.78	0	0%	3	6%	1	2%	12	23%	33	63%

Table 2: Frequency Distribution: Self-Efficacy Items (n = 52)

Respondents were asked three questions related to their enjoyment of using computers and were required to rate their responses on a semantic differential scale where 1 indicates *Strongly Disagree* and 5 indicates *Strongly Agree*. When asked about the degree to which respondents agreed that using computers to complete daily tasks is pleasant, the majority (87%) stated that they strongly agreed whilst 2% agreed, 2% disagreed and 2% strongly disagreed (Table 3). With regards to the respondents' agreement with having fun solving problems using a computer, 46% of respondents stated they strongly agree and 29% agreed. Of the 52 respondents, 60% strongly agreed that they felt innovative because using a computer allows them to accomplish tasks and 17% were neutral with the statement. The highest rated item was "Using computers to complete daily tasks is pleasant" ($\mu = 4.85$). All three items of enjoyment were rated in the positive range. From this it can be deduced that respondents enjoy using computers which confirms other studies of the enjoyment of computers in a corporate context (Chatzoglou et al., 2009; Davis et al., 1992).

Item	Mean	Standard Deviation	Strongly Disagree		2nd Option		Neutral		4th Option		Strongly Agree	
	μ	σ	n	%	n	%	n	%	n	%	n	%
Using computers to complete daily tasks is pleasant.	4.85	0.70	1	2%	1	2%	0	0%	1	2%	45	87%
I have fun solving problems using a computer.	4.23	0.94	1	2%	2	4%	6	12%	15	29%	24	46%

Because using a computer allows me to accomplish tasks, I feel innovative.	4.38	0.91	0	0%	2	4%	9	17%	6	12%	31	60%

Table 3: Frequency Distribution: Enjoyment Items (n = 52)

Respondents were asked to rate four items related to their computer anxiety and were required to rate their responses on a semantic differential scale where 1 indicates *Strongly Disagree* and 5 indicates *Strongly Agree*. When asked about the degree to which respondents agreed that they hesitate to use a computer for fear of losing work that cannot be recovered, the majority (79%) stated that they strongly disagreed with the statement and 17% disagreed (Table 4). With regards to the respondents' agreement with finding computers intimidating, 87% of respondents stated they strongly disagree and 12% disagreed. Of the 52 respondents, 90% strongly disagreed that they feel fearful of not being able to progress with their work as a result of errors made whilst using a computer and 8% disagreed. With regards to feeling fearful of unfamiliar technology, 77% strongly disagreed and 21% disagreed with the statement. All four items were rated negatively and from this it can be deduced that the respondents did not suffer from computer anxiety.

Item	Mean	Standard Deviation	Strongly Disagree		2nd Option		Neutral		4th Option		Strongly Agree	
	μ	σ	n	%	n	%	n	%	n	%	n	%
I hesitate to use a computer for fear of losing work that cannot be recovered.	1.29	0.70	41	79%	9	17%	1	2%	0	0%	1	2%
Computers are intimidating to me.	1.19	0.63	45	87%	6	12%	0	0%	0	0%	1	2%
I fear that I won't be able to progress with my work as a result of errors made whilst using a computer.	1.12	0.38	47	90%	4	8%	1	2%	1	2%	0	0%
I have a fear of unfamiliar technology.	1.25	0.48	40	77%	11	21%	1	2%	0	0%	0	0%

Table 4: Frequency Distribution: Computer Anxiety Items (n = 52)

Respondents that had not used an e-learning system before were asked four questions related to their intention to use e-learning and were required to rate their responses on a semantic differential scale where 1 indicates *Extremely Unlikely* and 5 indicates *Extremely Likely*. When asked about the degree to which respondents intend to use e-learning for training when it is implemented, the majority (56%) rated it extremely likely and 23% found it likely (Table 5). With regards to the respondents' intention to use e-learning for training in order to improve their performance, 67% rated it extremely likely and 17% were neutral with their response. Of the 52 respondents, 40% rated it extremely likely that they would use e-learning for training on a regular basis and 37% rated it likely. With regards to respondents' intention to use e-learning instead of requesting assistance from facilities such as call centres, live chats or face-to-face training, the results show that the majority (46%) found this extremely likely and 31% found it likely. The highest rated item for intention was "I intend to use e-learning for training on a regular basis" (μ = 4.35). The lowest rated item for intention was "My intention is to use e-

learning instead of requesting assistance (using call centre, live chat, face-to-face training)" (μ = 4.35). All four items for intention were positively rated. From this it can be deduced that the respondents intend to use e-learning in order to become more independent in learning to use software and to be more effective in their professional duties.

Item	Mean	Standard Deviation	Extremely Unlikely		2nd Option		Neutral		4th Option		Extremely Likely	
	μ	σ	n	%	n	%	n	%	n	%	n	%
I intend to use e-learning for training when it will be implemented.	4.27	1.01	2	4%	0	0%	9	17%	12	23%	29	56%
I intend to use e-learning for training in order to improve my performance.	4.35	1.08	2	4%	1	2%	9	17%	5	10%	35	67%
I intend to use e-learning for training on a regular basis.	4.08	1.01	2	4%	1	2%	9	17%	19	37%	21	40%
My intention is to use e-learning instead of requesting assistance (using call centre, live chat, face-to-face training).	4.02	1.23	4	8%	3	6%	5	10%	16	31%	24	46%

Table 5: Frequency Distribution: Intention Items (n = 52)

The overall mean and standard deviation ratings were calculated for the four metrics by obtaining an arithmetic average value based on the items measured (Table 6). Respondents rated their self-efficacy the highest (μ = 4.57) and rated computer anxiety the lowest (μ = 1.21). However since computer anxiety negatively affects the intention to use a system, a negative rating for computer anxiety is a positive result which also confirms the theory investigated (Chatzoglou et al., 2009). A negative computer anxiety result implies that the respondents have a constructive perception about their capabilities concerning the tasks that they have to carry out whilst using a computer. From this it can be deduced that respondents are confident in their ability to use a computer to meet everyday demands and do not fear the use of computers. The overall standard deviation ratings indicate that the data points are far from the mean with regards to the intention to use metric showing a large standard deviation (σ = 1.08). The computer anxiety metric had the lowest standard deviation rating meaning that the data points were close to the mean (σ = 0.55).

Metric	Overall Mean Rating	Overall Standard Deviation
	μ	σ
Self-Efficacy (n = 52)	4.57	0.77
Enjoyment (n = 52)	4.49	0.85
Computer Anxiety (n = 52)	1.21	0.55
Intention (n = 52)	4.18	1.08

Table 6: Overall Mean and Standard Deviation

5. Conclusions and Future Research

This study primarily aimed to report on the intention to use e-learning in a corporate context and the three constructs that can influence the intention to use, namely: enjoyment, self-efficacy and computer anxiety. An in depth literature review was conducted to develop a comprehensive understanding of behavioural intention to use in the field of e-learning and a theoretical model was proposed. The results of a survey of SysCompSA's customer base revealed that respondents had positive levels of self-efficacy, enjoyment and intention to use e-learning. Computer anxiety was rated negatively, which is a positive result since high anxiety can negatively affect intention to use e-learning. It can be deduced from the findings of the survey and the theoretical model that the customers of SysCompSA do intend to use e-learning in order to learn to use the software provided by the company. The research question was answered by establishing that positive levels of self-efficacy and enjoyment as well as negative computer anxiety can contribute to the willingness to use e-learning in the corporate context, based on the results of the case study.

A positive intention to use e-learning can provide SysCompSA the evidence that e-learning is worth investing resources in. The results of this study are in agreement with studies previously conducted (Chatzoglou et al., 2009; Davis et al., 1992), therefore confirming that self-efficacy, enjoyment and computer anxiety as antecedents of intention to use e-learning. The study contributes valuable insights into the intention to use e-learning, specifically in companies, based on users' self-efficacy, enjoyment and computer anxiety. Nonetheless, a longitudinal study using the same sample of participants based on the comparison of the intention to use e-learning and the satisfaction of the use thereof may contribute substantially to the e-learning body of knowledge. Regarding the statistical analysis, correlations can be investigated for future work to test the relationships between the three constructs and intention to use, as well as other constructs that relate to the purpose of the study. Using other case studies, this research could be extended to other contexts in order to broaden the research of e-learning in the corporate context, which is currently lacking.

