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Acronyms

Acronym	Description
CAA	Computer-Assisted Assessment
CML	Computer Moderated Learning
DSR	Design Science Research
eModerate	Electronic Moderation
eModeration	Electronic Moderation Process
eModerator	Electronic Moderator
FREMA	e-Framework Reference Model for Assessment
HCI	Human-Computer Interaction
HE	Heuristic Evaluation
HEI	Higher Education Institution
ICT	Information Communication Technology
MGI	Midrand Graduate Institute
PHEI	Private Higher Education Institution
SA	South Africa
SAHE	South African Higher Education
UCD	User-Centred Design
UEM	User Evaluation Methods
UT	Usability Testing
UX	User Experience
VLE	Virtual Learning Environment
www	World Wide Web

Chapter One: Introduction

1.1 Introduction

The transformation of a paper-based moderation process into an electronic moderation process, also called eModeration as used at private higher education institutions (PHEI), has posed unique challenges. These challenges concern academic processes, people, finding an appropriate eModerate system and evaluating the user experience of such an interactive eModerate system. An in-depth literature review indicated that, in terms of the user experience of eModeration, no appropriate framework for evaluating eModeration systems existed at the time of this study.

The overall goal of this study was to investigate the user experience evaluation of eModeration systems and create a User Experience Evaluation Framework for eModeration. Such a framework could be used by managers at higher education institutions to evaluate the user experience of existing or potential electronic moderation (eModeration) systems.

This chapter provides the background and rationale, research objectives, research questions, literature review and research plan for the study.

1.2 Research background and rationale

Technological development in the twenty-first century has opened up new possibilities for the use of technology to improve education, in particular the processes and protocols used by people to monitor the delivery of teaching support in learning and assessment (Geldenhuys, 2010). Internationally, higher education institutions are expected to change delivery to online communication services, such as online teaching, social moderation and moderation meetings, and increase levels of accountability (Adie, 2014; Beutel, Adie, and Lloyd, 2014). According to Bloxham (2009) accountability in relation to assessment is high on the priority list of higher education institutions internationally. Technological development challenges current education systems to question existing academic and business process practices in such a way that education may need to be reshaped to meet the changing demands of academic processes (Geldenhuys, 2010). Beutel et al. (2014) indicate that not enough attention has been paid to the process of electronic moderation. Two of the challenges of electronic moderation, as identified by Adie (2014), concern the relationship between the technology and the user, as well as the user's competency with technology. Grainger, Adie and Weir (2015), however, acknowledge that advancements in information and communication technologies in higher education have resulted in more efficient handling of assessment and communication channels. One of the current developments in education is eAssessment, which is being used in the areas of computer-assisted assessment, online delivery of formal examinations and automated marking (Boyle and Hutchison, 2009; Bridge and Appleyard, 2008; Gipps, 2005; Hodson, Saunders and Stubbs, 2002). Another field of technological development in education is electronic moderation where the lecturer or assistant lecturer acts as an eModerator and provides feedback to students on assessments (Morgan, 2008; Salmon, 2013; Salmon, 2003; Vlachopoulos, 2008).

Existing literature on eModeration provides evidence of research that focuses on the learning and teaching relationships between the student and lecturer or facilitator where the lecturer or facilitator is the eModerator in online discussions (Salmon, 2013; Salmon, 2003; Vlachopoulos, 2008). The term '*eModerator*' has been derived from the word '*moderator'* which is usually associated with a mediating role (Salmon 2013; Salmon, 2003). Traditionally, a moderator is someone who presides over a meeting (Morgan, 2008). An eModerator has a more extensive role within the context of Computer Moderated Learning (CML), which is still evolving (Morgan, 2008). Salmon (2003:113) states that "as eModerators become more comfortable with their on-line teacher roles, … they will start to look closely at online assessment and evaluation and will not wish their time and their students' time to be constrained by old assessment methods".

There appears to be no consensus when it comes to the use of the terms "electronic moderation" or "eModeration", which becomes particularly evident when examining the definition of these terms in the work of Morgan (2008) and Salmon (2013, 2003). For the purposes of this study the following definition of eModeration has been used: “[1]eModerate [eModeration] can be defined as the electronic moderation (quality assurance/critical reading) of summative examination scripts by external moderators in a virtual learning environment” (MGI, 2010:3).

In the context of this study, the eModerator’s role is to preside over the electronic moderation of examination scripts and to then provide a moderation report on the assessment. Note that the relationship under consideration is between the eModerator and the dean of the faculty (manager), rather than between the student and the lecturer as has been the case in studies conducted by Morgan (2008), Salmon (2013, 2003) and Vlachopoulos (2008). The dean provides feedback to the lecturer of the module hence there are three entities involved in the moderation process: the lecturer who marks the papers, the eModerator who moderates the marking and the dean who receives the moderation report and provides feedback to the lecturer (see Chapter Five for more details).

As a tool, eModeration is an essential emerging technology in the area of online teaching. However, the application is still novel (Morgan, 2008) and the factors that determine the user experience have not been theorised in any depth. As a result of developments in technology, the workplace has evolved from the traditional specific location to one that is virtual (Wright and Snell, 1998). Nielson-Norman-Group (2012) and Barnum (2002) concur that if the interactive systems are difficult to implement and use, users will simply stop using them and find alternatives. In the case of eModeration, if an eModerate system does not provide a positive experience to the user, the user will revert to the manual paper-based method of moderating examination scripts. Given this background and the current paucity of literature on the user experience of eModeration systems, the need to investigate how to best evaluate user experiences of eModerate systems was identified. Additionally, the researcher found that there was a need to investigate what specific user experience constructs would be required in a user experience evaluation framework for eModeration.

[1] eModerate is used interchangeably with eModeration

There exist different definitions for the term “user experience” (UX). According to Kuniavsky (2010) the definition of user experience includes the totality of end users’ perceptions as they interact with a product or service; these include effectiveness, efficiency, emotional satisfaction and the quality of the relationship with the entity which created the product or service. Kuniavsky’s (2010) definition attempts to transcend ergonomic, attitudinal and visual metrics which include all aspects that an individual would consider relevant to an experience. The user experience is affected by the user’s emotions, the usability of the product and the context (Law, 2011; McCathy and Wright, 2007; Norman, 2013). Therefore, the user experience of those using the electronic moderation system (eModeration) is critical to the adoption of eModerate systems. The concepts of usability and user experience are discussed in more detail in Chapter Three.

Considering the academic literature, articles about electronic versions of moderation have been published focusing on topics such as quality assurance in moderation (Adie, 2014; Grainger et al., 2015), analysis of moderation practices (Czaplinski, Senadji, Adie, and Beutel, 2014), social moderation (Adie, 2014, Adie, 2011 and 2009; Beutel et al., 2014), and e-portfolio project evaluation (Greatorex, 2013). However, no reference to electronic moderation could be found with regards to the electronic moderation of summative examination scripts in tertiary education institutions and the user experience thereof. This points to a gap in the existing body of knowledge.

1.3 Research problem statement

The traditional process for moderating examination scripts relies on much paperwork, is tedious and time-consuming, is not cost-effective and presents problems regarding the security of scripts (Midrand-Graduate-Institute-Academic-Committee, 2007). These problems have also been experienced by private higher education institutions such as Midrand Graduate Institute (MGI) (Midrand-Graduate-Institute-Academic-Committee, 2007; van Staden, 2010). As a result of the challenges that MGI had faced regarding the paper-based moderation system, a decision was taken by the institution to investigate the possibility of moving towards an electronic moderation system. It should be noted that when the study commenced the institution was called Midrand Graduate Institute.

However, in May 2016 the institution's name was changed to Pearson Institute of Higher Education. Although the researcher acknowledges the institutional name change, for the purpose of this thesis the institution will be referred to as Midrand Graduate Institute.

An eModeration system moves the moderation of summative assessments off the desk and onto the desktop (computer screen) using different Internet-based technologies such as free online marking tools or sticky notes in Adobe. In eModeration, user experience is important in ensuring sustained use and adoption of eModerate systems. Such being the case, this study focused on user experience, as well as the factors likely to influence the adoption of these systems.

The problem statement addressed in this research concerns the lack of a conceptual eModeration user experience framework for the evaluation of user experience, which poses a challenge for managers and eModerators of eModeration systems.

The study evaluated the user experience of the users while they interacted with the eModerate system in order to determine whether any user experience problems existed and what consequences these had on the overall user experience. Three aspects were identified in the Hassenzahl and Tractinsky (2006) and Roto (2006) models which form the building blocks of user experience, namely system, context and user. Therefore, in order to implement an eModeration system within higher education institutions a user experience evaluation framework for eModeration is required for the following reasons specifically related to system, context and user:

- The process of eModeration suffers from challenges similar to those experienced by other IT projects. These challenges include perceptions and expectations of users and unforeseen software challenges, all of which result in dissatisfied users (Crowley and Thronley, 2014). Thus, a user experience evaluation framework for eModeration could assist with the implementation of *eModerate systems*.
- An eModerate user experience framework could aid in assessing the needs that exist at managerial and eModerator levels and then map eModerate solutions to these needs after investigating the *context* of eModeration in higher education institutions in South Africa (SA).

- Users (eModerators) may encounter negative experiences as a result of the adoption of information technology and its use, which can largely be attributed to a narrow focus on user and usability issues (Greatorex, 2013). Therefore, prior IT experiences should be considered when determining the users' needs.
- Research also needs to focus on the context of use and on the specifications of user requirements (Kaipo, 2011), as well as usability and usefulness. It will be difficult to determine what impact the change in the work environment from manual paper-based systems to a virtual learning environment — eModerate — will have on the user experience.

The concepts of user experience and usability that are relevant to electronic moderation are discussed further in Chapter Three. The investigation also includes users' needs, process levels, organisation levels and system levels so as to provide a proper application. These aspects have been incorporated into the User Experience Evaluation Framework for eModeration.

The study examined the application of the eModeration system at MGI, a private higher education institution in South Africa (SA). The eModerate system, an electronic moderation system used by MGI, was developed by the institution's eLearn team using Moodle open source software. A pilot study conducted at this institution by the researcher focused on the efficiency, effectiveness and usability of this eModerate system, but insufficient emphasis was placed on all other aspects associated with user experience (Van Staden, 2010). Since the introduction of the eModerate system in 2010, the project has largely concentrated on implementation within the Faculty of Information Technology. However, for the purposes of this study, data was collected from all of the faculties making use of eModeration.

A user experience evaluation framework for eModeration should not only address usability issues, but should also align the business goals with those of the organisation and to the user experience goals associated with the design phase (Hartson and Pyla, 2012). A user experience evaluation framework should also allow designers to engage with different stakeholders in the design of applications that are relevant to the user, organisation and context (Ungler and Chandler, 2012) and, in the process, address challenges.

Numerous publications exist on user experience frameworks for the commercial and health sectors (Kort, Vermeeren and Fokker, 2007; Mahlke and Thüring, 2007; Ouma, 2013; Schulze and Krömker, 2010). As described in Chapters Two and Three, an in-depth literature review was conducted regarding the use of keywords, such as user experience, user experience frameworks, eModeration, eModerator, eModerate systems, and eModerate frameworks from 2010 to 2015. The literature review was conducted using a 'state-of-the-art' review process (Grant and Booth, 2009), because the process offered new perspectives on the issue and because it highlighted an area in need of further research. The researcher used academic search engines such as Google Scholar, subject databases (IEEE, ACM, AIS), multi-disciplinary databases (Springer, EbscoHost, ProQuest), as well as multi-disciplinary citation-enhanced Scopus databases (see Appendix N for a summary). The National Research Nexus database that covers current and completed research was also consulted in order to verify whether such research had been conducted previously in SA. The researcher searched for and used policies and reports from government structures governing higher education institutions especially with regards to assessment in Africa, the United Kingdom and Australia where moderation is part of the assessment structures. The researcher was unable to locate any eModeration user experience frameworks. The literature search was conducted across multiple disciplines covering the subject fields and subdisciplines of Education and Information Systems, as well as the subdiscipline of Human-Computer Interaction. Microsoft Word's reference tool was used and APA version six was used as a citation method. Only literature written in English was consulted. Document formats studied included conference proceedings, journal articles, reports, eBooks, books, and the policies and procedures of higher education institutions associated with assessment. Valuable information was found in the reports, journals and conference proceedings, although little monography was available on eModeration. Most references were sourced from conference proceedings and journal articles. As evidenced by the greater numbers of conferences and journals engaging with this subject, eModeration has drawn increased attention in the last four years.

In addition to electronic searches using keywords, a retrospective literature search was conducted by analysing the articles cited in the reference lists found in the journals previously mentioned. The researcher also used citation-enhanced information resources such as Scopus and Google Scholar to identify highly cited articles and authors as well as related articles. The literature revealed the following authors as being prominent in the following areas:

- eModeration: Salmon, Greatorex, Beutel and Adie.
- User Experience: Hassenzahl and Tractinsky, Roto, Kuniavsky, Law, McCathy and Wright, Norman.
- Design Science Research: Hevner, Hevner and Chatterjee, Peffers, Turnanen, Rothenberger and Chatterjee.

However, these publications were of limited value in terms of eModeration user experience partly because of the inconsistent definition assigned to the term “eModeration”, as well as the different contexts or ways in which eModeration was being used in practice. Existing user experience frameworks as discussed in Chapter Three were used to guide the researcher in the design and development of the User Experience Evaluation Framework for eModeration.

In conclusion the problem statement can be summarised as follows:

There is no conceptual framework currently in existence that can be used to evaluate the user experience of electronic script moderation at higher education institutions.

1.4 Research question and associated subsections

In order to gain an understanding of the users (deans, moderators, eModerate system operator), context (moderation) and the user experiences within the *system* (eModerate), a descriptive, interpretive approach was followed. The main research question for this study was:

What constitutes an appropriate framework for evaluating the user experience of an eModeration system?

In order to answer the main research question, the following key sub-questions needed to be answered:

1. What are the most important user experience constructs for the electronic moderation system's framework?
2. Which existing user experience frameworks are relevant to the evaluation of electronic moderation systems?
3. Why do user experience issues influence the adoption of eModeration?
4. How do the insights gained influence the design of the framework?

These research questions guided the literature review process, research design and data collection methods. The research process also assisted with proving the validity of the proposition.

1.5 Value of the study

Using Design Science Research, this study addressed a gap regarding user experience evaluation frameworks for eModeration. An in-depth study was conducted into the experience of users, such as deans and moderators, using an electronic moderation system in a virtual learning environment at private higher education institutions in SA. The need to identify appropriate user experience constructs associated with and required for a user experience evaluation framework for eModeration was established and investigated. This study's theoretical contribution lies in the proposal of a validated conceptual framework for the evaluation of eModeration user experience. This particular conceptual framework is of practical value since it will enable managers to evaluate eModerate systems before purchase and/or take remedial steps to ensure a better user experience with existing systems. This study is valuable because it offers insight into the evaluation of the user experience of eModerate systems on theoretical and practical levels.