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Appendix G: IJIKM 2016 Journal Article

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Intention to Use and Satisfaction of e-Learning for Training in the Corporate Context

Maxine Esterhuyse, Brenda Scholtz, and Danie Venter
Nelson Mandela Metropolitan University,
Port Elizabeth, South Africa

Maxine.Esterhuyse@nmmu.ac.za Brenda.Scholtz@nmmu.ac.za
Danie.Venter@nmmu.ac.za

Abstract

Together, the fields of education and information technology have identified the need for an online solution to training. The introduction of e-learning has optimised the learning process, allowing organisations to realise the many advantages that e-learning offers. The importance of user involvement in the success of e-learning makes it imperative that the forces driving intention to use e-learning and satisfaction thereof be determined. The purpose of this paper is to investigate the relationships between the metrics influencing intention to use and the satisfaction of using e-learning in companies.

The results of a survey distributed amongst a South African software development company's customer base revealed that the 94 respondents have positive enjoyment and self-efficacy levels, and low computer anxiety levels. Correlation analysis revealed significant relationships between *enjoyment* and *self-efficacy* and between *enjoyment* and *satisfaction*. Companies should therefore ensure that users enjoy using e-learning as it can directly influence satisfaction and self-efficacy.

Keywords: e-learning, intention, satisfaction, survey, self-efficacy, enjoyment, computer anxiety

Introduction

Corporations functioning in unstable and competitive markets have to acknowledge the importance of human capital so that employees' skill sets can be leveraged to gain competitive advantages that extend into the long-term (Weng, Tsai, & Weng, 2015). The daily tasks of employees working at traditional businesses are generally routine and straightforward, whereas high-tech businesses operate in a dynamic environment characterised by rapid change, uncertainty, and intense competition (Hsia, Chang, & Tseng, 2014). Employees working in such environments are required to learn efficiently and increase productivity in order to solve the complex problems encountered by high-tech businesses. Countless businesses have turned to e-learning in order to train employees so that their knowledge, competencies and skills can be efficiently harnessed.

Due to an acceleration in technological progress and the amalgamation of disciplines such as computer science and education, learning has demanded that an accessible environment providing the necessary educational resources be made available (Ryan, 2016; Shafaei, Nejati, Quazi, & von der Heidt,

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2015; Yanuschik, Pakhomova, & Batbold, 2015). The integration of information and communication technology (ICT) and educational environments has made valuable contributions to the process of learning and the availability thereof (Drigas, Ioannidou, Kokkalia, & Lytras, 2014; Özyurt & Özyurt, 2015; Zhang, Ordóñez de Pablos, & Zhu, 2012). The inception and development of ICT stresses a focus on a user-oriented system because ICT seeks to solve human-related problems (Jeong & Park, 2013; Jiang, Klein, Roan, & Lin, 2001).

e-Learning is the use of ICT to provide information and knowledge resources to learners by relinquishing time and geographic restrictions (Liaw & Huang, 2013). The use of online resources have been blended together with modern education where information, communication, education and training is delivered online and this forms the foundation of e-learning (Chang, 2016). There are numerous benefits that organisations implementing e-learning can realise, such as cost savings, an improvement in the learning process, an increase in access to instructors for learners, accommodation of various learning styles, dynamic course content, and high-quality training that can be structured or unstructured. Applications of e-learning have been noticed in several areas, including primary and higher education and corporate training as well as training for government employees (Pereira, Ramos, Gouvêa, & Da Costa, 2015).

The workplace is progressively starting to realise the potential long-term advantages of implementing e-learning. Based on the literature discussed in this section, five categories of advantages to e-learning were identified, namely cost saving, learning improvement, advantages for the learner, advantages for the instructor, and organisational advantages (Figure 1). As indicated in the proposed e-learning success model (Figure 1), these advantages will occur if e-learning is successful. Cost savings are derived since e-learning can provide cost-effective training for employees and customers, resulting in increasing levels of satisfaction and intention to use (Chang, 2016; Chen, 2010). Within the corporate environment, e-learning has been utilised as a popular approach to training and induction due to its attributes of flexibility, ease of access, just-in-time delivery, low costs, consistency, and customer value (Al-Qahtani, Al-Qahtani, & Al-Miseha, 2013). The advantages of e-learning can be grouped according to cost saving, learning improvement, learner advantages, instructor advantages and organisational advantages (Chang, 2015, 2016; Horton, 2000). Cost savings can be realised with e-learning due to travel, facilities, and supplies becoming superfluous (Figure 1). An improvement in the learning process occurs due to the assistance of e-learning features that can also help to attract learners to be involved in an in-depth learning experience. Learners may benefit from being able to access learning resources at any time, from any location and follow a pace suitable to their specific learning style. Two advantages for instructors are, firstly, that they can facilitate learning from any location because traveling is eliminated and, secondly, they can provide dynamic learning content.

One of the main advantages at an organisational level for e-learning is the improved competencies, skills, and knowledge of employees. An organisation's human capital includes knowledge, skills, relationships, competencies, and creativity present in the workforce (Chang, 2016). Setting aside resources in order to invest in human capital is said to put organisations in a better position to be exposed to long-term advantages. By offering and encouraging training for staff in the corporate environment, businesses can realise advantages such as improvements in employee productivity where tasks are completed efficiently and effectively without errors that may have financial and reputational implications. Another benefit of e-learning involves enhancements in the quality of products and services offered due to the increasing competency, skills, and knowledge levels of research and development, sales, marketing, and operations teams and their ability to ensure that outputs are continuously improved. The final benefit of financing employee competency initiatives noted by Chang (2016) is the design and development of competitive strategies, new products, and services resulting from the increased level of competency and collaboration within the organisation.

Since end-users are considered the key stakeholders in ICT, their attitude towards a system is crucial and should be valued. The focus on end-users is supported by the popularity of the inclusion of user satisfaction as a predictor of information systems' (IS) success (DeLone & McLean, 2003; Melone, 1990; Raymond, 1987) or to anticipate a user's behaviour of system use or intention to use a system (Gelderman, 1998; C. Lin, Wu, & Tsai, 2005; H. Lin & Wang, 2006). The left-hand side of the proposed e-learning success model in Figure 1 is motivated by the arguments from these authors that user satisfaction and intention to use are factors or antecedents of e-learning success.