1.6 Scope of the study

This section addresses the domain of the study, target system used, limitations and delimiters, and assumptions.

1.6.1 Domain of the study

This study, conducted in the field of Information Systems and Human-Computer Interaction, spans the areas of user experience, usability and eModeration. Existing literature provided background information about online marking, online moderation, the definitions of eModeration and how eModeration was being used (Chapter Two). It also provided information regarding user experience and usability evaluation methodologies that informed the foundations of this study (Chapter Three). The literature review served as a frame of reference for the research, design and development of a conceptual framework during the first iteration of the Design Science Research process. How successful an eModerate system is, as well as how satisfied the users are with the user experience of an eModeration system depends on various factors.

The goal of this study was to identify aspects of the experience that users believed contributed to the success of an eModerate system being used by higher education institutions. In order to answer the research questions it was necessary to examine what moderation practices were being implemented within the higher education environment in SA and how these practices were implemented.

The eModeration systems of MGI and Monash University, two private higher education institutions situated in SA, were chosen as part of the application context (Chapter Five). It is argued that a deeper understanding of moderation practices at private higher education institutions could potentially provide a basis for an understanding of eModeration in similar contexts. The researcher attempted to investigate how eModeration systems worked in specific environments and what the users' experiences were of such systems. The case study also contained an embedded unit of analysis — the user experience of persons involved in moderation, namely deans and moderators.

The framework was evaluated within the contexts of both MGI and Monash University. MGI was used in the second iteration of the Design Science Research process, which was restricted to the evaluation of moderators in the respective faculties of Information Technology, Science, Commerce, Social Sciences and Creative Arts. The undergraduate programme moderators were excluded from the evaluation as were modules in the Faculty of Creative Arts, which consisted of portfolios and drawings. At the time of this study MGI had 11 remote campuses where some of the Commerce and Social Science degree courses were offered. Moderation samples were also included from these campuses. On completion of the literature review and the design of the User Experience Evaluation Framework for eModeration, the moderators of MGI were interviewed in order to test the proposed framework during the third iteration. After refinement of the framework Monash University was approached to evaluate the proposed User Experience Evaluation Framework for eModeration. This constituted the fourth iteration of the Design Science Research process. The proposed eModeration User Experience Evaluation Framework is provided in Chapters Seven and Eight of this study.

1.6.2 Target system

The eModerate system selected for this study was the one used by MGI, an institution within the private higher education sector of SA, known as eModerate.

The evaluation of the framework took place within another private higher education institution in SA, namely Monash University.

1.6.3 Limitations and delimiters

For the purposes of this study the researcher defined the term “eModerating” as the process being followed in order to quality assure summative examination scripts using an electronic moderation system called eModerate.

Data could only be collected from the moderators and the deans after an examination session in July and/or December. Some of the modules being offered as part of the degrees were year-long modules which meant that the examinations only took place at the end of year.

The potential target size was a limitation because at MGI only 75 moderators participated in the study across the faculties. Not all of the moderators selected agreed to be involved in the study.

Hevner et al. (2004) mention that it is common practice to limit the scope of the Design Science Research and focus on a specific subset of the overall process, problem or solution. For the purpose of this study the scope was limited to the context of private higher education institutions and the user experience of eModerate systems. A further restriction on the applicability of moderation to the study concerns how moderation practices used within higher education institutions in SA are not always used in other countries.

Since the focus of this study was on the user experience of eModeration systems, technology adoption literature was beyond its scope. Certain constructs from the Technology Adoption Model (TAM) may be present, but these have been dealt with from a Human-Computer Interaction User Experience perspective.

1.6.4 Ethical clearance

In order to answer the research questions it was necessary to examine what moderation practices were being implemented within the higher education environment of SA and how these practices were being implemented. Ethical clearance to conduct the study was granted by UNISA (Appendix A).

Ethical clearance was also obtained from MGI and Monash University in order to conduct the study at these institutions (Appendix A).

1.7 Research methodology

According to Oates (2006), research methodology refers to the way in which the researcher approaches the research question(s), using a combination of strategies and methods. Creswell and Plano Clark (2011) describe research methodology as being a strategy, a plan of action or a research design. The research methodology incorporates methods (techniques or procedures) used to collect, analyse and interpret the data (Creswell and Plano Clark, 2011). The research methodology concerning the conceptual framework also clarifies what approach will be followed in order to analyse any generated data. The intention of a conceptual framework is to make explicit how the researcher structures his or her thinking about the research topic and the process to be undertaken (Oates, 2006). The methodology used is that associated with Design Science Research as a process.

Saunders, Lewis and Thornhill (2012a, 2009) and Saunders (2012b) proposed the *'research onion*', which has multiple layers, as a model of research methodology. The outer layer starts with '*philosophies*' and progresses through '*approaches*', '*strategies*' and '*time horizons*' with '*techniques and procedures*' in the middle. Saunders et al. (2009) only covers the deductive (theory testing) approach and the inductive (theory building) approach correlated with positivism and interpretivism respectively. Although individual methods such as experimental and grounded theory are discussed with a focus on empirical research, there is no mention of problem solution or technology design, or a critical examination of values under strategies (Saunders et al., 2009). Saunders et al. (2012a) further supplement the research onion with additional concepts that correspond to Design Science Research: for example in the philosophy layer, ontological, epistemological and axiological issues are discussed. At the approach level a creative design reasoning approach has been added to deductive and inductive approaches (Saunders, 2012b). At the strategy level "*problem analysis and technology invention"*, "*design"*, "*development"*, and "*construction*" are mentioned as methods relevant to Design Science Research. The methodology used for this research is that associated with the process of Design Science Research. In academic terms there is no agreement within literature as to where Design Science Research is supposed to fit in the "*research onion"*. In the work of Saunders et al. (2009) no mention is made of Design Science. Venable (2011) argues that Design Science Research should be included in the "*research onion*", but does not indicate where. It was only later that Saunders et al. (2012a) added creative design to the approach level that aligns with Design Science Research. For the purposes of this study Design Science Research was added to the strategy layer because the case studies used in this study form part of a research strategy used in Design Science Research. See Figure 1.1 for the integration between the research onion and Design Science Research as inferred by the researcher for this study.

Hevner and Chatterjee (2010:5) defined Design Science Research as follows:

> "a research paradigm in which a designer answers questions relevant to human problems via the creation of innovative artifacts, thereby contributing new knowledge to the body of scientific evidence. The designed artifacts are both useful and fundamental in understanding that problem".

Hevner and Chatterjee (2010:5) further laid down the first principal of Design Science Research:

> "The fundamental principle of Design Science Research is that knowledge and understanding of a design problem and its solution are acquired in the building and application of an artifact".

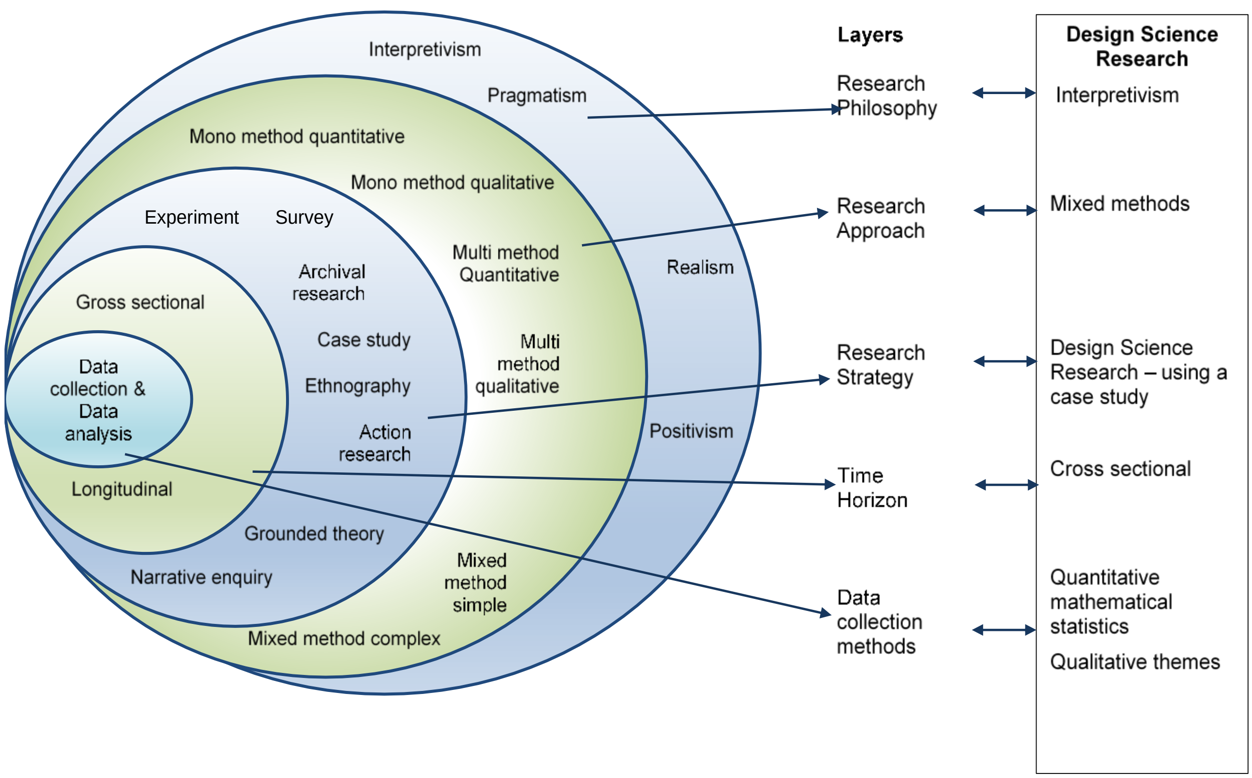

Figure 1.1 Research Onion (Saunders et al., 2012b) integrated with Design Science Research as inferred and used in this study

For this study the research process was guided by the Design Science Research process as augmented by Hevner and Chatterjee (2010) together with an adapted form of Saunders et al.'s (2009) and Saunders (2012b) research onion. As a result the research process comprised the following aspects:

- **Philosophy**: Describing the philosophical underpinnings of the research will determine how the data obtained has been interpreted (Creswell, 2009; Klein and Myers, 1999; Myers, 2013; Myers, 2011). The philosophical worldview proposed in this study was based on interpretivism. Interpretivism favours qualitative methods, but also utilises quantitative methods (Mackenzie and Knipe; 2009). Interpretivism focuses on meaning in context, by understanding the context of the phenomenon, because the context is what defines the situation (Myers, 2013). However, this study was also based on pragmatism, because of the practical nature of the problem which is characteristic of pragmatism (Morgan, 2008). Rossman and Wilson (1985) also mention that pragmatic researchers make use of all approaches available in order to understand the problem with a focus on the "*what"* and "*how"* of research, especially in Design Science Research. The context in which the research was applied made it necessary to focus on having an in-depth understanding of the context, hence the interpretive slant. However the practicalities of the application within the context also called for a pragmatic approach and thus the overall philosophy has an element of both interpretivism and pragmatism.
- **Approach**: Within the Design Science Research process various methods may be used. The methodology prescribes what methods will be used, and how these will be applied. Mixed methods can be used to gain a complete understanding of the research problem by triangulating the findings of quantitative and qualitative data (Athanasou et al., 2014; Creswell and Plano Clark, 2011; Ivankova, 2007; Myers, 2013; Oates, 2006; Olivier, 2009). Mixed methods focus on collecting, analysing, and then mixing qualitative and quantitative data in a single study (Creswell and Plano Clark, 2011). A mixed methods approach was useful because qualitative research sees the world from the perspective of those working with the system, doing the moderation, and managing the eModeration process, i.e. the

respondents (Myers, 2013; Struwig and Stead, 2001). Qualitative research is also concerned with interpretation and the deep descriptive meaning of phenomena (Athanasou et al., 2014), which allow the researcher to understand the "*why"*, "*what"*, and "*how"* of a phenomenon (Du Plooy-Cilliers, Davis and Bezuidenhout, 2014). Two separate databases were kept, one with the qualitative data and the other with the quantitative data. The study collected data concurrently beginning with quantitative then qualitative data in order to explore the topic with participants, as suggested by Myers (2013). It also made use of a substantial literature review that established a rationale for the research question as advocated by Creswell (2009). Both inductive and deductive approaches were used

- **Research strategy of enquiry**: The research strategy is the overall approach used to answer the research question (Creswell, 2009, Hevner and Chatterjee, 2010; Myers, 2013; Oates, 2006; Olivier, 2009). The Design Science Research paradigm allows for an embedded case study research strategy as described by Creswell (2009), Myers (2013) and Yin (2014). As demonstrated in the work of Hevner et al. (2004), an Information Systems Framework was used in this study, with the intention of constructing an artifact. The researcher interpreted participant responses and, as suggested by Lazar, Feng and Hochheiser (2010) and Oates (2006), utilised triangulation to examine the same research question using different methods, approaches and lenses. The strategy of enquiry for this study was a case study and the units of analysis selected were the user, system and context.
- **Data collection techniques used**: This refers to the actions and practical techniques used to collect data in order to design the conceptual framework.
    - The literature review was done during iteration one of the Design Science Research process.
    - All of the moderators at MGI were approached for the research. A survey was used during the second iteration of the Design Science Research process. At the same time semi-structured interviews were conducted that explored key themes related to the conceptual framework for the User Experience Evaluation Framework for eModeration with the deans as participants. Open-ended questions were used to allow participants to

define, and also describe a situation during eModeration. Closed questions were used to obtain specific information or to confirm facts or opinions.

    - During the third iteration of the Design Science process the refined conceptual framework was presented to the eModerators. A semi-structured interview was used to test the conceptual framework and to identify issues and themes that needed improvement. After collection and analysis of the data the conceptual framework was refined before it was presented for the fourth iteration.
    - During the fourth iteration of the Design Science Research process expert reviewers from Monash University were interviewed in order to evaluate and validate the eModeration user experience framework.

- **Data analysis**: This refers to the way in which data was processed. According to Oates (2006) quantitative data analysis uses mathematical approaches such as statistics to examine and interpret the data. Qualitative data analysis looks for themes and categories within the words people use (Oates, 2006). Myers (2013) states that the analysis of qualitative data can be done using analytical induction, hermeneutics, semiotics and narrative. In this study, analytical induction was used for qualitative data where a causal explanation of the phenomenon from the two cases was discussed. The quantitative data was analysed by an independent statistician to ensure the rigour of the research process.

The thesis used a Design Science Research approach for the writing up of the information, which is grouped into four phases as presented in the next section.

1.8 Structure of the thesis

The study consisted of four main phases: the literature review, the development of the conceptual theoretical framework and practical application, the evaluation, the recommendations and conclusions.

Figure 1.2 represents the overall structure of the thesis including the chapters and the phases of the Design Science Research process.

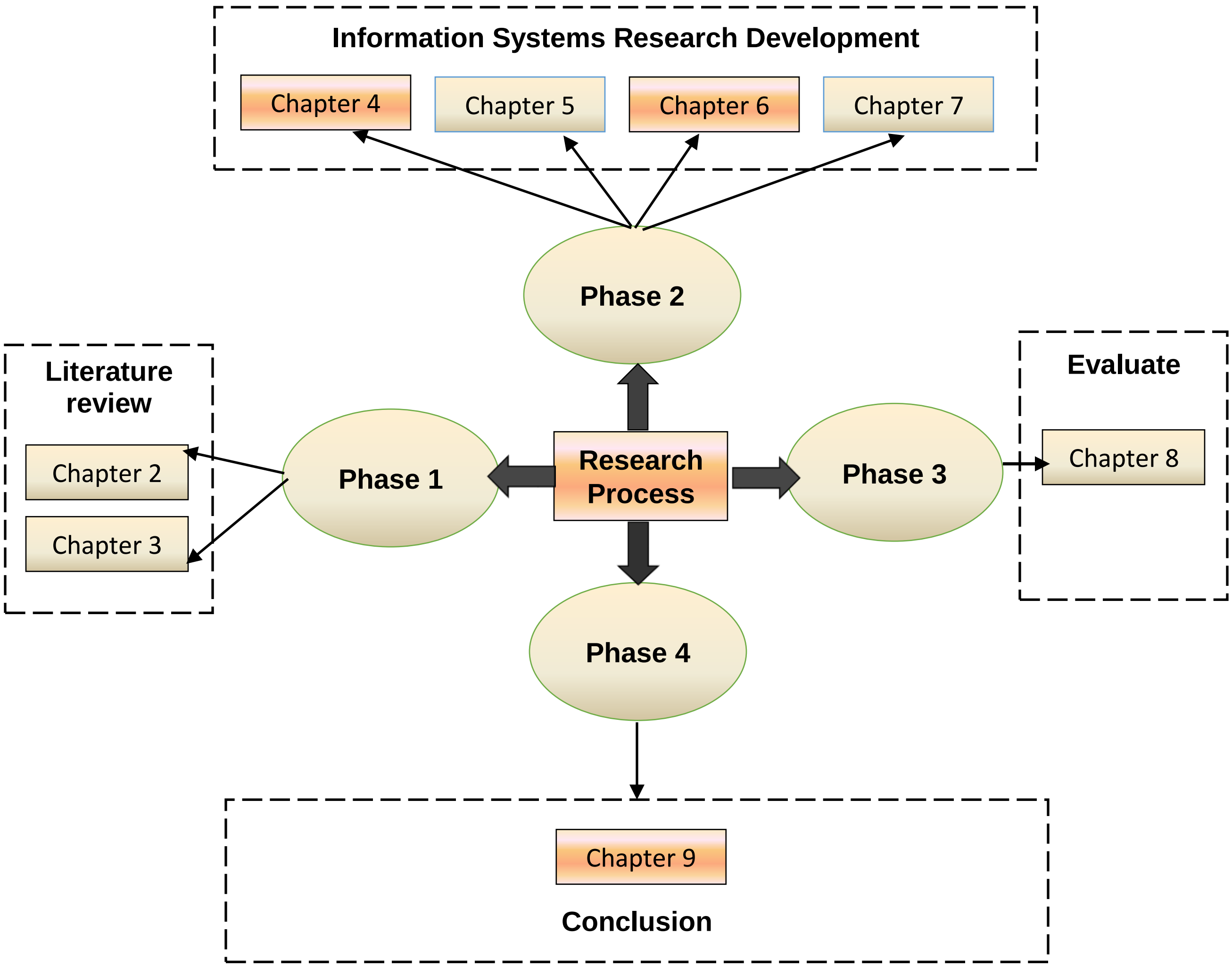

Figure 1.2 Overall structure of the thesis

The phases indicated in Figure 1.2 comprise the following:

Phase 1: Theoretical framework — knowledge base and environment

Chapter One serves as an introduction to the thesis and addresses the context and the problem statement. In addition, the research approach is covered by providing a summary of the methodology and the research methods, as well as the research questions. Chapter One also serves as Step One of the Design Science Research process, i.e. it identifies, provides an understanding and motivates the relevance of the problem. Chapter Two deals with the literature review which gives background information on moderation and eModeration, while Chapter Three deals with the literature on user experience and usability. Chapter Three also provides a detailed discussion of the aspects related to user experience and how these relate to eModeration systems. The literature review identifies factors that contributed to the user experience as a frame of reference for the study and identifies the required metrics that form part of evaluating the eModerate user experience. The areas of study, eModeration, user experience and usability are then integrated by generalising criteria appropriate for the evaluation of eModerate systems. Chapters Two and Three answer sub-questions one and two and form part of Step One of the Design Science Research process, i.e. the knowledge base required to determine the relevance of the problem.

Phase 2: Information Systems Research Development

Chapter Four describes the Design Science Research approach followed by the development of the data collection protocols, how data was collected from the field and how it was then ordered. This chapter outlines and describes the overall design of the research by looking at the theoretical background of Design Science Research and how the research was conducted in this study. It outlines and justifies the research paradigm and the researcher’s position with regards to this study, i.e. it describes the research strategy and provides a full discussion on Design Science Research using a case study and the specific data collection techniques. The research made use of surveys (with eModerators and deans) and interviews with deans. The eModerate systems were then tested at MGI using interviews with eModerators, and evaluated at Monash University also by using interviews. Chapter Four forms part of Step Two of the Design Science Research process, which defines the objectives and focus of the research area and the solution.

Chapter Five describes the research in context. This chapter aids in analysing the domain and eModerate requirements that played a role at each of the private higher education institutes, and which also affected the conceptualised eModerate user experience evaluation framework.

Chapter Six explains the design and development of the proposed artifact, paying specific attention to both the relevance and design cycle of the Design Science Research. This chapter describes the overall design and development of the artifact which included a set of criteria used to evaluate eModerate systems, with an emphasis on usability and criteria for assessing user experience. These criteria were also used to analyse existing material identified through the literature review that assisted with the design and development of the framework.

Chapter Seven describes how the testing of the User Experience Evaluation Framework for eModeration artifact was planned. The planning and testing of the artifact was done by means of appropriate metrics analysis and interviews/surveys with eModerators and deans. This chapter explains the process of data collection, provides details about the specific cases, and the process of analysis that was used in the study. Chapters Five, Six, and Seven have been used to answer sub-question three. Chapter Seven serves as Step Four of the Design Science Research process, which tests the artifact for relevance and applicability.

Phase 3: Evaluation

Chapter Eight describes the final evaluation of the eModerate systems with managers at a second private higher education institute and presents the results of the study. The criteria identified in Chapter Six were used as the basis for the evaluation. The results of the evaluation were recorded, analysed, and compared with the main findings. Chapter Eight forms part of Step Five which evaluates the artifact and the Design Science Research process.

Phase 4: Conclusion

Chapter Nine discusses the responses and results of the study. This chapter draws conclusions and provides guidelines for managers of academic institutions based on the results of the evaluations. The guidelines have been designed to aid in bettering the user experience of users of eModerate systems, specifically when they moderate examination scripts electronically. Chapter Nine forms part of Step Six of the Design Science Research process, which communicates the results of the research. This chapter presents the results and provides a discussion of these as they relate to the people and processes in the eModerate system. The discussion is founded on the constructs identified as being relevant to the user experience of eModerate. Furthermore, based on the research, the proposed framework for the evaluation of the user experience of an eModerate system in a virtual learning environment will be discussed.

Table 1.1 illustrates how the thesis was approached and demonstrates the interrelationships between the phases, chapters, targets, outputs and research design. Where the outputs were determined using six steps in Design Science Research, of which steps three, four and five are repeated to refine the artifact.

Table 1.1 Research roadmap

<table>
<tr><th colspan="2">Phase1
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<tr><td colspan="8">Research Design</td></tr>
<tr><td colspan="8">Design Science Research with an embedded case study approach, mixed-methods used as a data capturing strategy, with deductive and inductive analysis.</td></tr>
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1.9 Definitions and terms

EMODERATOR is defined as “a subject field expert who is officially appointed by the University to moderate the assessment of a module. An experienced assessor who has credibility in his or her area of knowledge and who will complete the moderation process electronically by using the eModerate system”.

EMODERATE SYSTEM is defined as “the electronic system being developed to upload or download summative assessments electronically onto the eModerate portal, allowing only managers of faculties and eModerators access to uploaded documents. The eModerator then uses the system to electronically assess the assessments and supply feedback to the manager of the faculty by uploading the assessed assessments, the module mark sheet and a report”.

ELECTRONIC MODERATION is defined as “the electronic moderation of summative examination scripts by external moderators”.

EXTERNAL MODERATOR is defined as “a subject field expert who is not an employee of the University and who is officially appointed by the University to moderate the assessment of a module … an experienced assessor and has credibility in his or her area of knowledge and expertise” or “subject field expert who is an employee of the University and who is officially appointed by the University to moderate the assessment of a module … an experienced assessor and has credibility in his or her area of knowledge and expertise”.

INTERNAL MODERATOR is defined as “an academic employee of the University … The Internal Moderator is an experienced Assessor in whom others have confidence and who has knowledge of the module or field of study”.

Chapter Two: Literature Review — Moderation

2.1 Introduction

This chapter discusses the differences between moderation and electronic moderation. Moderation is a process used by moderators to ensure that assessments are scored accurately, consistently and credibly. A moderator can be referred to as a peer-reviewer, second-reviewer or external marker (Gipps, 2005; McGaw, Gipps and Godler, 2004; Vice Provost Monash University Unit Procedure, 2015a). A moderator is also the person appointed to conduct pre- or post-assessment moderation (ACU National, 2008).

This chapter emphasises the role of research in the field of electronic examination script moderation, which involves creative and collaborative problem solving by a team of moderators — who are specialised in their respective fields and have an understanding of user experience — using advanced technology for electronic moderation. The chapter begins by discussing moderation in Section 2.2, followed by a discussion of the use of electronic moderation for moderating examination scripts in Section 2.3. Section 2.4 deals with the protocol to be followed regarding electronic moderation systems and their challenges. The chapter then concludes by discussing user experience in the context of eModeration systems.

2.2 Moderation

The next section investigates the following topics related to moderation:

- Philosophical principles of moderation
- Definition of moderation
- Moderation process

2.2.1 Philosophical principles of moderation

Before moderation can be defined or discussed it is necessary to understand the philosophical principles that underpin moderation. The Australian Catholic University

(ACU National, 2008) identified the following general principles which underpin moderation:

- Moderation assists members of the teaching team with improving their assessment skills.
- Moderation ensures that assessments are self-reviewed, and that school processes are followed where applicable.
- Moderation forms an integral part of the quality of assessment practices each time a module is offered.
- Moderation done externally by an independent moderator or moderators on a regular basis provides opportunities for independent feedback.
- Moderation can only be effective when conducted in the spirit of professional learning and quality improvement.
- Moderators should have adequate and appropriate knowledge of assessment practices, policies and procedures and also be prepared to perform the role.

Universities or higher education institutions that make use of moderation practices define, discuss or describe their institution's philosophical underpinnings regarding moderation in their Teaching and Learning or Assessment policies. It is also a requirement of the National Policy for South Africa (SAQA, 2001) that moderation within the National Qualification Framework (NQF) serves as a means for professional interaction and upskilling of practitioners so as to continuously improve the quality of assessments, which are aligned with the philosophical underpinnings described by the Australian Catholic University (ACU National, 2008).

2.2.2 Definition of moderation

Moderation ensures that assessors who assess a learner are using comparable assessment methods and are making similar and consistent judgements about that learner's performance. According to Hanlon, Hallam, Jefferson, Molan, and Mitchell (2005) best practice aspects of the marking process include second marking which is also referred to as moderation. Moderation produces reports on how assessments are scored (Gipps, 2005) ensuring that assessors are using comparable assessment methods and are making similar and consistent judgements about the learner's performance. Hanlon et al. (2005) further assert that the purpose of moderation is to ensure the reliability of methods used for the sampling of assessments from large groups and that the rules related to the moderation of marks provide evidence of standards.

According to some international institutions such as University Manchester Metropolitan (2007), moderation systems produce assessments that are credible, fair, valid, reliable, practicable and efficient, whereas other institutions such as the Australian Catholic University (ACU National, 2008:1) perceive the moderation of assessments as "a quality review and assurance process by which the University seeks to ensure that its assessment procedures and practices are valid, reliable and are aligned with its stated standards, principles and ethos". However, both institutions agree that moderation ensures that assessments are valid and reliable. Grainger, Adie and Weir (2015:7) state that:

> "moderation involves teachers matching evidence in student work with a standard descriptor on a criteria sheet and then having a discussion that aims to reach consensus about their judgements of the students' overall level of achievement … a practice of engagement in which teaching team members develop a shared understanding of assessment requirements, standards and the evidence that demonstrates differing qualities of performance".

The Queensland Studies Authority (Authority Queensland, 2008) views moderation through an expert as a process that involves student responses being graded by markers, after which advice is then provided by the "expert" confirming whether consistency was applied in the marking process, and whether marks need adjustment. In the South African context, moderation is defined as the process of ensuring that those being assessed are assessed in a consistent, accurate and well-designed manner (SAQA, 2001).

The English Board of the Quality Assurance Authority (McGaw et al., 2004), the United Kingdom, New Zealand (Authority New Zealand Quality Qualifications, 2011) and the Australian Catholic University (ACU National, 2008) assert that moderation systems combine internal and external moderation. The National Policy for South Africa (SAQA, 2001), Lesotho (Lesotho CHE, 2014) and Namibia (Namibia CHE, 2009) also use moderation systems that combine internal and external moderation. The South African definitions of what constitutes an internal or an external moderator do not differ from those used internationally. An internal moderator can be a member of the teaching team, while an independent or external moderator is not involved with assessment in the unit, but is external to the University (ACU National, 2008; Adie et al., 2014; McGaw et al., 2004). According to Czaplinski et al. (2014:348) “external moderation establishes standards for professional accreditation bodies and warrants the reliability of assessment, grading and its consistency across higher education institutions by involving judgements by an external independent expert”. Private higher education institutions in South Africa distinguish between internal and external moderators as follows:

- **Internal moderator**: “An academic employee of the University … The Internal Moderator is an experienced assessor in whom others have confidence and who has knowledge of the module or field of study” (Midrand Graduate Institute, 2010:3).
- **External moderator**: “A subject field expert who is not an employee of the University and who is officially appointed by the University to moderate the assessment of a module … an experienced assessor and has credibility in his or her area of knowledge and expertise” (Midrand Graduate Institute, 2010:3).

External examiners or moderators are commonly asked to formally record whether the standards applied in a module are comparable with those applied across the sector (Hanlon et al., 2005, McGaw et al., 2004). The moderator’s response is taken as a key measurement of the integrity of the standards operated by an individual (Grainger et al., 2015; Hanlon et al., 2005). In the case of MGI these standards are maintained and applied by the internal examiner (lecturer) of a module.