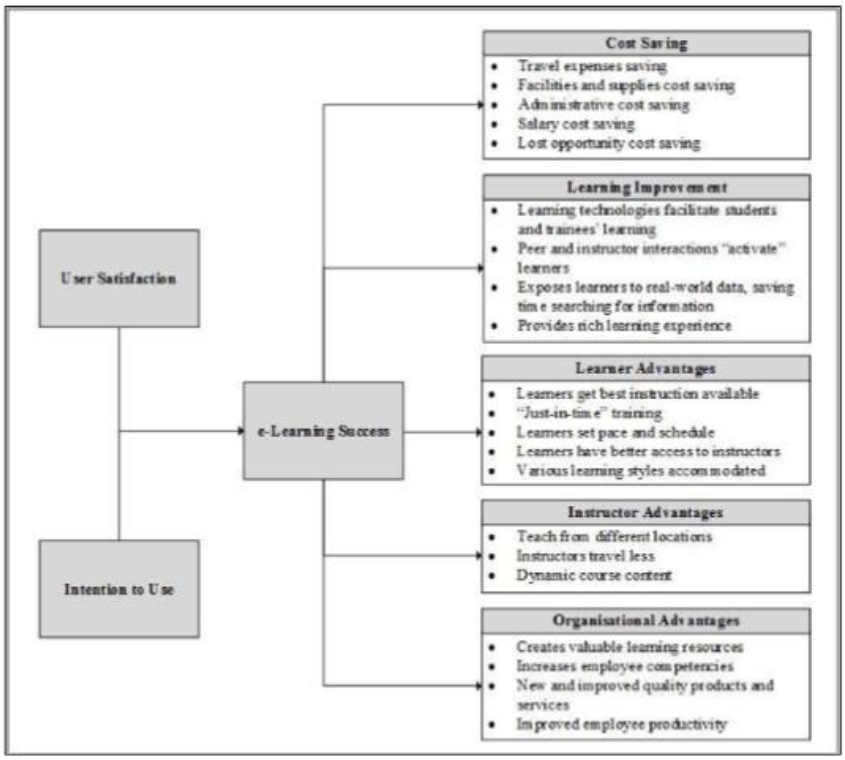

Figure 1. e-Learning Success Model

Because it is complex to prove the return on investment of e-learning, the success of e-learning implementations must be established. e-Learning success can be determined by the behavioural intention to use and user satisfaction thereof (Al-Qahtani et al., 2013; Mohammadi, 2015). Behavioural intention can be defined as an immediate predecessor of usage behaviour and provides an indication of when a user is prepared to execute a particular behaviour (Tarhini, Hone, & Liu, 2013). The measurement of behavioural intention is suggested as effective for predicting actual usage (Chu & Chen, 2016; Tarhini et al., 2013). A number of studies have explored the antecedents of technology adoption intention and have highlighted the attitude of users as a central predictor (Hsiao, 2012; Tarhini et al., 2013; Tosuntas, Karadag, & Orhan, 2015). Chen and Tseng

(2012) found that motivation and self-efficacy both had significant positive effects while computer anxiety had a significant negative effect on the intention towards the usage of e-learning. Whilst some studies refer to *behavioural intention to use* or *behavioural intention*, others refer simply to *intention to use* and this is the term that will be used henceforth in this paper.

User satisfaction can be conceptualised as the cumulative feeling or attitude toward the many factors that affect a given situation and is envisaged as the manifestation of affections gained from an interaction (Shee & Wang, 2008). User satisfaction is completely subjective and is influenced by the interaction of the user with the various system components (Lindgaard & Dudek, 2003). In the IS domain, user satisfaction can be classified as the degree to which users believe that the system in use is conforming to and supporting their requirements (Cyert & March, 1963).

Whilst the success of e-learning initiatives has become one of the most researched topics in prior literature (Alias, Zakariah, Ismail, & Aziz, 2012; Klobas, McGill, & Renzi, 2014; Mohammadi, 2015); most studies that are related to the success of e-learning are conducted in university contexts. There are few articles researching learning satisfaction and learning intention within the corporate space (Wu, Hsieh, & Lu, 2015). The purpose of this paper is to investigate the intention to use e-learning in corporate organisations as well as the satisfaction thereof. The structure of the paper entails the next section exploring the intention to use e-learning and the satisfaction of using such systems. The subsequent section describes the research methodology and is followed by a discussion of the results of the survey. In the last section, several conclusions and recommendations are made for academia and practitioners alike.

Intention to Use e-Learning

The success of e-learning initiatives can be determined by the behavioural intention to use e-learning, which is also referred to as intention to use (Mohammadi, 2015). Companies that want to avoid the under-utilisation of technological resources must focus on implementing effective strategies to encourage continued usage and participation intentions amongst users (Weng et al., 2015). Research involving intention to use emphasises the investigation of the antecedents that increase intended technology usage in the future (Armenteros, Liaw, Fernández, Díaz, & Sánchez, 2013; Cheung & Vogel, 2013; Chu & Chen, 2016). One of many theoretical models developed to study user behaviour is the theory of reasoned action (TRA), and according to the TRA, the immediate determinant of behaviour is the user's intention to perform or not to perform a given behaviour (Fishbein & Azjen, 1975). Technology usage intention can be influenced by user attitude and subjective norms. However, when a given behaviour is performed, it can be limited by a shortage of opportunities, skills, and resources (Cheung & Vogel, 2013). It is for this reason that the TRA was extended using the theory of planned behaviour (TPB) to include an additional variable, namely perceived behavioural control (Azjen, 1991). Perceived behavioural control describes a person's perception of his or her ability to perform a given task and self-efficacy is a component thereof (Cheung & Vogel, 2013). The components of the TPB model, namely attitudes, subjective norms, and perceived behavioural control, collectively explain behavioural intentions and have been commonly used to investigate user behaviour relating to e-learning implementations (Cheung & Vogel, 2013; Chu & Chen, 2016; Tarhini et al., 2013).

Smith and Sivo (2012) suggested that by identifying the metrics that could possibly influence the intention to use e-learning, educational managers, designers, and facilitators could align the development and promotion of such systems to ensure that the metrics are accounted for in strategic planning. A study conducted by Chatzoglou, Sarigiannidis, Vraimaki, and Diamantidis (2009) investigated various metrics that, together, can be combined in the form of a model to determine the intention to use e-learning. Perceived usefulness and perceived ease of use are included in the study by Chatzoglou et al. (2009) and originated from the Technology Acceptance Model (TAM). TAM aims to explain the determinants of computer acceptance and consequently the user behav-

iour across a diverse range of end-user computing technologies and user profiles (Davis, Bagozzi, & Warshaw, 1989). The remainder of the metrics included in the study are learning goal orientation, management support, self-efficacy, enjoyment, computer anxiety, and intention to use (Chatzoglou et al., 2009).

Management support is the perceived level of general support for web-based training provided by top management which includes encouragement and resource support (Igbaria, Zinatelli, Cragg, & Cavaye, 1997). The extent to which a person believes that using a computer would enhance job and task-related performance is referred to as ***perceived usefulness*** (Arbaugh, 2000; Davis, 1989; Davis et al., 1989; Sun, Ke, & Cheng, 2007). The degree to which a person believes that using a computer will necessitate minimum or no effort is referred to as ***perceived ease of use***. ***Learning goal orientation*** is described as the motivation of individuals to improve their level of competence in order to facilitate task performance improvements by focusing on the learning process (Carson, Mosley, & Boyar, 2004; Hwang & Yi, 2002; Printrich, 2000).

Self-efficacy relates to the belief in one's capabilities to initiate one's motivation, cognitive resources, and courses of action required to meet the demands of a given situation (Wood & Bandura, 1989). According to Bandura (1986), self-efficacy is not associated with the skills one has, but rather with the judgements and belief of what one can do with those skills possessed. Bandura (1986) further explains that self-efficacy will determine what actions to take, how much effort to invest, the length of perseverance, and what methods to use in challenging situations. Self-efficacy has been included in more recent models for systems usage as an antecedent of intention (Henry & Stone, 1995; Hwang & Yi, 2003; Venkatesh & Davis, 2000). Venkatesh (2000) proposed self-efficacy and enjoyment as determinants of ease of use, but did not address their interrelationship. Another study by Hwang and Yi (2003) identified the metric of self-efficacy to have a significant effect on enjoyment.

When referring to ***enjoyment*** in the field of IS, it can be defined as the extent to which the task of using the technology or system is perceived as pleasing, regardless of any performance consequences that may be anticipated (Davis, Bagozzi, & Warshaw, 1992). According to Venkatesh and Speier (2000), enjoyment can be considered a type of intrinsic motivation. Intrinsic motivation is the pursuit of an activity due to a genuine interest or positive feelings associated with the activity (Deci, Koestner, & Ryan, 1999). ***Computer anxiety*** describes the hindrance of the intention of one to use a system due to the anxiety originating from the use of a computer, which in turn hinders one from being able to complete tasks using a computer (Igbaria & Parasuraman, 1989). Computer anxiety refers to the subjective response and feelings associated with any direct or indirect contact with a computer (Sievert, Albritton, Roper, & Clayton, 1988). When users have computer anxiety, they may experience feelings of uneasiness, apprehensiveness, or fear when thinking about current or future use of computers. Computer anxiety has been found to impact how people perceive technology (Anderson, 1996; Harrison & Rainer, 1992). Because the intention to use e-learning measures the future subjective probability of usage behaviour, it is necessary to investigate the user satisfaction of e-learning during the current process of using e-learning.