2.2.3 Moderation process

Higher education institutions in South Africa, Lesotho, and Namibia are required to demonstrate how the reliability of assessments is ensured, for example, by consistent use of marking schemes or rubrics, and moderation. Higher education institutions are also obliged to establish a robust assessment system through the monitoring, evaluation and demonstration of fairness of assessments (Hanlon et al., 2005). The moderation process assists in assuring that an assessment outcome is valid, fair and reliable and that the internal markers have applied marking criteria consistently (Bloxham, 2009). Grainger et al. (2015) view the process of moderation in tertiary education as a quality assurance practice. The institution should have consistent, clear criteria for the marking of all assessments and ensure that proper mechanisms for the moderation of marks are in place (Hanlon et al., 2005) and provide appropriate marking rubrics and standards (Grainger et al., 2015) with the aim of improving the quality of teaching and learning experiences (Beutel et al., 2014). Adie et al. (2014:5) and Sadler (2010) indicate that while the majority of universities provide guidelines for the principles and processes of moderation, there are problems with the “shared understanding of criteria, standards and the qualities that provide evidence of a standard amongst staff … Further, there is disagreement in the literature over the role of assessment criteria in focusing the moderation discussion on the evidence provided by the student in the assessment task”. It is important to provide the external examiner with information about what is expected from students in order for them to pass or gain a particular grade, as well as the roles, powers, and responsibilities expected of the moderator during the moderation process.

In the case of private higher education institutions in SA assessment opportunities and practices are regulated in accordance with the requirements of the National Policy. Section 2.2 describes the manual process used in the setting, marking and grading assessments of students’ work in SA by internal and external examiners (moderators) followed by an explanation of an electronic moderation process.

Moderation processes, whether manual or electronic, may be used to ensure the generalisability of assessment standards and outcomes (Coates, 2010). Moderation requires teaching staff to review samples of students’ work to assure the comparability of standards across contexts (Coates, 2010; Hanlon et al., 2005). Assessment decisions can affect the students’ ability to achieve goals set by themselves and secure progression through the education process (Hanlon et al., 2005).

As Hanlon et al. (2005) assert, it is assumed that all higher education institutions operate quality assurance systems as a means of ensuring the integrity of their assessment processes. Beutel et al. (2014) and Bloxham (2009) agree that the moderation processes followed by higher education institutions are institutional mechanisms by which the quality of assessment processes within higher education are assured. It is the responsibility of the module team (internal examiner) to ensure the consistency of the assessment process through the use of assessment criteria and the process of moderation. If the internal examiner fails to provide such assessment criteria to the external examiner (moderator), it can lead to an 'error variation'. It is important to provide properly designed assessment criteria for the assessment process as a safeguard against 'error variation'. For the purposes of this study the term "moderator" will be used for external examiner and the term "lecturer" for internal examiner.

The moderation processes used by the institutions in this study are discussed in more detail in Chapter Five. The next section examines the processes of eModeration.

2.3 eModeration

The main difference between manual and electronic moderation lies in how the students' examination responses are presented to markers, usually on-screen instead of on paper, or handwritten instead of typed (Greatorex, 2013). According to Salmon (2003:113) "as e-moderators become more comfortable with their online teaching roles, … they will start to look closely at online assessment and evaluation, and will not wish their time and their students' time to be constrained by old assessment methods".

The next section discusses the following elements of eModeration:

- eModeration: Definition
- eModeration: Rationale
- eModeration: Frameworks

2.3.1 eModeration: Definition

The term "eModerator" is derived from the word "moderator" that is usually associated with a mediating role (Salmon, 2003:11). Traditionally, a moderator is someone who presides over a meeting (Morgan, 2008). An eModerator has a more extensive role within the context of computer moderated learning (CML), which is still evolving (Morgan, 2008). In the South African context, moderation is the process of ensuring that those being assessed are assessed in a consistent, accurate and well-designed manner (SAQA, 2001) and that the moderation systems produce assessments that are credible, fair, valid, reliable, practicable, and efficient. Moderation produces reports on how assessments are scored (Gipps, 2005, McGaw et al., 2004) and further ensures that assessors are using comparable assessment methods and are making similar and consistent judgements about the learners' performance.

In the context of this study, the eModerator is the moderator of a module who presides over the electronic moderation of examination scripts and provides a moderation report on the assessment. The relationship in this research is between the eModerator and the dean of the faculty and not between the student and lecturer which has been the focus in other studies such as those conducted by Morgan (2008), Salmon (2013, 2003), and Vlachopoulos (2008). The dean reports back to the lecturer of the module hence there are three entities involved in the electronic moderation process:

- the lecturer who marks or scores the papers;
- the eModerator who moderates the marking (acting as a second marker); and
- the dean who receives the moderation report and provides feedback to the lecturer.

Given the emergent nature of eModeration, there exists a lack of consensus on the meaning of the term, but for the purposes of this study the following definition has been used: "[eModeration] can be defined as the electronic moderation of summative examination scripts by external moderators in a virtual learning environment" (MGI, 2010:24). It is fundamentally different to, and does not extend the definition of eModeration as being the function of a lecturer monitoring online content.
To conclude, electronic moderation can take the form of:

- **Social moderation**: An example of this is the use of newspaper articles where a person acts as an eModerator and moderates the work produced by journalists (Meadows-Klue, 2008). Adie's (2011) studies on social moderation focus on assessors or teachers acting as eModerators who purposefully develop agreements on standards, quality and consistency of assessment judgement across different programmes. Adie (2014) also proposes a theoretical framework for online professional discussion. Grainger et al. (2015) use social moderation meetings to discuss the criteria sheet with team members during assessment to ensure a common understanding of accountability and justification, as well as to build community. Grainger et al.'s (2015) study reaffirms Adie et al.'s (2014) typology as a valid and reliable framework for analysis and discussion when used with assessment moderation.

- **Moderation forums:** Moderation forums, such as those found at the Queensland University of Technology, use online moderation meetings to support the collaborative professional development of teachers and the formation of a common understanding of what denotes quality in students' work. This is done in a standard-based assessment system and for the purpose of sharing meanings of assessment (Adie, 2009). Adie et al. (2013) make use of moderation forums to discuss the moderation process with new staff and to establish a shared understanding of assessment and standards with detailed guidelines to ensure consistency throughout the semester. Wichmann et al. (2009) utilise eModeration to moderate eDiscussions between students where the lecturer is the eModerator.
- **Peer moderation:** An example of peer moderation can be found in MGI's examination script moderation. Here the eModerator acts as a moderator of examination scripts and then compiles a report for the dean on the quality of the marking. The report is in turn communicated to the lecturer of the module.

In this study eModeration takes the form of peer moderation.

2.3.2 eModeration: Rationale

The role of Information Communication Technology (ICT)-based assessment has become a major area of research in light of the growing use of virtual learning environments (VLE) in universities (Salmon, 2003), e.g. the automated scoring of text (Gipps, 2005), which focuses on the lecturer's task in the assessment process (Campbell, 2005). Cambridge Colleges use electronic marking to mark examination questions. The markers scan single questions in a student's answer script and "e-mark" the question especially if there is more than one marker (McGaw et al., 2004). McGaw et al. (2004) assert that electronic marking can aid in providing psychometric data on individual questions and monitor the consistency or quality of markers. Case studies of eAssessment in terms of how ICT can support the formative assessment processes have been carried out with reference to the submission of assignments online and feedback between the lecturer or facilitator as the eModerator to students (Bridge and Appleyard, 2008; Nicol, 2007; Salmon, 2013; Salmon, 2003). The research found that the online submission of assignments and the ability to provide feedback to the student enhanced the learning experience and helped the lecturer with keeping records of assignments.

Adie (2014) indicated that using online communication could lead to the mastering of new technology and that it was important not to overlook the essential elements of practice. Internationally, higher education services are also changing in order to make use of online communication (Centre for Digital Education and Converge (CDEC), 2012). Grainger et al. (2015) acknowledge that moderation is central to quality assurance. They further acknowledge that advances in information and communication technologies employed by universities have enabled them to conduct more effective assessments and have enhanced communication regarding moderation. In their study Coates and Thakur (2013) indicated that higher education institutions are under pressure to utilise online technologies as a result of expansion over the last three decades, which has been attributed to driving forces associated with cost and pricing. Cloud applications allow these institutions to share content, for example, where student exemplars are uploaded, and online moderation meetings are then scheduled to process the moderation of the exemplars (Grainger et al., 2015).

The literature review indicated that the research focus was on the development of teaching and learning between student and lecturer or facilitator as the eModerator in online discussions, (Salmon, 2013; Salmon, 2003; Vlachopoulos, 2008:48) as well as the way in which feedback was given on submitted assessments. Park (2008) views eModeration activities as the instructor's pedagogically effective space which allows him or her to interact with learning activities, and use eModeration as a discussion board, thereby building the learning community and increasing the connectivity of educators to the learning environment. Research by Bridge and Appleyard (2008) found that computer-assisted assessments work well with large class sizes and that online marking and submission of work enhanced written feedback and dialogue between the eModerator and student. Research has been done on online eAssessment (Dennick, Wilkonson and Purcell, 2009:1) — also referred to as computer-assisted assessment — that focuses on this as a method of coping with large class sizes while providing meaningful feedback to students on coursework submission (Hodson, Saunders and Stubbs, 2002) or online delivery of formal examination and automated marking (English, 2002). For example, UNISA currently uses an online marking tool to mark assignments, but is not using it for moderation purposes (Van der Merwe, 2010). The online marking tool used by UNISA is useful for the marking of assessments such as electronically-submitted assignments, tests and/or exams. The onscreen marking tool allows the marker to insert ticks, impression scores, re-usable comments or individual comments and preconfigured rubrics. The tool adds additional marking and commenting toolbars to the Adobe Professional 9 software, thereby adding to the Adobe Professional functionality. Initially the onscreen marking tool used red ticks, while moderation was done using a green pen. On request, UNISA upgraded the system to accommodate users who wished to use different coloured pens.

According to Greatorex (2013), it is important for eModerators to view more than one portfolio and to be able to see the mark scheme at the same time, rather than having to switch between files. If this is not easily achieved it is most likely going to have an impact on the moderator's experience of moderating electronically (Greatorex, 2013). Greatorex (2013) assert that there are advantages to eModeration, for example, moderators do not have to rely on post centres and fewer printing problems are experienced. However, Greatorex (2013) concluded that as a result of infrastructure problems, technology limitations, incompatibility between software systems, differing moderation approaches and specification requirements of e-portfolios, eModeration was not ready yet for wide scale implementation in the institution in which Greatorex conducted the research. It is, however, important to mention that Greatorex's research concentrated more on the onscreen marking than the idea, process and principles of eModeration.

A detailed discussion of how the eModerate system was used in this study will follow in Chapter Five where the research is discussed in context.

2.3.3 eModeration: Frameworks

Wills et al. (2009) developed an e-Framework Reference Model for Assessment (FREMA), which is an eLearn framework for assessment that provides a guide to existing resources in the domain of assessment, and aims to help users understand the state of eLearning assessment. It also allows the assessment community to record their projects and services. Bailey and Garner (2010) identified a need to continue research into how institutional policies and departmental practices concerning formative assessment have had the intended effect of enhancing written feedback, and producing innovative practices and procedures that can assist lecturers. Wills et al.'s (2009) framework can be used for the purposes of providing feedback and for record keeping as identified by Bailey and Garner (2010). Although the FREMA concept maps can assist with how to structure and discover resources in assessment, these do not provide a sufficient framework for eModeration.

Figure 2.1 illustrates an eModerate framework by Salmon (2003, 2013). The purpose of the framework is to provide a guide for a lecturer who acts as an eModerator over online discussions with learners especially in an Open Distance Learning (ODL) environment.

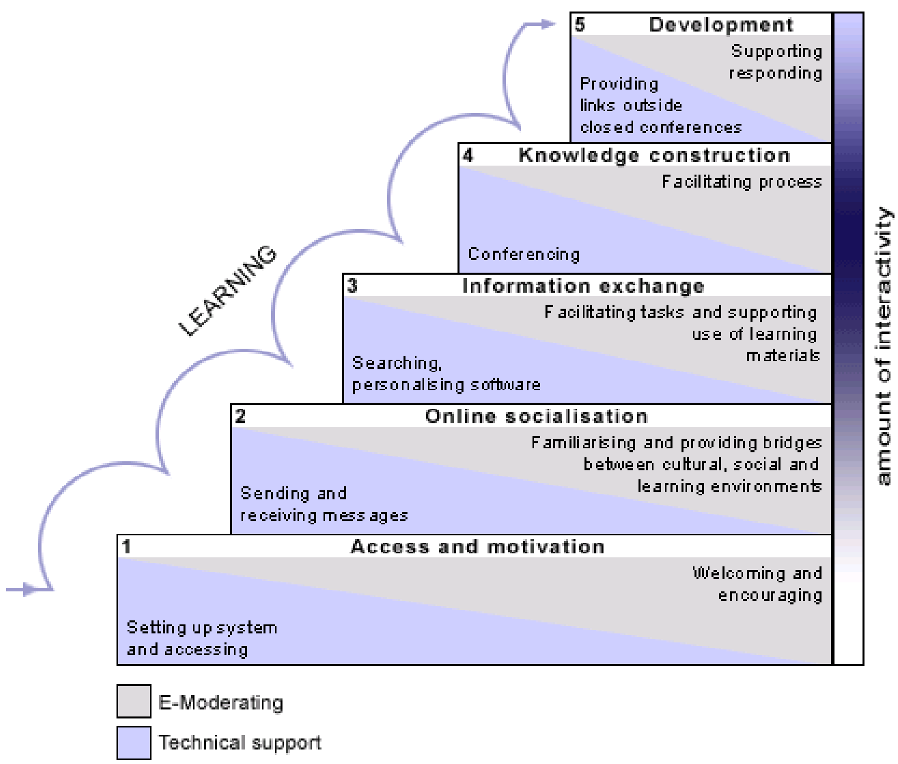


Figure 2.1 eModeration Framework (Salmon, 2003)

Salmon's (2003) eModeration framework focuses on the role that a facilitator or lecturer plays as an eModerator in an online forum. Although some of the principles are applicable to eModeration as defined by this study, the framework does not make provision for the evaluation of user experiences of eModerate systems. The principles of the framework can, however, be incorporated into the design and development of an eModerate system especially in the third phase where information is exchanged. The principles of the eModerate framework (Salmon, 2003), such as the roles and responsibilities of eModerators during eModeration have been taken into consideration in the investigation with regards to finding a solution for this study. The eModeration framework formulated by Salmon (2003) was the only framework that the researcher could find in the literature.

2.4 eModeration Guidelines

The following guidelines from Salmon's (2003, 2013) framework can be adapted for eModeration as defined in this study:

- The eModerator should have appropriate access to the system that is secure and welcomes the eModerator.
- As it has been defined and used in this study, eModeration does not involve socialisation, but the eModerator should be informed about who he or she should contact if problems are encountered.
- Information exchanged between the user (eModerator) and the system should be adequate, sufficient and assist the eModerator in his or her role.
- At the knowledge level of the framework, the eModerator will submit a moderation report to the dean or manager upon completion of the moderation.
- The interaction between the eModerator and the eModerate system should incorporate guidelines from user experience, such as the concepts of flow, usability, user needs, and process.

Packham, Jones, Miller and Thomas's (2004) findings show that effective eModeration (in an eTutor situation) is multifaceted and requires the qualities and characteristics from eModerators, the next two qualities could be related to user experience and eModeration:

- Subject knowledge: The eModerators should familiarise themselves with the material, the learning process and the module assessments in order to ensure effectiveness in their role.
- Technological expertise: The eModerators should have the necessary technical skills within the virtual learning environment, especially the ability to navigate within the environment.

Not all of the qualities for eModerators who act as tutors are relevant to eModeration as it is used in this study. Subject knowledge and technological skills are areas that are related to electronic script moderation by eModerators. Packham et al. (2004) also identified characteristics associated with effective eModerators, namely that they are encouraging and motivating, knowledgeable and informed, organised and competent. Again not all of these characteristics are relevant to the eModeration of electronic scripts, but some aspects may correlate with this research. This knowledge was used in the identification of the roles and responsibilities associated with eModerators.

In order to assist the designers' understanding of the changing nature of the user experiences when using or interacting with the eModerate system at a given time and place, it was necessary to investigate the relationship between user experience and eModeration. The concepts of user experience and usability relevant to electronic moderation will be further elaborated on in Chapter Three.

2.5 Conclusion

The relationships between users, context, eModerate system and user experience are depicted in Figure 2.2.

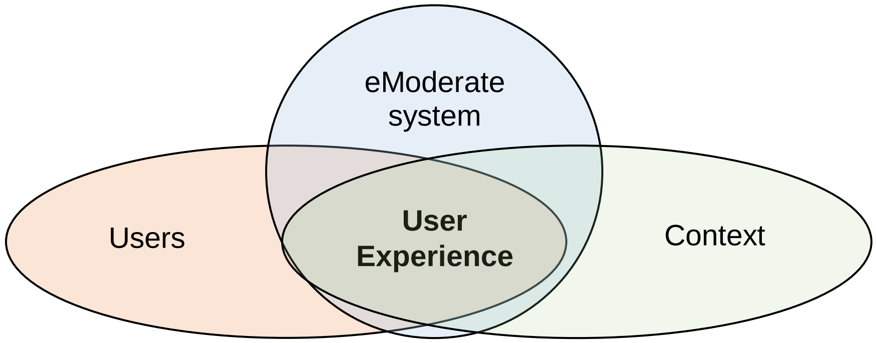


Figure 2.2 Relationships between users, context, eModeration systems and user experience in a virtual learning environment

The eModerate system can be seen as a management enabler as it automates the manual moderation process, thereby simplifying and streamlining the existing process.

In the context of this research, eModeration refers to the change from a paper-based moderation system to an electronic moderation system in a virtual learning environment. In this context moderators engage in online discussions and attempt to improve the users' experience of moderation via increased functionality and usability, and are also responsible for ensuring that the content is applicable to the context of eModeration. In this study, the eModeration discussion also takes place between the eModerator and the manager (dean), which is hereafter referred to as peer moderation.

The chapter has presented a framework from Salmon (2003) that was used to identify guidelines for eModeration which would be applicable to the planned framework.

Because eModerate systems are web-based systems, this chapter examined how the user can upload and download work needing to be moderated to the system. However, it is not an e-commerce website where a consumer can purchase a product nor is it an information website where information can be found. eModerate systems require logins and passwords, and are protected. They are designed for one purpose and that is to electronically moderate submitted information, in this case electronic examination scripts. In order to understand such systems, it is necessary to investigate the multifaceted and changing nature of user experiences when interacting with eModerate systems. The lack of available literature about user experience evaluation for eModeration has been viewed as further support for this study.

Chapter Three: Literature Review – User Experience

3.1 Introduction

User experience design is complex in nature and draws on the fields of interaction design, information architecture, usability, human computer interaction and user interface design, amongst others (Preece, Sharp and Rogers, 2009). In order to understand the multifaceted and changing nature of user experiences when using or interacting with the eModerate system at a given time and place, it is necessary to define what user experience is. Clarifying the definition of user experience is also necessary in order to aid understanding of the existing user experience constructs.

User experience constructs are similar to those constructs associated with interactive product design such as usability, functionality, aesthetics, content, and look and feel with sensual and emotional appeals also being applicable (Rogers, Sharp and Preece, 2011). Hassenzahl (2005) asserts that user experience also extends to the users' motivations and emotions, which may include negative or positive expressions. Users' motivations and emotions include their perception of the product, system or site that they are using. These constructs contribute to the emotional outcomes of the users' user experience which is influenced by the usability of a system (Hassenzahl, 2005; Rogers et al., 2011).

Bevan (2009) identified two specific aspects associated with user experience and usability within the context of user-centred design, and differentiated between these accordingly:

- **User experience**: Understand and design the user's experience with a product, also identifies which emotional responses are evoked by using the product.
- **Usability**: Evaluate the effectiveness and efficiency of the product, user comfort and satisfaction, and ensure that it is easy to use.

The purpose of this chapter is to review the concepts identified in the existing literature associated with user experience. This literature review has been used as a guide to determine which constructs and guidelines are associated with eModeration user experience evaluation. This chapter will answer the first two subquestions, namely:

> RQ1 What are the most important user experience constructs for the electronic moderation system's framework?

> RQ2 Which existing user experience frameworks are relevant to the evaluation of electronic moderation systems?

From the previous definitions (Section 1.2) it is evident that there is a close link between user experience and usability. Section 3.2 will first provide a definition of usability which will be followed by a detailed definition of user experience. Thereafter, the relationship between usability and user experience will be discussed followed by the definition of user experience that is applicable to this study. Section 3.3 discusses different user experience constructs. Section 3.4 will discuss existing user experience frameworks and Section 3.5 the various evaluation methods which can be used to evaluate the user experience. Section 3.6 will highlight the relationship between user experience and eModerate systems.

3.2 Defining usability and user experience

System designers are responsible not only for the presentation, aesthetics, content and architecture of systems or products, but also for the usability, needs of the user and the overall user experience of a product (Bias and Mayhew, 2005; Rogers et al., 2011). Norman (2009:7) does not believe that usability should take precedence arguing that there should be a balance between "aesthetic beauty, reliability and safety, usability, cost and functionality" during the design and development process. However, Tractinsky (2013) warns designers not to overemphasise aesthetics otherwise usability is sacrificed. It is also important to note that "usability guidelines suggest that there is no inherent conflict between usability and aesthetic principles" (Tractinsky, 2013:19). The usability of a product includes aspects such as interaction, context and predisposition (McCarthy and Wright, 2007). According to Norman's (2009) user-centered industrial design model, good design will include aesthetic pleasure and creativity while it is usable, workable, easy to interpret and understand, and enjoyable. These aspects in turn affect the users' experience of the product, especially on an emotional level (Norman, 2013). When users start to use a product, they focus on the usability of the product; only later is there a shift from the dependency of a product's success based on usability to user experience (Clow, 2009; Law, 2011; McCarthy and Wright, 2007; Norman, 2013).

For this reason, and in order to provide a well-rounded definition of user experience, it is necessary to first define usability as it informs the understanding of user experience.

3.2.1 Defining usability

The International Standards Organization (ISO) defines usability as:

> "…the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241-11, 1998).

Usability has traditionally been measured against six attributes or characteristics (Nielsen, 1994a; Rogers et al., 2011):

- **Learnability**: How easy is it for a user to accomplish a task the first time that he or she interacts with or encounters the design?
- **Efficiency:** Once the design has been learnt by the user, how quickly can he or she perform the task?
- **Effectiveness:** This refers to how good a product is at doing what it is supposed to do. How effective is the product in allowing the user to learn, carry out his or her work efficiently, access information needed, or buy goods required?
- **Safety:** What errors could occur while using the product and what measures have been put in place in order for the user to easily recover from such errors?
- **Memorability:** How easily can a user re-establish proficiency when returning to the design after a period of nonuse?
- **Errors and satisfaction:** How pleasing is the design to the user?

Chow, Bridges and Commander (2014:2) define the usability of a website as being "the degree to which users seeking information find a website relevant and easy to use". Therefore, it can be said that usability is characterised in terms of effectiveness, efficiency, safety, utility, learnability, memorability, enjoyability and user satisfaction (International Organization for Standardization, 1998; Preece et al., 2009; Rogers et al., 2011).

Usability is essential to the success of any interactive system, be it an eLearn site, a company intranet or a moderation system. According to Barnum (2002) and Nielsen (2003), if the interactive systems are difficult to implement and use, users will simply stop using them and find alternatives. This is also true for eModeration systems because if the users find the interactive system difficult to use, they will revert to manual moderation. Usability alone does not address the overall quality of user experience (Rogers et al., 2011). It is for this reason that it is necessary to consider user experience and why user experience goals have been identified in the literature review.

3.2.2 Definition of user experience

Hassenzahl (2005) claims that the user experience point of view extends the user-centred design approach by covering issues that go beyond practical usability and functionality. Due to the different approaches available, the definition of user experience is not settled and different viewpoints exist on how user experience should be defined.

According to the current International Organization for Standardization, standard 9241-210, human-centred design describes user experience as:

> " [a] person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service.
>
> User experience includes all the user's emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours and accomplishments that occur before, during and after use.

> User experience is a consequence of brand image, presentation, functionality, system performance, interactive behavior and assistive capabilities of the interactive system, the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use" (ISO 9241-210, 2010: clause 2.15).

Rubinoff (2004:2) defines user experience as follows:

> "User experience refers to a concept that places the end-user at the focal point of design and development efforts, as opposed to the system, its applications or its aesthetic value alone. It's based on the general concept of user-centred design. The user experience is primarily made up of four factors: branding, usability, functionality, and content" (Rubinoff, 2004:2).

Kuniavsky (2010:14) describes user experience as:

> "[The] totality of end users' perceptions as they interact with a product or service. These perceptions include effectiveness (how good is the result?), efficiency (how fast or cheap is it?), emotional satisfaction (how good does it feel?), and the quality of the relationship with the entity that created the product or service (what expectations does it create for subsequent interactions?)".

Kuniavsky's (2010) definition attempts to transcend ergonomic, attitudinal and visual metrics, including instead all aspects an individual would consider as relevant to an experience. The goal is to align developers' understandings of the role that the product will play in the individual's life with the way in which that individual will perceive the design of the product. The User Experience Professional Association (Usability Body of Knowledge) (Glossary, 2014) extends Kuniavsky's (2010) definition by asserting that user experience is concerned with all of the elements that make up the interface, such as layout, visual design, text, brand, sound and the interaction of users with a product. User experience is "about creating an experience through a device" (Hassenzahl, 2013).

In their definitions of user experience Hassenzahl and Tractinsky (2006), and Roto (2006) agree that user experience is the consequence of the following elements:

- **Context**: The context refers to the environment in which the user operates or interacts with the system and is affected by factors such as organisational setting and meaningfulness of the activity.
- **System**: This refers to the characteristics of a system, e.g. complexity, purpose, usability and functionality.
- **User**: The user's internal state is based on expectations, needs, motivation, moods and predisposition. It can be said that user experience is a consequence of a user's internal state.

According to Hassenzahl and Tractinsky (2006), a system that comprises various characteristics should include aspects of user experience which affect the user when interacting with the product. The definition of user experience as formulated by Hassenzahl and Tractinsky (2006) is illustrated in Figure 3.1.

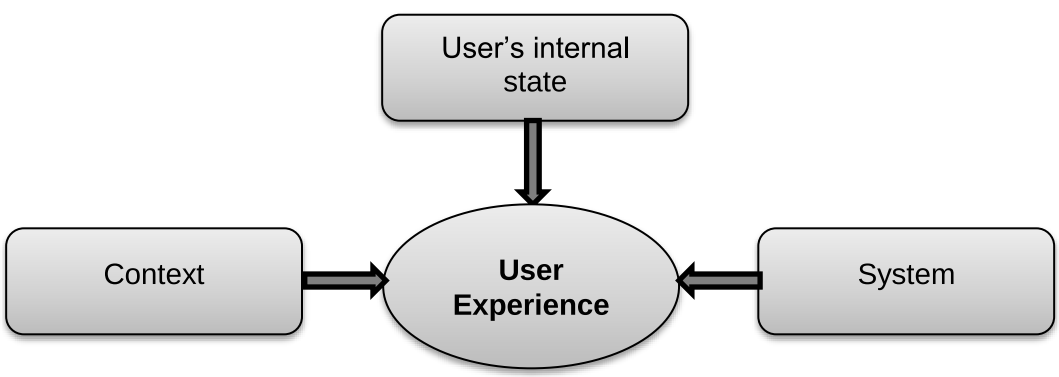


Figure 3.1 Schematic representation of Hassenzahl and Tractinsky's (2006) definition of user experience

A particular challenge regarding user experience as formulated by Hassenzahl and Tractinsky (2006), Mahlke and Thüring (2007), and Wimmer, Wöckl, Leitner and Tscheligi (2010) concerns how to measure all instrumental and non-instrumental aspects or qualities associated with the design process that will lead users to use and accept products or services — essentially the user's emotional reaction. Hassenzahl, Burmester and Koller (2003), Law et al. (2008), Law, Roto, Hassenzahl, Vermeeren and Kort (2009), and Wimmer et al. (2010) acknowledge that another aspect of user experience concerns the situation in which a product or service is used. While Roto (2006) agrees with Hassenzahl and Tractinsky's (2006) definition and provides elements (context, system, user) of user experience he extends their definition by including factors under these elements, such as infrastructure, services, people and the technology context that also affect user interactions with a product. The elements that make up the building blocks of user experience as defined by Roto (2006) are illustrated in Figure 3.2.