User Satisfaction

In addition to intention to use, user satisfaction has commonly been used as an antecedent to predict system success (DeLone & McLean, 2003; Liaw & Huang, 2013; Melone, 1990; Raymond, 1987). According to Chen (2010), e-learning can be classified as a system. In systems that are highly user-oriented, such as e-learning, users are pivotal to success and therefore their perceptions of the extent to which they are satisfied with using such systems is important (Shee & Wang, 2008). When used in research, satisfaction can be described as the aggregate of a person's perceptions towards the various factors affecting a given situation (Bailey & Pearson, 1983).

When describing user satisfaction relating to human-computer interaction, it is the experience of affections gained from an interaction with a technology, influenced by a variety of components in the interaction (Lindgaard & Dudek, 2003; Mahmood, Burn, Gemoets, & Jacquez, 2000). In the field of IS, user satisfaction is the degree to which users perceive that the system they are using addresses and caters for their requirements (Cyert & March, 1963). Satisfaction can also be explained as the difference between the expected gain or advantage and the actual gain or advantage (Tsai, Yen, Huang, & Huang, 2007). In the corporate context, user satisfaction refers to the positive emotional state of an employee with reference to working circumstances, supervisors, his or her job duties, and the company as a whole (Yeh, 2014). IS researchers have proven that satisfaction is the most important factor in the success of system implementation and can be influenced by factors related to the student, teacher, course design, technology, system design, and the environment (Teo, 2014). Therefore, a higher level of satisfaction towards a system indicates a higher degree of willingness to use it (Liaw & Huang, 2013). A study by Kang and Lee (2010) found the metric of enjoyment to be a noticeable antecedent of user satisfaction. Because computer anxiety is a negative reaction towards computer usage, it can affect users' positive responses such as satisfaction (Kang & Lee, 2010). Companies that thoroughly monitor customer satisfaction can take important precautions to improve their bottom line.

Research Methodology

The objectives of this paper are to explore and report on the satisfaction of using and the usage intention of e-learning in a corporate context. An in-depth literature review of studies related to the usage intention and satisfaction of using e-learning was undertaken. The theoretical model derived is predominantly based on the model derived by Chatzoglou et al. (2009). The model was updated by the findings of the literature review and according to the context of this study. The model proposes that the success of e-learning usage intention and satisfaction can be determined by measuring three metrics: computer anxiety, self-efficacy, and enjoyment.

Participants

In order to report on results within a real-world context, an electronic survey was administrated to participants in an established organisation in the South African property industry. The company specialises in the development of technological solutions in the form of software for the industry in which it operates. For purposes of anonymity, the company will be referred to as PropTechSA. The company's vision for e-learning is for it to form an integral part of customers' interaction with their software, especially first time users and when there are new product or feature releases. Prior to the implementation of e-learning, customers were trained to use the software by means of traditional face-to-face courses. PropTechSA would like to transfer these courses to an online environment, in the form of e-learning, in order to reduce costs and to introduce a more effective learning process that is convenient for customers. Some of the courses are partially available online but usage rates of these courses are low. One of PropTechSA's goals is, therefore, to improve the usage of the current e-learning system. In order to do this, the usage intention and satisfaction of using e-learning needs to be investigated so as to devise a strategy to get employees and customers to move from face-to-face training to e-learning resources. As part of establishing the viability of e-learning as a solution for PropTechSA, a preliminary study was undertaken where a focus group and survey were used to identify the needs and profile of PropTech's customer base. The focus group and survey indicated that there are a number of barriers linked to e-learning faced by PropTechSA's customer base, which include a lack of resources such as Internet speed and a lack of social interaction that may be experienced. However, PropTechSA's customers are open to the idea of e-learning and results indicated that it is an option to explore further.

Research Metrics

Based on the requirements and scope of this study, it was decided that the metrics to be investigated would be adapted from the metrics used in the study by Chatzoglou et al. (2009) and other relevant literature due to the context of the study. In the respondent pool of this study, there were two groups of respondents: those who have never used an e-learning system before and those who have used or are currently using such a system. This study measured the first group's intention to use an e-learning system and the second group's satisfaction with e-learning, a metric that was not included by Chatzoglou et al. (2009) but has been added for the purpose of this study. It was decided to exclude the metrics of management support and learning goal orientation, since these metrics are outside of the scope of this study. The focus of this study is on the user's behaviour, attitude, and intentions towards e-learning. The metrics of perceived usefulness and perceived ease of use were also omitted due to scope constraints. The metrics chosen from the study by Chatzoglou et al. (2009) were based on their applicability to both groups of respondents, namely self-efficacy, enjoyment, and computer anxiety.

Hypothesis Formulation

The main objectives of this study are to determine what the intention to use e-learning and the satisfaction of using e-learning is in companies. However, it was decided that it would be interesting to also investigate the relationships between intention, satisfaction, and the three metrics said to influence the aforementioned: self-efficacy, enjoyment, and computer anxiety. In order to meet the objectives, several hypotheses were formulated by following a similar method to Chatzoglou et al. (2009) who undertook a study measuring the intention of employees to accept web-based training.

The hypotheses were identified based on the theory concerning computer anxiety, self-efficacy, enjoyment, intention, and satisfaction of e-learning and were tested at the 95% significance level ($\alpha = 0.05$). A model of the hypotheses is depicted (Figure 2). The following hypotheses were proposed:

$H_{1.1}$: Computer anxiety has a negative effect on intention.
$H_{1.2}$: Self-efficacy has a positive effect on intention.
$H_{1.3}$: Enjoyment has a positive effect on intention.

$H_{1.4}$: Enjoyment and computer anxiety are negatively correlated.
$H_{1.5}$: Self-efficacy and computer anxiety are negatively correlated.
$H_{1.6}$: Enjoyment and self-efficacy are positively correlated.

$H_{1.7}$: Computer anxiety has a negative effect on satisfaction.
$H_{1.8}$: Self-efficacy has a positive effect on satisfaction.
$H_{1.9}$: Enjoyment has a positive effect on satisfaction.

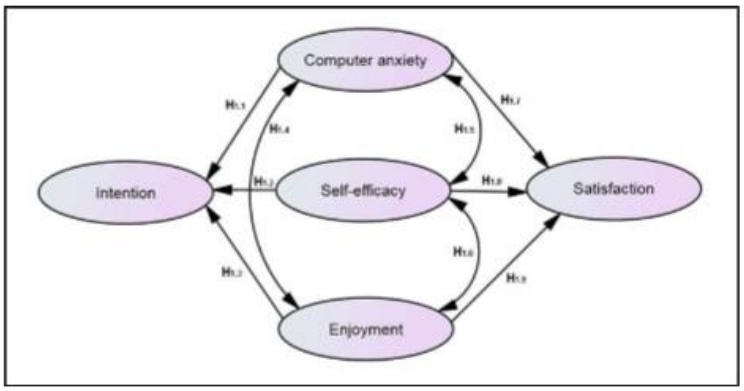

Figure 2. Model for e-Learning Success

Research Materials

In order to achieve the proposed research objectives, a survey was conducted to measure the usage intention and satisfaction of using e-learning as well as respondents' computer anxiety, self-efficacy, and enjoyment (Appendix). The survey was conducted using an online survey tool, namely Google Forms, where results are captured in a spreadsheet. The survey measured five constructs and the questionnaire is divided into three sections (Figure 3). It was obligatory for all respondents to answer Sections A and B but respondents would only have to answer Section C: Intention or Section D: Satisfaction, depending on whether they have used an e-learning before. The items in the questionnaire used to measure the intended metrics had five-point semantic differential scales where there were opposing levels such as Least preferred and Most preferred.

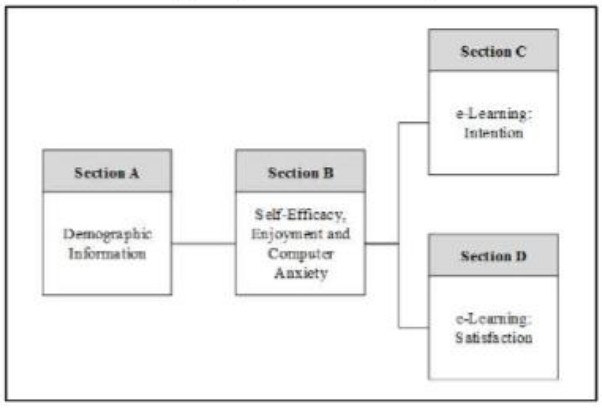

Figure 3. e-Learning Questionnaire Structure

The quality of the survey questions was established by undergoing a pre-testing process (Zikmund, 2003). Two academic expert users and three industry expert users were asked to make

remarks regarding the research survey instructions and to indicate any issues or lack of clarity of the questionnaire items.

Profile

Section A of the questionnaire enabled descriptive statistics to be calculated in the form of demographic information (Table 1). Respondents were classified according to their gender, home language, age, highest qualification obtained, and computer experience.

Table 1. Demographic Information (n = 94)

Demographic Information		Frequency (n)	Percentage (%)
Gender	Male	2	2
	Female	92	98
Home Language	Afrikaans	50	53
	English	37	39
	Xhosa	0	0
	Other African	6	6
	Other European	1	1
Age	18-24	1	1
	25-39	57	61
	40-49	23	24
	50+	13	14
Highest Qualification	Some High School	2	2
	High School or equivalent	64	68
	Vocational/Technical School	12	13
	Bachelor's Degree	8	9
	Honour's Degree *or* 4-year equivalent	6	6
Computer Experience	Novice user	2	2
	Intermediate user	41	44
	Expert user	51	54

The proportion of female respondents in relation to male respondents is notable. A total of two males (2%) and 92 females (98%) participated in the study, which may appear to be a possible limitation, however, this ratio is representative of the actual customer base of PropTechSA. The majority of the respondents speak Afrikaans (53%), are between 25 and 39 years of age (61%), have a high school or equivalent level of education (68%), and believe that they are expert computer users (54%) who can troubleshoot problems and work without assistance to complete tasks.

Results and Discussion

Cronbach's alpha statistics were used to establish the reliability, related to internal consistency, of the responses to the questionnaire. The observed quantitative data were analysed to reveal significant relationships between the metrics investigated. When reporting these results, they will be compared with the literature review findings.

Validity and Reliability of Data

The reliability (internal consistency) of the data obtained from the quantitative feedback was measured using Cronbach's alpha. The Cronbach's alpha coefficients for the five metrics investi-

gated varied between 0.61 and 0.92 (Table 2). Self-efficacy and enjoyment were the only metrics scoring below the commonly acceptable value of 0.70, however, some authors argue that a Cronbach's alpha value between 0.60 and 0.70 is acceptable for exploratory research (Gravetter & Wallnau, 2009). Consequently, the scores derived from the responses to the questionnaire can be considered as fairly reliable.

Table 2. Cronbach's alpha coefficients – all metrics

Metric	n	Cronbach's α
Self-Efficacy	94	0.64
Enjoyment	94	0.61
Computer Anxiety	94	0.76
Intention	52	0.92
Satisfaction	42	0.89

Results

The structured survey was distributed electronically to the customers who are using PropTech-SA's software. Of the 94 respondents, 52 respondents answered a section related to intention to use and 42 respondents answered a section related to the satisfaction of using e-learning, based on whether or not an e-learning system had been used previously. The respondents had varying levels of expertise and familiarity in the field of e-learning in the corporate context. Each metric measured by the survey was calculated as the average of the responses to the relevant set of items in the questionnaire using a semantic differential response scale of 1 to 5. The results for each scale item revealed the respondents' perception of the five metrics measured (Table 3). Metric scores were classified according to the ranges depicted in the column headings of the frequency distributions for the metrics where square brackets indicate inclusion in the relevant interval and parentheses depict exclusion.

Table 3. Frequency distributions - all metrics

	Very Negative [1.00 to 1.80)		Negative [1.80 to 2.60)		Neutral [2.60 to 3.40]		Positive (3.40 to 4.20]		Very Positive (4.20 to 5.00]	
Self-Efficacy	0	0%	0	0%	8	9%	9	10%	77	82%
Enjoyment	0	0%	2	2%	4	4%	21	22%	67	71%
Computer Anxiety	87	93%	6	6%	0	0%	1	1%	0	0%
Intention	2	4%	2	4%	5	10%	11	21%	32	62%
Satisfaction	0	0%	0	0%	8	19%	2	5%	32	76%

More than 60% of the respondents rated four of the five metrics (self-efficacy, enjoyment, intention, and satisfaction) as Very Positive. Self-efficacy had the highest incidence of very positive ratings (82%). Computer anxiety was rated very negatively by the largest portion of respondents (93%) which is a positive result because a negative computer anxiety result implies that the respondents have a constructive perception regarding their capabilities concerning the tasks that they carry out using a computer. From this it can be deduced that respondents are confident in their ability to use a computer to meet everyday demands and do not fear the use of computers.

Measures of central tendency, namely mean, and dispersion, namely standard deviation, were calculated for the five metrics measured in this study (Table 4). The overall mean ratings show that respondents rated their self-efficacy the highest (M = 4.58), a very positive score, and com-

puter anxiety the lowest (M = 1.19) a very negative score. Since computer anxiety may negatively affect the intention to use a system, a negative rating for computer anxiety is a positive result which is a similar result to that obtained by Chatzoglou et al. (2009) where computer anxiety also obtained a negative rating. Satisfaction (M = 4.52) and Enjoyment (M = 4.50) obtained very positive mean scores and Intention (M = 4.18) a positive mean score.

Table 4. Overall Mean and Standard Deviation

Metric		Overall Mean Rating	Overall Standard Deviation
	n	M	S
Self-Efficacy	94	4.58	0.82
Enjoyment	94	4.50	0.88
Computer Anxiety	94	1.19	0.58
Intention	52	4.18	1.08
Satisfaction	42	4.52	0.87

Correlations between the metrics are reflected in Table 5. Correlations are deemed significant if they are both statistically and practically significant. Statistical significance depends on the significance level and sample size, for example, for a 0.05 significance level and sample size n = 94 (number of respondents for this study), the absolute value of a correlation's coefficient must be greater than 0.203 to be statistically significant, whilst correlations greater than 0.300 are deemed practically significant (Gravetter & Wallnau, 2009). In Table 5, significant correlations between the metrics are indicated as bold red and italics while correlations that are statistically but not practically significant are depicted as plain red.

Table 5. Pearson Product Moment Correlations - all metrics

	Self-Efficacy	Enjoyment	Computer Anxiety	Intention	Satisfaction
Self-Efficacy	-	***0.505***	-0.267	0.178	0.284
Enjoyment	***0.505***	-	-0.240	0.209	***0.338***
Computer Anxiety	-0.267	-0.240	-	-0.164	-0.005
Intention	0.178	0.209	-0.164	-	-
Satisfaction	0.284	***0.338***	-0.005	-	-

Two significant relationships were identified: between *enjoyment* and *self-efficacy (r = 0.505)* and between enjoyment and *satisfaction (r = 0.338)*.A number of relationships were identified as statistically significant but not practically significant and these were:

- Self-efficacy and computer anxiety (r = -0.267);
- Self-efficacy and satisfaction (r = 0.284);
- Enjoyment and computer anxiety (r = -0.240); and
- Enjoyment and intention (r = 0.209).

Hypotheses regarding the relationships between enjoyment and self-efficacy ($H_{1\,6}$) and between enjoyment and satisfaction ($H_{1\,9}$) are supported by the results of the statistical analysis and thus are accepted (Table 6). The strongest direct relationship was between enjoyment and self-efficacy (r = 0.505) and this confirms that an interesting and fulfilling training program may lead trainees

to establish new initiatives, to overcome complex job-related problems, and to improve their self-esteem related to their jobs, which has been confirmed in earlier studies (Chatzoglou et al., 2009; Hwang & Yi, 2003). The second strongest direct relationship was between enjoyment and satisfaction (r = 0.338). From this it can be deduced that trainees use e-learning because they believe that the training process is interesting, helpful, and enjoyable, and because of this trainees are pleased to use it. Alternatively, if trainees think that e-learning will be boring and of no real value for the trainee, they will not be enthusiastic and motivated enough to participate in the training process. This result is consistent with the relationship established by Kang and Lee (2010) between enjoyment and satisfaction. The remaining seven hypotheses originally proposed are not accepted since the relevant correlations are not significant. In summary, by considering the results of the Pearson Product Moment correlations, the following statement can be made:

"$H_{1.6}$ and $H_{1.9}$ are accepted as there is a significant relationship between enjoyment and self-efficacy and between enjoyment and satisfaction."