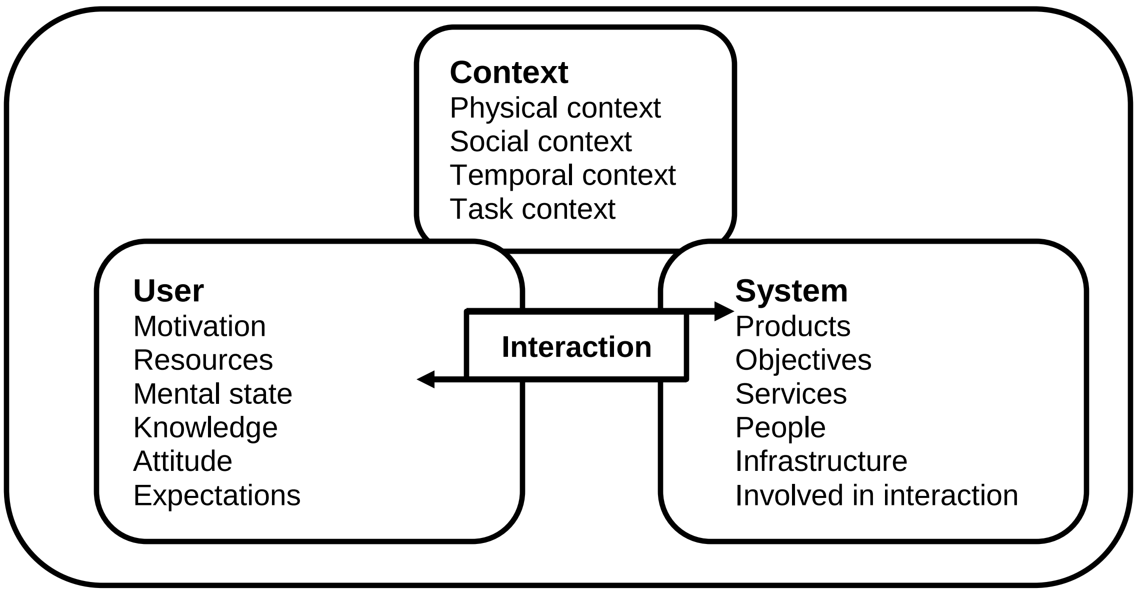


Figure 3.2 User experience building blocks (Roto, 2006)

Law, Roto, Hassenzahl, Vermeeren and Kort (2009:719-728) concluded that there are three reasons why it is difficult to formulate a universal definition for user experience (Cockton, 2006; Sward, 2006; McCarthy and Wright, 2004):

- "User experience is associated with a broad range of fuzzy and dynamic concepts, including emotional, affective, experiential, hedonic and aesthetic variables".

- “The unit of analysis for user experience is flexible, ranging from a single aspect of an individual interaction with a stand-alone application to all aspects of multiple end users’ interactions with the company and its merging of services from multiple disciplines”.
- “The landscape of user experience research is fragmented and complicated by various theoretical models such as emotion, experience, value, beauty and hedonic quality”.

The next section considers the relationship between usability and user experience and the researcher’s stance concerning these.

3.2.3 Defining the relationship between usability and user experience

Having discussed the definitions of usability and user experience in the previous sections it is now necessary to define the relationship between these two concepts.

Usability focuses on providing a product that is efficient and effective while user experience provides the user with a level of satisfaction based on the elimination of usability problems (ISO 9241-11, 2010; Roto, 2006). According to ISO 9241-210 (2010: clause 2.15) when usability is interpreted from the perspective of the user’s personal goals, usability can include perceptual and emotional aspects associated with user experience. This implies that usability criteria can be used to assess aspects of user experience.

Rubinoff’s (2004) definition of user experience is relevant to this research with the exception of the branding factor which is not relevant to current eModeration systems. Preece et al. (2009) explain that user experience differs from objective usability goals in that user experience is concerned with how the users experience the product from a personal point of view or perspective, which is in alignment with the ISO definition (ISO 9241-210, 2010). User experience aspects are more subjective qualities and are concerned with users’ emotions regarding a system, which makes user experience more relevant than usability for this study. Usability goals, on the other hand, are more objective (Preece et al., 2009; Vermeeren, Law, Roto, Obrist, Hoonhout and Väänänen-Vainio-Mattila, 2010). As McCarthy and Wright (2007) indicate, there has been a shift in determining a products' success from only considering usability aspects to including aspects such as product interaction, individual disposition and context, which in turn affect the user experience of a particular product.

There are various viewpoints and opinions on the relationship that exists between usability and user experience. One of the perceptions argues that user experience subsumes usability, which means that user experience includes usability (Bevan, 2009; Hassenzahl and Tractinsky, 2006; Law and Van Schaik, 2014; Rubinoff, 2004; Väätäja, Koponen, and Roto, 2009). It also means that user experience evaluation entails the extension of existing usability evaluation methods (ISO 9241-210*,* 2010; Moczarny, de Villiers, and van Biljon, 2012, Tullis and Albert, 2008).

However, a different group of researchers argue that satisfaction is a subjective component of usability and that satisfaction is a term used with user experience. Therefore, usability includes user experience (Bevan, 2009). Bevan (2009) argues that user experience can be conceptualised as an elaboration of the satisfaction component associated with usability. Bevan (2008a) further extends usability to encompass user experience by interpreting satisfaction as including:

- **Likeability**: This examines to what extent the user is satisfied with the perceived achievement of pragmatic goals.
- **Pleasure:** This examines to what extent the user is satisfied with the perceived achievement of hedonic goals of stimulation, evocation and identification (Hassenzahl, 2005), as well as associated emotional responses.
- **Comfort:** This examines the extent to which the user is satisfied with physical comfort.
- **Trust:** This examines to what extent the user will be satisfied that the product will behave as intended.

Bevan (2009:13) explains the relationship between the satisfaction component of usability and user experience in the following way:

> "A person's perceptions and responses in the definition of user experience are similar to the concept of satisfaction in usability. From this perspective, measures of

user experience can be encompassed within the 3-component model of usability, particularly when the satisfaction is task-related”.

A usability process that supports system iterative design (Van der Peijl, Klein, Grass and Freudenthal, 2012) normally promotes effectiveness and efficiency of the task performed as well as the satisfaction of the user. The usability process used to improve the usability of an artifact involves an iterative design cycle, which makes use of “usability-related activities, including goal-setting for usability attributes, operationalizing of attributes, measuring attributes and evaluating measurements to establish goal achievement” (Van Schaik and Aranyi, 2014).

A third point of view presented by Moczarny, de Villiers and van Biljon (2012:217) claims that “usability and user experience are separate but closely related concepts”. Moczarny (2011) illustrates this relationship between user experience and usability as overlapping entities (see Figure 3.3).

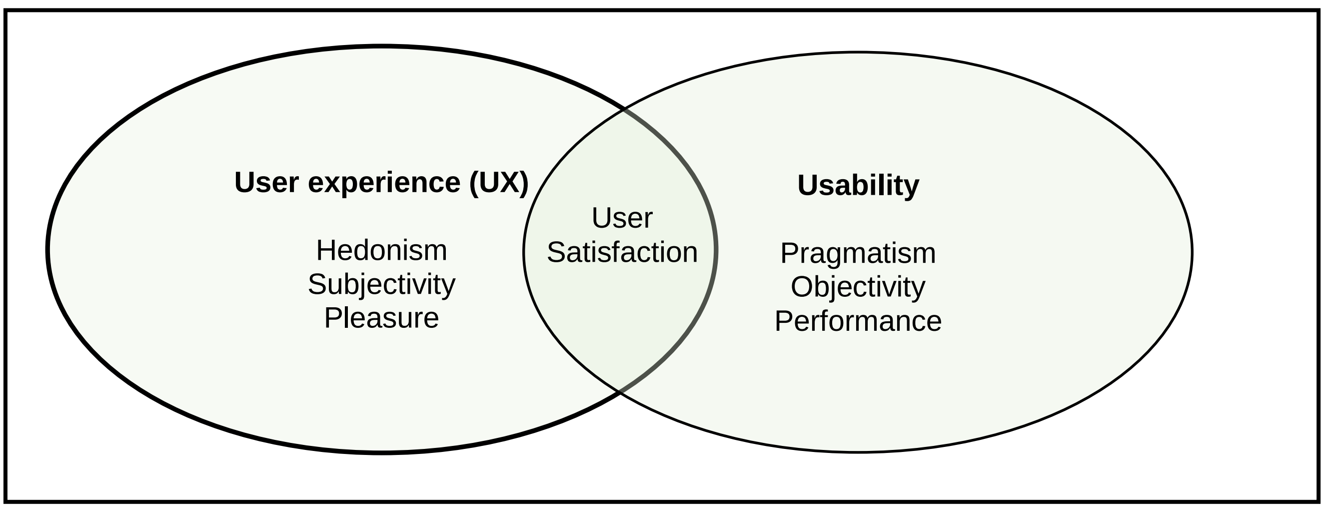


Figure 3.3 Some differences between and attributes of user experience and usability (Moczarny, 2011)

Moczarny (2011) supports the work of Hassenzahl (2008a) that distinguishes between the two perceptions of quality as pragmatic and hedonic attributes, where the consequences are defined as the result of experience. Pragmatism refers to “a product’s ability to support the achievement of behavioural goals, i.e. usefulness and ease of use, which are usability goals" (Moczarny, 2011:30). Hedonism, on the other hand, refers to the enjoyment and stimulation, i.e. "the product's ability to stimulate and enable personal growth and identification, which are attributes of user experience" (Moczarny, 2011:39). Hedonism contributes directly to positive experiences, and whether the users experience fulfillment through the use of a product to which they attach hedonic attributes (Hassenzahl et al., 2015; Hassenzahl, 2008b). The focus of usability is on the performance of, and satisfaction with, users' tasks and achievements in a defined context of use while user experience takes a more holistic approach that values the balance between task-oriented aspects and non-task-oriented hedonic aspects of the use of eSystems (Petrie and Bevan, 2009). Figure 3.4 illustrates the key elements of a model for user experience as seen by Hassenzahl (2008a). Hassenzahl (2008a) views user experience from both a designer and a user perspective. According to Hassenzahl (2008a), the perceived product character will influence the users' judgement about the product's appeal, emotional satisfaction or pleasure, and the time spent with the product.

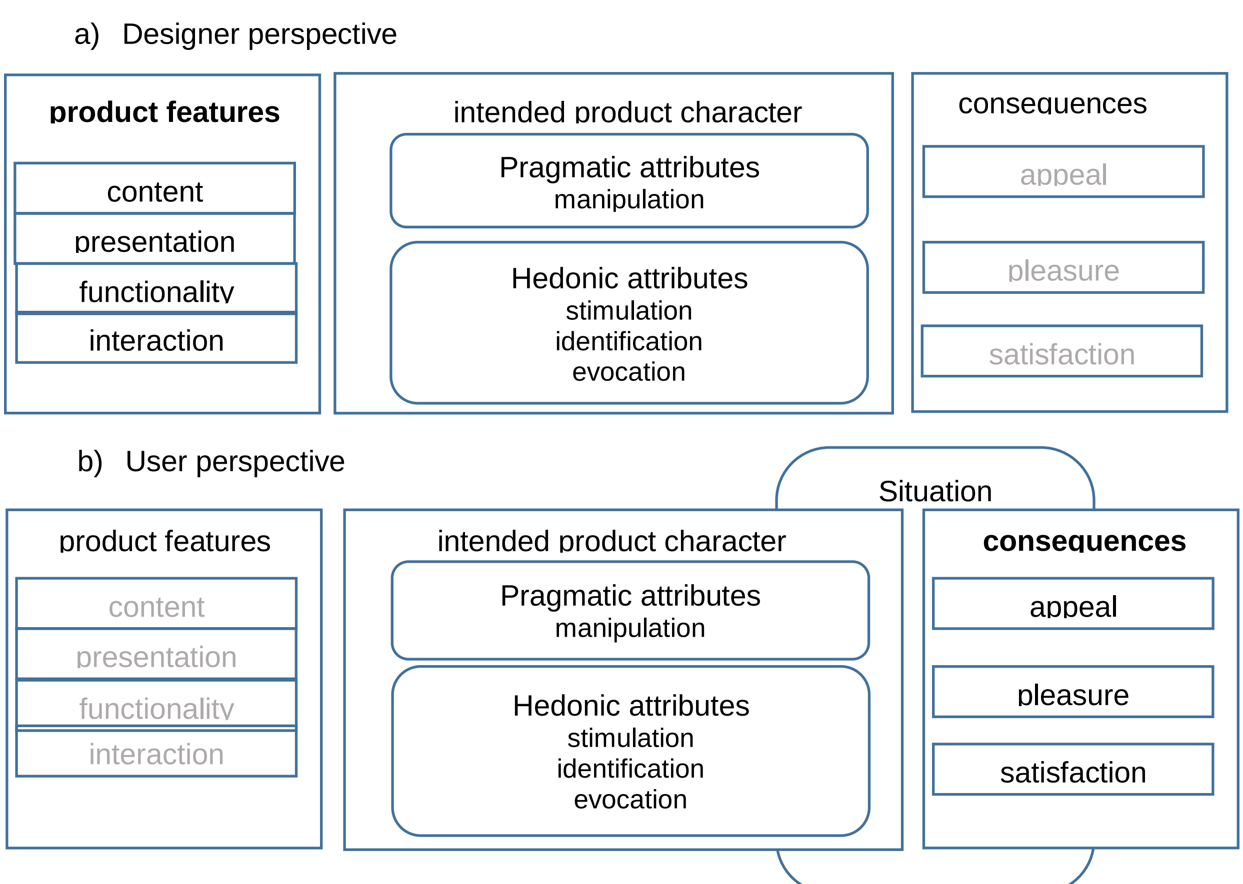


Figure 3.4 Key elements of the model of user experience (Hassenzahl, 2008)

In contrast with usability goals which are objective, user experience goals are more subjective and are important in terms of the users' personal perspectives as they cover a range of emotions and felt experiences (Preece et al. 2009; Rogers et al., 2011). Usability goals are assessed from the users' own perspectives, with regards to usefulness and productivity (Preece et al. 2009). The researcher agrees with Hassenzahl that user experience should be viewed from a designer's as well as a user's perspective. The researcher also agrees with Bevan's (2008a) pragmatic and hedonic approach, which addresses user experience and usability in an integrated way. The researcher views usability as being embedded in user experience.

Chang and Chen (2009) describe customer satisfaction as an affective response to the purchasing of a product, which is an important goal in customer marketing. Satisfaction is an important factor of usability, and because usability is seen as part of user experience, there is an overlap. Van Schaik and Aranyi (2014) agree with Mahlke and Thüring's (2007) view that usability is part of user experience because usability is concerned with instrumental qualities as determinants of system appraisal. Figure 3.5 presents a summary of the constructs of usability and the constructs of satisfaction which are embedded within usability as synthesised from the literature by the researcher.