Table 6. Hypothesis testing results

Hypothesis	Relationship	Remarks
$H_{1.1}$	Computer anxiety → intention (-)	Not accepted
$H_{1.2}$	Self-efficacy → intention (+)	Not accepted
$H_{1.3}$	Enjoyment → intention (+)	Not accepted
$H_{1.4}$	Enjoyment ↔ computer anxiety (-)	Not accepted
$H_{1.5}$	Self-efficacy ↔ computer anxiety (-)	Not accepted
$H_{1.6}$	Enjoyment ↔ self-efficacy (+)	Accepted
$H_{1.7}$	Computer anxiety → satisfaction (-)	Not accepted
$H_{1.8}$	Self-efficacy → satisfaction (+)	Not accepted
$H_{1.9}$	Enjoyment → satisfaction (+)	Accepted

Conclusions and Recommendations

This study aimed to investigate and report on the intention and satisfaction of using e-learning from a corporate perspective. An in-depth literature review was conducted to develop an understanding of intention and satisfaction in the field of e-learning and a theoretical model was proposed, based on an adaptation of the model by Chatzoglou et al. (2009) and other literature. The model proposed three prominent antecedents that can influence the intention and satisfaction of e-learning, namely enjoyment, self-efficacy, and computer anxiety. The results of a survey of PropTechSA's customer base identified positive levels of self-efficacy, enjoyment, satisfaction, and intention to use amongst the respondents. The positive results for enjoyment and self-efficacy as well as the negative result for computer anxiety correlate with literature (Chatzoglou et al., 2009; Davis et al., 1992). Computer anxiety was rated negatively, which is a positive result since high anxiety can negatively affect intention to use e-learning. Therefore, if trainees have high computer anxiety levels, they are not confident to use computers for the training program and could exert little effort into the training process. Based on the positive mean score for intention to use e-learning observed in this study it can be deduced that the customers of PropTechSA do intend to use e-learning in order to learn to use the software provided by the company. It is also evident from the observed positive mean satisfaction score that the respondents currently using e-learning for training are satisfied with their experience thus far because of their positive emotional state due to the ability of e-learning to meet their learning requirements (Cheok & Wong, 2015; Yeh, 2014).

This study has identified important metrics that can be used by companies to determine the potential success of e-learning initiatives and prioritised in online training strategies in order to ensure

trainee satisfaction and intended future usage. Positive intention to use and satisfaction levels can provide PropTechSA the evidence that e-learning is worth investing resources in so that the chance of benefiting from the many advantages e-learning offers (Figure 1) is higher. Enjoyment was found to play an important role in the establishment of user satisfaction and self-efficacy. This finding is perhaps the most important managerial lesson to be learned from this study for practitioners because, nowadays, managers tend to believe that the importance of pleasure derived from system usage diminishes as the system matures and user tasks become mundane. It is important therefore that the metrics of enjoyment, self-efficacy, and satisfaction are considered in the strategic plans for e-learning in organisations.

Whilst the literature motivated the nine hypotheses, only two of these (enjoyment → self-efficacy and enjoyment → satisfaction) were supported and not the others. The analysis of the results revealed that there were no significant relationships between the three antecedents (computer anxiety, self-efficacy, and enjoyment) and intention. These results contradict the studies of Chen and Tseng (2012) and Kang and Lee (2010) who found that anxiety had a negative effect on intention. It also contradicts the study of Hwang and Yin (2003) who found that a user's self-efficacy had an impact on intention to use a web-based system. Lastly, the results are contrary to the findings of Kang and Lee (2010), who found that computer anxiety can negative impact users' positive responses such as satisfaction.

It is not clearly evident at first why the findings contradicted the literature, thereby resulting in seven of the nine hypotheses not being accepted. However, the contradiction could be due to the particular context in which the respondent customers work. As identified by Yeh (2014), the working circumstances, supervisors, and tasks of the users could play a role in e-learning satisfaction. Factors related to working conditions were not considered in this study and is possibly a limitation. Another reason could be because of the type of software investigated, or due to the fact that the respondents were a mixed sample of users which included some that had used e-learning before and others who hadn't. The experience of the user with e-learning systems and other related systems could also influence the results. Future research could conduct a longitudinal study with a broader profile of users and possibly consider more factors. The investigation of a larger sample of metrics could improve the hypothesis testing results. A larger sample will allow more sophisticated statistical analysis to be conducted. This research could be extended to other contexts such as companies operating in construction, manufacturing, banks, or companies in different countries in order to broaden the research of e-learning in the corporate context, which is currently lacking.

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Appendix

Survey Items

Self-Efficacy

1 = Extremely Disagree *to* 5 = Extremely Agree (for all 4 items)

SE1 I feel confident using a computer without any assistance.

SE2 I find it easy to adapt to new software versions.

SE3 When faced with a problem whilst using a computer, I try solving it myself before calling for assistance.

SE4 If I cannot solve a problem on my first attempt whilst using a computer, I try again.

Enjoyment

1 = Extremely Disagree *to* 5 = Extremely Agree (for all 3 items)

ENJ1 Using computers to complete daily tasks is pleasant.

ENJ2 I have fun solving problems using a computer.

ENJ3 Because using a computer allows me to accomplish tasks, I feel innovative.

Computer Anxiety

1 = Extremely Disagree *to* 5 = Extremely Agree (for all 4 items)

CA1 I hesitate to use a computer for fear of losing work that cannot be recovered.

CA2 Computers are intimidating to me.

CA3 I fear that I won't be able to progress with my work as a result of errors made whilst using a computer.

CA4 I have a fear of unfamiliar technology.

Intention

1 = Extremely Unlikely *to* 5 = Extremely Likely (for all 4 items)

INT1 I intend to use e-learning for training when it will be implemented.

INT2 I intend to use e-learning for training in order to improve my performance.

INT3 I intend to use e-learning for training on a regular basis.

INT4 My intention is to use e-learning instead of requesting assistance (using call centre, live chat, face-to-face training).

Satisfaction

1 = Extremely Disagree *to* 5 = Extremely Agree (for all 5 items)

SA1 I achieved my learning goals using e-learning.

SA2 Using e-learning helped me to improve my performance.

SA3 I was satisfied with using e-learning for training.

SA4 I would use e-learning for training on a regular basis.

SA5 I would recommend using e-learning for training to my colleagues.

Biographies

Maxine Esterhuyse is currently pursuing her Masters degree in Information Systems and Computer Science at the Nelson Mandela Metropolitan University (NMMU) in Port Elizabeth, South Africa. Maxine works as a junior lecturer for business information systems at the university. She manages an e-learning project for the university and is currently involved in end-user software training that takes place in a face-to-face setting. Her research interests are e-learning, enterprise systems, human-computer interaction and business intelligence. Maxine has a number of research papers published on the subject of e-learning. Several of her conference papers were presented at conferences affiliated with the Association for Information Systems (AIS).

Brenda Scholtz (Ph.D.) is Head of Department for Computing Sciences at the Nelson Mandela Metropolitan University (NMMU) in Port Elizabeth. Brenda has worked in the IT industry for over 15 years as programmer, systems analyst, consultant and IT manager. She was awarded her PhD in ERP skills and education in 2012. Her research interests are in the broad field of Information Systems, more specifically related to business process management, enterprise systems, business intelligence, enterprise architectures and environmental information systems. Brenda is currently serving as project manager for several industry research collaboration programmes between South Africa and Germany. Brenda is also a member of the Institute of Information Technology Professionals South Africa (IITPSA), the Association for Information Systems (AIS) as well as the Business Architecture Guild. Brenda has published over 48 papers in international journals and conferences.

Danie Venter obtained his BSc from UNISA and his BSc Hons, MSc and PhD (2014) degrees from the Nelson Mandela Metropolitan University (NMMU), the first two degrees in Computer Science and the last two in Statistics. He has been a quantitative research consultant in the NMMU Unit for Statistical Consultation and a similar entity in its predecessor the University of Port Elizabeth (UPE) since 1990. He was the director of these entities until the end of 2015 when he reached retirement age. Since then he has been reappointed on a contract basis.

He has collaborated with colleagues in various NMMU/UPE faculties and researchers at other universities in numerous quantitative research projects, with more than 100 articles in accredited journals and many presentations at local and international conferences. He has assisted a large number of Master's and Doctoral students (more than a 1000) during all stages of their quantitative research projects, in more than 60 instances formally in a supervisory capacity. He has also been involved as the main statistical consultant in numerous research projects in the private sector. His main research areas are industrial psychology, business management, computer science, human movement and other health sciences. His fields of expertise include: the measurement of latent variables (e.g. job satisfaction, health risks); questionnaire development; forecasting; effect size; the development of data processing and analysis applications in VBA on an Excel platform.

Appendix H: The e-Learning Survey

e-Learning Survey

Masters Research Project Title: A Best Practice Environment for e-Learning in the Corporate Context

Author: Maxine Pier Esterhuyse (email: Maxine.Esterhuyse@nmmu.ac.za)

Information and Informed Consent: You have been selected and are invited to participate in a research study for a Masters project being conducted by Maxine Pier Esterhuyse. The aim of the study is to investigate the intention to use e-learning and the satisfaction of the use of e-learning systems. The responses to the study will assist the researcher in analysing the adoption of e-learning and best practices in the corporate environment. The results of this study may be obtained by contacting the researcher directly via email. Your participation in this study by completing the following questionnaire would be greatly appreciated. However, if at any time you feel uncomfortable, you may withdraw from the study by simply closing the questionnaire in your web browser. Your identity will remain confidential at all times and your participation is completely voluntary. You will remain anonymous throughout the duration of this study.

Declaration by participant

I, the participant, was invited to participate in the above-mentioned research project that is being undertaken by Maxine Pier Esterhuyse from the Department of Computing Sciences of the Nelson Mandela Metropolitan University and am aware of the terms of participating *

- ○ Agree
- ○ Disagree

PRP Initial

e-Learning Survey

* Required

E-learning can be defined as the process of learning conducted via electronic media, typically on the internet.

Section A

Demographic Information

1. Gender *

- Male
- Female

2. Home Language *

- Afrikaans
- English
- Xhosa
- Other: _____

3. Age *

- 18 - 24
- 25 - 39
- 40 - 49
- 50 +

4. Highest level of education *

- Some High School (no National Senior Certificate)
- High School or equivalent
- Vocational/Technical School
- Bachelor's Degree
- Honours Degree/4-year equivalent
- Master's Degree
- Doctoral Degree

5. Which of the following best describes your computer experience? *

- Novice user – I can perform basic tasks using a computer, but don't use them regularly
- Intermediate user – I am comfortable using a computer and can use many end-user commands
- Expert user – I am able to successfully troubleshoot problems and work independently to accomplish tasks

PRP Initial

e-Learning Survey

* Required

Section B

The use of Computer Devices and Applications

1. Which of the following devices do you own? *

You can select more than one option.

- Smartphone
- Tablet
- Laptop
- Personal Desktop Computer
- Work Desktop Computer
- Other: _____

2. Of the devices selected in the question above, which devices do you use to connect to social media websites? *

You can select more than one option.

- I don't use social media
- Smartphone
- Tablet
- Laptop
- Personal Computer
- Work Computer
- Other: _____

3. I use the following social media websites: *

	Very Seldom or Never (Less than once a month)	Seldom (Once or twice a month)	Occasionally (Once a week or more)	Frequently (Every day)	Always (Numerous times a day)
3.1. Facebook	o	o	o	o	o
3.2. Twitter	o	o	o	o	o
3.3. Instagram	o	o	o	o	o
3.4. YouTube	o	o	o	o	o
3.5. LinkedIn	o	o	o	o	o

PRP Initial

3.6. If there are any social media websites that you use other than those listed above, please specify:

_____

4. Using an e-learning platform would appeal to me. *

	1	2	3	4	5	
Strongly Disagree	o	o	o	o	o	Strongly Agree

5. How much time, on average, per week would you be able to dedicate to e-learning? *

- Less than 1 hour
- 1 - 2 hours
- More than 2 hours

6. Preference of online training material: *

	Least preferred				Most preferred
6.1. PDF documents (step-by-step instructions)	o	o	o	o	o
6.2. Interactive tutorials (learner involvement in self-paced demonstration of task)	o	o	o	o	o
6.3. Video (visual recording of task)	o	o	o	o	o

7. Can you view online videos at your place of work (e.g. YouTube)? *

- Yes
- No

8. Do you have access to sound on your computer at work? This may be via the use of earphones or speakers. *

- Yes
- No

PRP Initial

9. How would you rate the following barriers to e-learning? *

	Not a barrier	Somewhat of a barrier	Moderate barrier	Extreme barrier
9.1. Unreliable electricity supply	o	o	o	o
9.2. Computer ownership and availability	o	o	o	o
9.3. Internet access and speed	o	o	o	o
9.4. Computer competency of learner	o	o	o	o
9.5. Face-to-face training preference	o	o	o	o
9.6. Privacy of personal information	o	o	o	o
9.7. Security of personal information	o	o	o	o
9.8. Feeling isolated	o	o	o	o

9.8. If you experience any barriers to e-learning other than those listed above, please specify:

_____

10. Have you used a webinar (a seminar or demonstration conducted via the internet) before? *

- o Yes
- o No

PRP Initial

e-Learning Survey

* Required

11. Based on your webinar experience, how likely are you to be willing to participate in a webinar again? *

	1	2	3	4	5	
Unlikely	O	O	O	O	O	Very Likely

12. I prefer webinars to face-to-face training. *

	1	2	3	4	5	
Strongly Disagree	O	O	O	O	O	Strongly Agree

PRP Initial

e-Learning Survey

* Required

Section C

Self-Efficacy, Enjoyment and Computer Anxiety

1. Self-Efficacy

Please indicate the extent to which you agree with the following statements: *

	Strongly Disagree				Strongly Agree
1.1. I feel confident using a computer without any assistance.	o	o	o	o	o
1.2. I find it easy to adapt to new software versions.	o	o	o	o	o
1.3. When faced with a problem whilst using a computer, I try solving it myself before calling for assistance.	o	o	o	o	o
1.4. If I cannot solve a problem on my first attempt whilst using a computer, I try again.	o	o	o	o	o

PRP Initial

2. Enjoyment

Please indicate the extent to which you agree with the following statements: *

	Strongly Disagree				Strongly Agree
2.1. Using computers to complete daily tasks is pleasant.	o	o	o	o	o
2.2. This statement is to test the validity of responses. Please select "Strongly Disagree".	o	o	o	o	o
2.3. I have fun solving problems using a computer.	o	o	o	o	o
2.4. Because using a computer allows me to accomplish tasks, I feel innovative.	o	o	o	o	o

3. Computer Anxiety

Please indicate the extent to which you agree with the following statements: *

	Strongly Disagree				Strongly Agree
3.1. I hesitate to use a computer for fear of losing work that cannot be recovered.	o	o	o	o	o
3.2. Computers are intimidating to me.	o	o	o	o	o
3.3. I fear that I won't be able to progress with my work as a result of errors made whilst using a computer.	o	o	o	o	o
3.4. I have a fear of unfamiliar technology.	o	o	o	o	o

PRP Initial

e-Learning Survey

* Required

Section D

Previous Experience with Face-to-Face Training

1. Have you ever attended a face-to-face training course? *

Face-to-face training is the traditional method of teaching where a trainer conducts sessions in the physical presence of trainees.