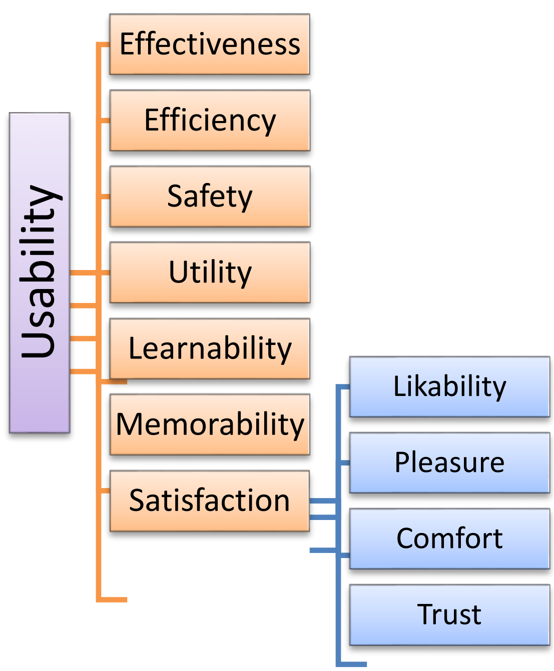


Figure 3.5 Usability constructs

To conclude this section on the relationship between user experience and usability as viewed by the researcher, Table 3.1 presents the qualities, attributes and characteristics of both areas. The researcher views usability as a concept embedded in user experience. The researcher also views user experience and usability as concepts that are closely related to user satisfaction, the latter may be thought of as a shared attribute of user experience and usability.

Table 3.1 Abstraction of usability and user experience

Interactive product:	Usability	User experience	User experience is a consequence of:
Qualities:	Objective (Preece et al., 2009; Rogers et al., 2011; Vermeeren et al., 2010) Instrumental: controllability, learnability, effectiveness (Hassenzahl and Tractinsky, 2006; Law et al., 2014; Mahlke and Thüring, 2007; Nielsen-Norman group, 2012; UPA 2006; Väänänen-Vainio-Mattila and Wäljas, 2009). Usability, usefulness, ease of use, and productivity (Law, 2011; Norman, 2004).	Subjective (Preece et al., 2009; Rogers et al., 2011) Non-instrumental: appeal, motivational qualities and attractiveness (Hassenzahl and Tractinsky, 2006; Mahlke and Thüring, 2007; UPA 2006; Väänänen-Vainio-Mattila and Wäljas, 2009)	**Emotional reaction** The result of an experience (Hassenzahl and Tractinsky, 2006; Mahlke and Thüring, 2007; Wimmer et al., 2010). Predictors of product appeal (Bias and Mayhew, 2005; Rogers et al., 2011).
Attributes:	**Pragmatic** Product's ability to support achievement of behavioural goals, i.e. usefulness and ease of use, which are usability goals (Bevan, 2008a; Moczarny, 2011; Preece et al., 2009).	**Hedonic** Ability to stimulate and enable personal growth and identification, enjoyment and stimulation (Hassenzahl et al., 2015; Hassenzahl, 2008b; Moczarny, 2011; Petrie and Bevan 2009).	**Behavioural elemental attributes**. Appeal, pleasure, satisfaction, joy, fun, pride (Hassenzahl, 2008a) Result of experience (Hassenzahl, 2008a; Moczarny, 2011).
Characteristic:	Usability focuses on performance of, and satisfaction with, users' tasks and achievements in a defined context of use and environment (Clemmensen et al., 2009; Petrie and Bevan 2009).	How does the user experience the use of the product — perspective (ISO 9241-210, 2010; Preece et al., 2009). User's emotional responses to system — pleasurable moments (Bevan,	

Interactive product:	Usability	User experience	User experience is a consequence of:
		2009; Hassenzahl and Tractinsky, 2006; Nielsen-Norman Group, 2012).	
Measurements:	System (Hassenzahl, 2013; Hassenzahl and Tractinsky, 2006; Roto, 2006; Wimmer et al., 2010)	Context (Hassenzahl and Tractinsky, 2006; McCarthy and Wright, 2007; Wimmer et al., 2010; Roto, 2006)	Emotion (Hassenzahl and Tractinsky, 2006; Roto, 2006)

3.2.4 Defining "user experience" for the purposes of this study

The researcher subscribes to the view that usability aspects affect the user experience of the product and concurs with the ISO 9241-11 and Roto's (2006) focus on usability, i.e. that a product must be efficient and effective while the user experience provides the user with a level of satisfaction after eliminating usability problems.

Based on the overviews presented in Sections 3.2.1 - 3.2.3 the researcher agrees that user experience involves more than a product's utility and usability — the subjective nature of user experience is affected by the user's internal state, the context as well as the perceived image of the product's instrumental (usability) and non-instrumental qualities (appeal, attractiveness, etc.) (Hassenzahl, 2008a; Hassenzahl and Tractinsky, 2006; Mahlke and Thüring, 2007; Nielsen-Norman group, 2012; UPA 2006; Väänänen-Vainio-Mattila and Wäljas, 2009).

This study is based on Rubinoff's (2009), Hassenzahl and Tractinsky's (2006), Roto's (2006) and Kuniavsky's (2010) descriptions of user experience, which explain how related user experience factors affect the formation of the users' experience. According to Tullis and Albert (2013) user experience includes three defining characteristics or elements: the "user" who is involved, the user who is "interacting with a product or system" with an interface, and the "user's experience" as observable and measurable.

For the purpose of this study, user experience has been identified as a concept where the end user is placed at the focal point of design and development, instead of the system alone or its aesthetic value, and where user experience is made up of the following constructs: usability, context, system and the user's internal state. For clarity this has been illustrated in Figure 3.6. The construct associated with user experience is further measured by non-instrumental (non-task-orientated usability) qualities and instrumental (task-orientated user experience) qualities. The constructs associated with user experience are made up of elements**.**

Based on the stance taken in this study regarding the relationship between user experience and usability, it is evident that user satisfaction is common to both user experience and usability. Hassenzahl's (2005) framework of pragmatic and hedonic aspects of user experience has been applied to the study, as well as Roto's (2006) approach to the evaluation of user experience and to categorising the factors affecting user experience. The study considers how usability attributes can contribute to acceptable user experience and/or how the lack of usability can be detrimental to the quality of the users' experience.

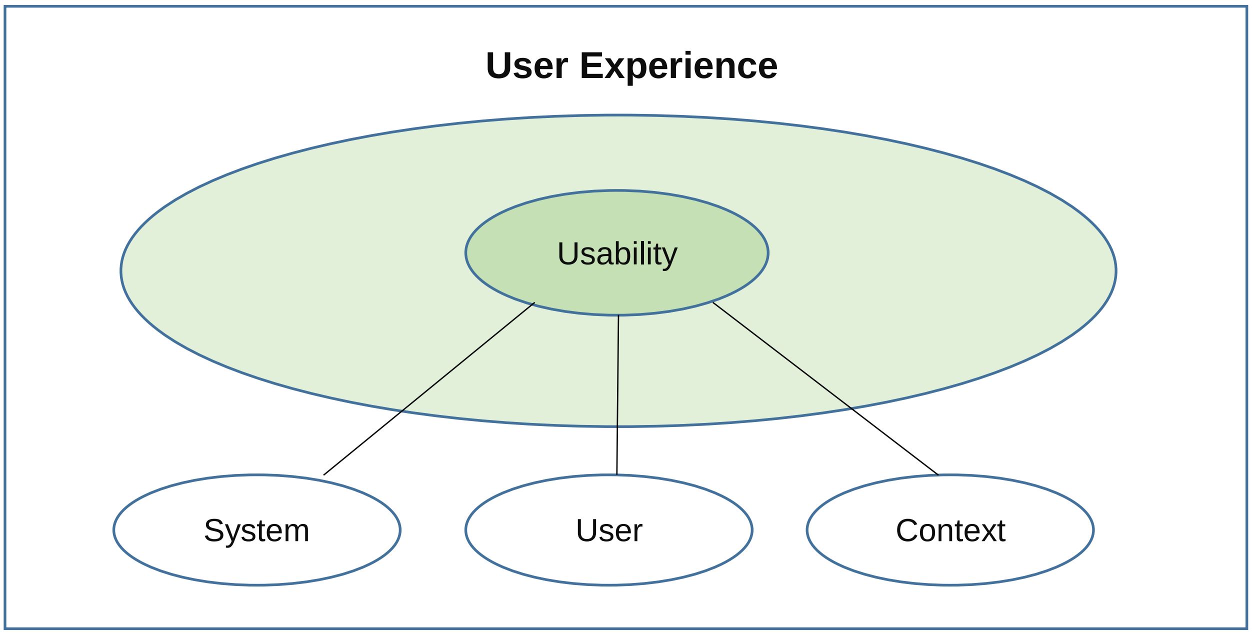


Figure 3.6 User experience constructs

Figure 3.6 illustrates the constructs of user experience for eModerate systems and assists in answering RQ2. The next section will elaborate on these user experience constructs, followed by an investigation into existing user experience evaluation frameworks.

3.3 User experience constructs

The term construct has been used to define and describe each of the areas deemed to be important in understanding user experience, such as context, system, user and usability as shown in Figure 3.6. According to Hevner et al. (2004:78) "constructs provide the language in which problems and solutions are defined and communicated". The term *"construct*" is also used in Design Science Research to construct the artifact that has various levels (Mettler, Eurich and Winter, 2014). In the next section each of these user experience constructs will be discussed in order to add to the understanding of user experience. A number of researchers have extended the discussion of the definition of user experience by elaborating on constructs that inform user experience by referring to them as:

- **Factors** — circumstance, fact or influence that contributes to a result (Ardito, Buono, Caivano and Costabile, 2014; Hassenzahl, 2005; Kuniavsky, 2010; Law et al., 2009; Sproll, Peissner and Sturm, 2010);
- **Elements** — a component or a characteristic part of something abstract (Garrett, 2011; Rogers et al., 2011); and
- **Internal state of users** — users' feelings, motivations and emotional states (Hassenzahl, 2005; Hassenzahl and Tractinsky, 2006; Ju and Kohler, 2014; Paluch, 2006; Rogers et al., 2011).

3.3.1 Factors associated with user experience

Rubinoff (2009) describes user experience as being made up of the following factors:

- **Branding**: This includes the aesthetic and design-related items in a website, such as the projection of the desired organisational image and message.
- **Usability**: This involves the ease of use of all site components and features, which can include navigation and accessibility.
- **Functionality**: This entails the technical, "behind the scenes" processes and applications.
- **Content**: This refers to the actual content presented in the form of text, multimedia and images, structures, or information architecture.

Rubinoff (2009) also points out that, independently, these four factors cannot create a positive user experience, but once combined they contribute to the success of, in this case, a website. Figure 3.7 represents Rubinoff's view and positions user experience as an overarching term for the factors that play a role in user experience.

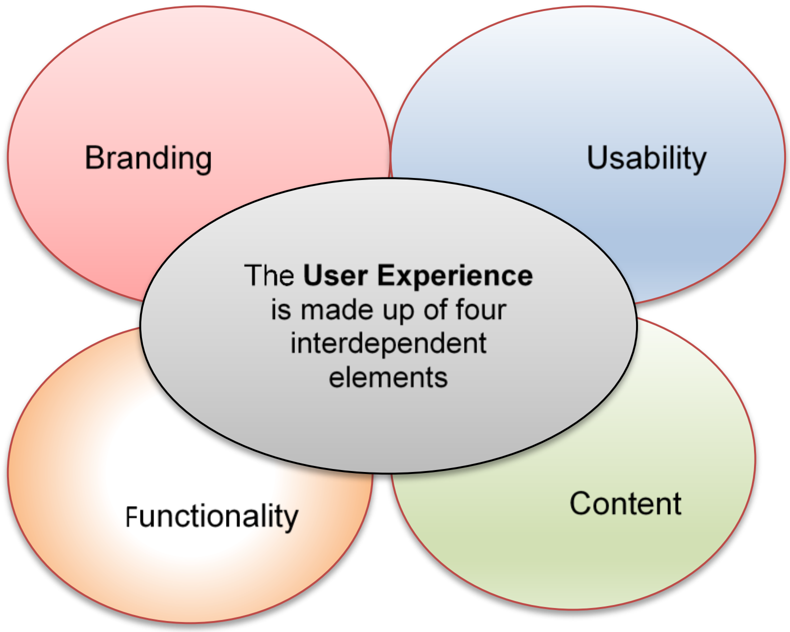


Figure 3.7 Four factors of User Experience (Rubinoff, 2009)

Schulze and Krömker (2010) consider human and system design aspects to form part of the factors that influence user experience, especially emotions, spatiotemporal dimensions and motivation. Porter and Bewer (2010), and Rubinoff (2004) identified the following system design factors that contribute to user experience: navigation, visual appeal, information hierarchy, usability, functionality and satisfaction with content.

Therefore, the factors that may contribute to user experience include both the product (system) with which the user interacts and the context within which the interaction occurs (Law et al., 2009).

3.3.2 Elements of user experience

Garrett (2011), in his definition of user experience, stated that the elements which make up a good user experience include:

- **Connection:** A good user experience will give the user the ability to form links with people, activities, and objectives beyond the user's expectation.

- **Control:** A good user experience is not supposed to overwhelm the user, but should rather put the user in charge, giving him or her the confidence that he or she is in control.
- **Relevance:** A good user experience will fulfill the needs of the user. It will also include factors related to organisational goals, time, data and the user’s environment.
- **Understanding:** A good user experience should allow the user to grasp the information that is shared.
- **Aesthetics:** A good user experience is pleasing and provides the user with positive emotions.

Garrett (2011) states that all the needs and activities that the user might encounter should be planned in advance so as to ensure an acceptable user experience. In addition, Garrett (2011) also identifies various elements (a characteristic part of something abstract) that are relevant to user experience when designing web pages. These can be divided into five stages or planes: strategy, scope, structure, skeleton and surface (as indicated in Figure 3.8). According to Rogers et al. (2011), Garrett’s (2011) user experience development process has been influential in design practice and has been used to guide web development and understanding of the elements associated with user experience. Zimmerman (2008) sees Garret’s framework as an instruction on how to proceed when planning a website or other online content, rather than an actual user experience framework. Garrett’s framework differs from Norman’s design framework. While Norman (2004) distinguishes between the designer’s and user’s understanding of the interface, Garrett conveys the bigger picture to practitioners by providing an understanding of the context of their decisions (Garrett, 2011; Rogers et al., 2011). On the left-hand side of Figure 3.8 is the Web as a software interface and on the right is the Web as a hypertext system.

According to Garrett (2011) the user should perform two basic tasks in order to ensure good user experience. The tasks of the user are placed on the left of the page and the information that the user must access has been placed on the right in stages.