- o Yes
- o No

(Move to Question 3 if you answered "No" to Question 1)

2. Please indicate the extent to which you agree with the following statements with regards to your MOST RECENT face-to-face training experience:

	Strongly Disagree				Strongly Disagree
2.1. I liked interacting with fellow course attendees.	o	o	o	o	o
2.2. I liked the training because of the free meal I received.	o	o	o	o	o
2.3. The certificate of attendance that I received is important to me.	o	o	o	o	o
2.4. If I received a certificate of competence based on a mark I received for assessments, it would be important to me.	o	o	o	o	o
2.5. I enjoyed the training because it gives me the	o	o	o	o	o

PRP Initial

	Strongly Disagree					Strongly Disagree
opportunity to improve my skills.						

3. Have you used an e-learning system before? *

- Yes
- No

PRP Initial

e-Learning Survey

* Required

Section E

e-Learning

1. Satisfaction *

With regards to your e-learning experience to date, please indicate the extent to which you agree with the following statements related to your satisfaction with using e-learning for training:

	Strongly Disagree				Strongly Agree
1.1. I achieved my learning goals using e-learning.	o	o	o	o	o
1.2. Using e-learning helped me to improve my performance.	o	o	o	o	o
1.3. I was satisfied with using e-learning for training.	o	o	o	o	o
1.4. I would use e-learning for training on a regular basis.	o	o	o	o	o
1.5. I would recommend using e-learning for training to my colleagues.	o	o	o	o	o

Thank you for your participation

PRP Initial

e-Learning Survey

* Required

Section E

e-Learning

1. Intention *

Please indicate the extent to which you agree with the following statements related to your intention to use e-learning for training:

	Strongly Disagree				Strongly Agree
1.1. I intend to use e-learning for training when it will be implemented.	o	o	o	o	o
1.2. I intend to use e-learning for training in order to improve my performance.	o	o	o	o	o
1.3. I intend to use e-learning for training on a regular basis.	o	o	o	o	o
1.4. My intention is to use e-learning instead of other forms of assistance (e.g. call centre, live chat, face-to-face training).	o	o	o	o	o

Thank you for your participation

PRP Initial

Appendix I: Survey Results Report for Korbitec

Due to the size of this report, it has been excluded from the printed document and can be found on the CD that accompanies this project.

Appendix J: Iteration 1 Questionnaire

Module 1 Interactive Tutorial Evaluation

What did you think of the interactive tutorials of Module 1 related to:

1. Visual appeal?

2. Time suitability?

3. Corporate suitability (related to Korbitec and to the customer base)?

4. Consistency of content?

5. Ability for content to encourage active learning?

Active learning relates to the ability for the content to engage learners.

6. Accuracy of content?

7. Appropriate assessment mechanisms?

The assessment needs determine whether learners are competent in the task at hand.

Submit

Never submit passwords through Google Forms.

Appendix K: Iteration 4 Qualitative Data

Subject Matter/Grammar Expert Feedback
Unit 1: Show Me
Slide 1: • Electronic Transfer Instruction (caps?)
Slide 2 • Module 1 include 3 Units. • The blue box highlighting the Show Me info disappears after a while (not sure if this is intended?)
Slide 3 • Title: Methods to Open a Transfer File • Electronic Transfer Instruction
Slide 4 • Title: Opening a New Transfer • In the text box, there should be a small paragraph break between paragraphs • The quotation marks (at the front) seem to face the wrong way – is this just a program styling thing? • Typically, in training materials, button/field/dialogue names are written in bold – should this not continue through to this material? (**New Matter** instead of "New Matter")
Slide 5 • Title is quite vague – the whole tutorial is about transfers so a title of "Transfers" seems a little unclear as to where we are in the tutorial. Should it be "Manual Transfers"? • Field names in bold? • Portion Number (capital N) • The blue box around Validate and the end of the text with validate written as a button name (…and click to **Validate**) made me think I had to click the button, but that didn't do anything. Consider revising the text slightly.
Slide 6 • From this slide, the "Back" button doesn't seem to work • Paragraph spacing in the second textbox needs updating (or remove paragraphs) • Phrasing: "and you will be able to capture the necessary data"
Slide 7 • Opening an Electronic Transfer Instruction (ETI)
Slide 8 • Again, the blue box around Close and the instruction regarding the **Close** button made me think I should click the button
Slide 10 • Paragraph spacing in text box. • File reference, Our reference and Branch (capitalisations) – "fields" should not be in bold.
Slide 11 • Bolding of field names (and Portion Number – capitalisation) • Same comment as before about the instruction (the way it's worded) and blue block
Slide 13 • Connecting to an Existing Matter (connecting rather than connect to keep structure of headings consistent) – this goes for all the slides that follow in this section
Slide 15 • **Confirm and search** or **Search and import** (capitalisations to match the buttons themselves)
Slide 16 • To launch a search, select… (comma) • From the **New Transfer** dialogue (name of the dialogue should match what appears at the top of the window)
Slide 18 • Formatting of the text box is different • "these notifications can be disabled by ticking the checkbox." (wording change)
Slide 21 • **Transfer Details** screen (bolding)
Closing Slide • Remove full stop from the title (Opening a New Transfer File) • Can you add a little space before the first line in the white section – it looks a little cramped

• Remove the comma after the email address (not necessary there and the grey is a bit jarring there)
Unit 2: Try Me
Slide 1 • Click **Next** to continue (bold)
Slide 2 • For some reason, I was looking for the "submit" button on the New Transfer screen. I think it might be clearer to make the navigation button say "Next" as on other slides so that the user is clear where to look for the button.
Slide 3 • The formatting of these instructions should be consistent so it is clear what to fill in and where. E.g.: • Task: Capture the detail in the highlighted fields. • File Reference: Try Me 001 Transfers • Township: Pretoria (although you type…) • Erf Number: 89 • Click Validate and then Confirm and search on the New Transfer window that pops up. • (the button names were bolded incorrectly, and I think the instruction could be clearer as the Confirm and search button only appears once Validate has been clicked.
Slide 5 • The **SEARCH CONFIRMATION** dialogue box…. Incurs a cost. This message can be disabled for future matters by selecting the checkbox. • (bolding and wording suggestion) • Click Search to find the property…. (bolding)
Slide 6 • Click **Back to Matter** to… (bolding and remove quotation marks)
Slide 7 • …into the matter from the search you just performed. (bolding/caps and wording
Slide 8 • …to view your search results. (bolding and caps)
Closing Slide • Remove comma after email address.
Unit 3: Test Me
You can't seem to go back to previous questions – is this correct?
Slide 1 • In the first 2 units, the relevant bullet point was highlighted with a blue box and the same should be done here.
Question 1 • …and ETIs are imported via… (I think the "are" was missing, but I'm not 100% sure of the intention here)
Question 2 • Select Transfer from the **New Matter** button • Capture the File Reference and Branch details in the **New Matter** menu • Validate the property after capturing the **Deeds Office**, **Property Type**, **Township**, **Erf Number** and **Portion Number** details • Perform a Deeds Office search to populate the Transfer Details information • (bolding relevant to each drop-down menu, also, I would recommend having the font size the same even if it means all statements are made smaller to accommodate the longer one)
Question 5 – the number is incorrect. All the following numbers are one out as well (i.e. Question 5 should actually be Question 6 etc.) • Capture the **File Reference**, **Our Reference** and **Branch** fields • Select **Send/Receive** from the **Message** tab • Validate the property after capturing the **Deeds Office**, **Property Type**, **Township**, **Erf Number** and **Portion Number** details • Perform a Deeds Office search to populate the **Transfer Details** information (bolding – this goes for all the drop-down menus) • Nothing happens when I click the Confirm and search button as my answer – the instruction should say that you have to click your selection and then click submit.

Question 10 Estate Agent (caps) • …and connects them when prompted. (remove "to")
Slide 7 • …into the matter from the search you just performed. (bolding/caps and wording suggestion)
Slide 8 • …to view your search results. (bolding and caps)
Closing Slide • Remove comma after email address.