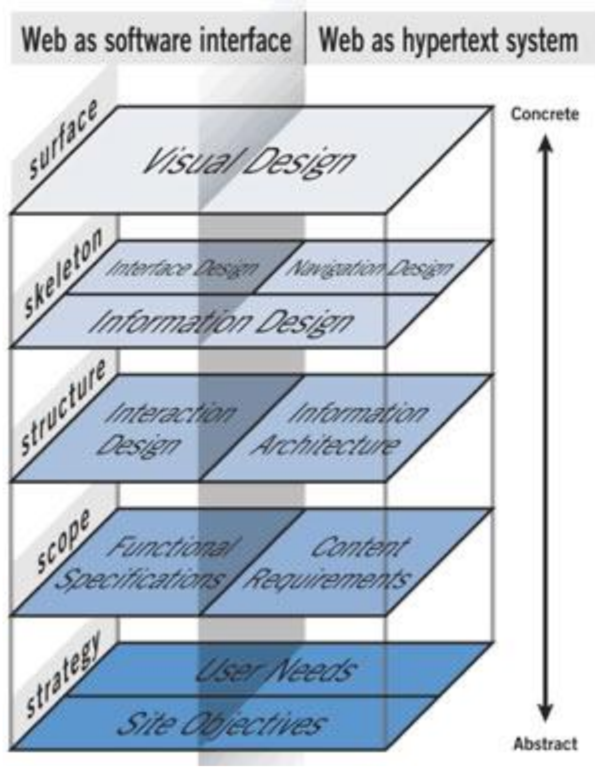


Figure 3.8 Elements of User Experience (Garrett, 2011)

When depicted as a diagram, the user experience development process framework — also referred to as a software design life-cycle — consists of five planes as shown in Figure 3.8 (Garret, 2011; Rogers et al., 2011). Each plane is related to, and dependent on, the others, with the top plane (surface) being the most concrete and the bottom plane (strategy) the most abstract. Decisions made early on in the process affect the planes further up (Rogers et al., 2011). Garrett (2011) describes the elements of user experience in the following five stages:

- **Strategy** involves the user's *needs* and the *company's objectives*.
- **Scope** involves the consideration of *functional specifications* in order to meet various specified tasks. The scope also involves a process of ensuring which *content requirements* should be provided to users.
- **Structure**, which appears on the left-hand side, deals with the *interaction design*. It defines how the user interacts with the site, while the right-hand side involves the *information architecture*, which provides content elements.

- The **skeleton** comprises the *interface design* with the *information design* being on the left-hand side. The *interface design* deals with the placement of the *components* to assist with the interaction process. At the same time the presentation of information on the right-hand side should be considered together with the *navigation design*, which forms part of the *information architecture*.
- The **surface** plane refers to the final presentation of the completed product. The surface plane comprises the *navigation*, components, text and graphics of the web page.

User experience can be further characterised by concepts such as attention, pace, play, interactivity, conscious and unconscious control, and flow. The concept of flow is popular in interaction design, particularly for informing the design of user experiences for websites and other interactive products (Preece et al., 2009). Nawaz (2012) emphasises that it is important to understand the user's flow in order to improve the usability of websites. The user's experience of flow when interacting with artifacts involves a number of abstract ideas such as the structure of the information architecture and how often the user interacts with the website which shapes the user's thinking (Nawaz, 2012).

User experience is also characterised by how the user feels while using a *product*, especially web applications (*environment*) and digital devices (*context*) (Paluch, 2006). Therefore, there is a need to examine what impact the user's internal state has on user experience.

3.3.3 The impact of the user's internal state on user experience

The dynamic nature of user experience involves the user's emotions in terms of how the user feels and their emotional state. User experience is dynamic in nature because of the ever-changing emotional state of an individual, which can be affected both during and after an interaction with a product (Hassenzahl, 2008a; Law et al., 2009). It is important to look beyond static aspects and to investigate the sequential aspects of user experience and how these can change over time (Law et al., 2009). Sproll et al. (2010) describe acceptable user experience on a website as a user's positive feelings towards the environment because his or her needs have been fulfilled. Findings by Ju and Kohler

(2014), and Hassenzahl, Diefenbach and Göritz (2010) also show that the fulfillment of needs is a perceived quality of the product in terms of user experience. Agarwal and Meyer (2009) agree that emotion is an integral component of user experience. The emotional state of the user is also tied to user acceptance and satisfaction (Agarwal and Meyer, 2009). According to Ardito et al. (2014), Hassenzahl (2005), and Väänänen-Vainio-Mattila and Wäljas (2009) user experience extends the user-centred design approach to cover issues beyond the pragmatic by taking into account hedonic users' motivations and emotions such as self-expression, identification and stimulation, which may involve positive or negative expressions. It is important to devote attention to how to motivate, attract and engage users, which in turn will contribute to acceptable user experiences (Ardito et al., 2014). In Figure 3.9 the researcher summarises users' feelings and emotional states in a diagram (Hassenzahl, 2005; Hassenzahl and Tractinsky, 2006; Paluch, 2006; Rogers et al., 2011).

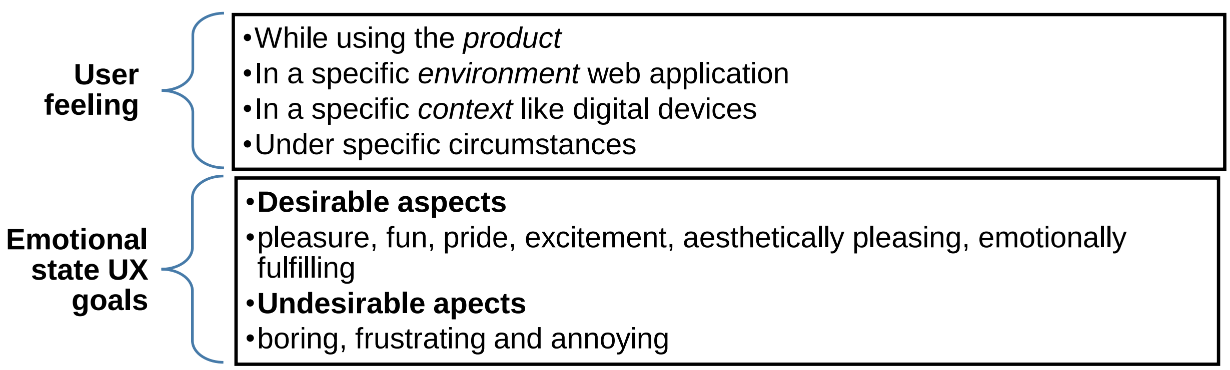


Figure 3.9 Users' feelings and emotional states during user experience (Hassenzahl, 2013; Hassenzahl and Tractinsky, 2006; Rogers et al., 2011)

The emotional state of the user is influenced by user experience goals and motivations. User experience goals include desirable constructs which contribute to a positive emotional outcome during the user experience such as being satisfied, finding that the experience was enjoyable, pleasurable, exciting, entertaining, helpful, motivating, challenging, enhanced sociability, supported creativity, was stimulating, fun, surprising, rewarding, and emotionally fulfilling (Hassenzahl, 2005; Hassenzahl and Tractinsky, 2006; Preece et al., 2009; Rogers et al., 2011). User experience research focuses predominantly on positive emotions like enjoyment, fun, or trust — qualities that lead to an affective reaction (Zimmerman, 2008). Hassenzahl (2005) asserts that a user can perceive a system as engaging, entertaining, aesthetically pleasing or rewarding, but it can also evoke emotions of frustration, annoyance and boredom (Preece et al., 2009; Rogers et al., 2011; Tractinsky, 2013). Personal emotions will influence the users' future interaction with the system and may be miscommunicated to others, with the intention of, or potential to, influencing their subjective experience (Hassenzahl, 2005).

User experience shifts the focus on to the users' emotions, meaning and value of interaction with systems (Law et al., 2009), which is a key element in the success of any product (Sproll et al., 2010). Research done by Ju and Kohler (2014) focuses on user experience approaches that emphasise emotions as an experiential quality of product interaction determined by the users' motives and needs, which are shaped by the context (Hassenzahl and Monk, 2010; McCarthy and Wright, 2004). The attention is not on the product or system itself, but on the users' emotions while interacting with the system — the user experience. Law et al. (2009) argue that the term user experience should be restricted to the users' "interaction" with products, services and systems which have an interface. Law et al. (2009:10) further recommend that the term user experience be "scoped to products, systems, services, and objects that a person interacts with through a user interface". It is important to realise that emotion plays a role in central processing such as behaviour, decision making perception, cognition, and learning (Russel, 2003). Hassenzahl (2005) perceives emotion as a consequence of product use, while Zimmerman (2008) sees emotion as the result of the cognitive appraisal process of the product and the usage situation.

3.3.4 User experience constructs abstracted by the researcher

There is little consensus about what user experience constructs should be called. Researchers refer to the constructs that inform user experience as "elements" (Garrett, 2011; Rogers et al., 2011) or "factors" (Porter and Bewer, 2010; Rubinoff, 2004). These terms are used interchangeably in literature and appear to be synonymous. However, sometimes there appear to be slight variations in meaning. For example, the term “elements” may be used to describe aspects or characteristics of something abstract, such as the learnability of the system. While “factors” can refer to circumstances or influences, for example, that contribute to the result. In this study the term “constructs” will be used to refer to the system, context and user, while “elements” will be used for the abstract terms influencing the user experience.

The frameworks discussed by Hassenzahl and Tractinsky (2006), and Mahlke (2008) incorporate emotions associated with user experience design (emotional design). In the context of product design and the evaluation thereof, emotional responses play an important role because these influence the users’ intention to use the product and how they discuss the product with others. It is for this reason that it is necessary to investigate and find user experience evaluation frameworks that can be used in the design and development of the User Experience Evaluation Framework for eModeration.

3.4 User experience frameworks

A review of user experience literature has indicated that the existing user experience frameworks are based on different approaches. Forlizzi and Battarbee (2004) identified three different approaches to user experience frameworks:

1. Product-centred: These assist with formulating products that create a compelling experience;
2. Interactive-centred: These take into account how people engage with products and their environment; and
3. User-centred: These generate a better understanding of the user.

Preece et al. (2009) followed a user-centred approach when they investigated the use of artifacts and target domains. It was important to Preece et al. (2009) to seek the users’ opinions and reactions to early designs and to involve the users from a very early stage of development. Paul, Roenspieb, Mentler and Herczeg (2015) followed a human-centred design approach in the design of their Usability Engineering Repository tool, because they felt that user-centred analysis, design and evaluation did not sufficiently support or consider users’ tasks and overall context.

This section presents some of the user experience frameworks that have been used for websites. It is, however, important to note that the eModerate web page is not a website where a user can purchase a product or find information. An eModerate website has a specific purpose. It contains specific content; it is not accessible to all — only those with login details can access the web page — it is controlled by an eLearn developer and it is relevant to higher education institutions that embrace the principles of moderation. As a result, it was necessary to investigate which existing user experience frameworks could be used or adapted to aid in the design of an appropriate User Experience Evaluation Framework for eModeration.

The user experience frameworks presented in this section represent some of the roles of usability in the creation of a good user experience for general websites:

- User Experience framework (Mahlke and Thüring, 2007)
- User Experience framework (Kort, Vermeeren and Fokker, 2007)
- Framework of User Experience influencing factors (Schulze and Krömker, 2010)
- M-health User Experience framework (Ouma, 2013)

3.4.1 User Experience framework according to Mahlke and Thüring (2007)

Mahlke and Thüring's (2007) framework for user experience contains three central components, namely instrumental (usefulness, usability) and non-instrumental (aesthetics, symbolic, motivational) quality perceptions, and emotional user reactions such as subjective feelings, motor expressions, physiological reactions, cognitive appraisals and behavioural tendencies. Figure 3.10 shows Mahlke and Thüring's (2007) user experience framework with its components and consequences.

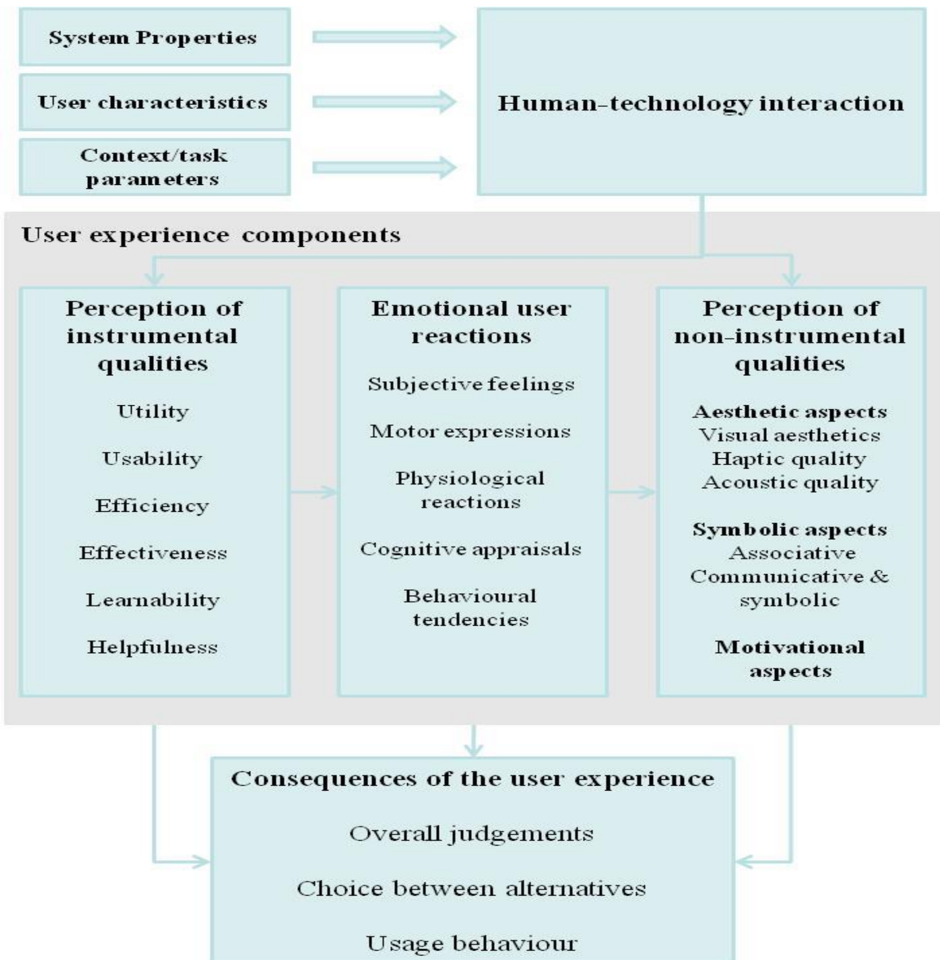


Figure 3.10 User Experience framework (Mahlke and Thüring, 2007)

The interaction characteristics of the user depend on the system properties, user characteristics and the context of the task. The overall outcome of the user's interaction with the three components identified by Mahlke and Thüring (2007) is the user experience. Mahlke and Thüring (2007) tested this user experience framework with portable audio players that differed in terms of design aspects. The participants in the study had to complete four tasks after which they had to complete a questionnaire which assessed their ratings on different experience criteria (usability as instrumental qualities; visual aesthetics; haptic quality and symbolic quality as non-instrumental qualities). The questionnaire further assessed the users' emotional reactions. The end result demonstrated that aspects associated with instrumental quality, such as the usability of the system, had a substantial influence on the emotional reactions of the user. It also showed that the non-instrumental aspects played a significant role. Overall all three components had an influence on the overall judgements of the users.

3.4.2 User Experience framework (Kort, Vermeeren and Fokker, 2007)

Kort et al.'s (2007) user experience framework consists of two layers — an inner and an outer layer as illustrated by Figure 3.11 below.

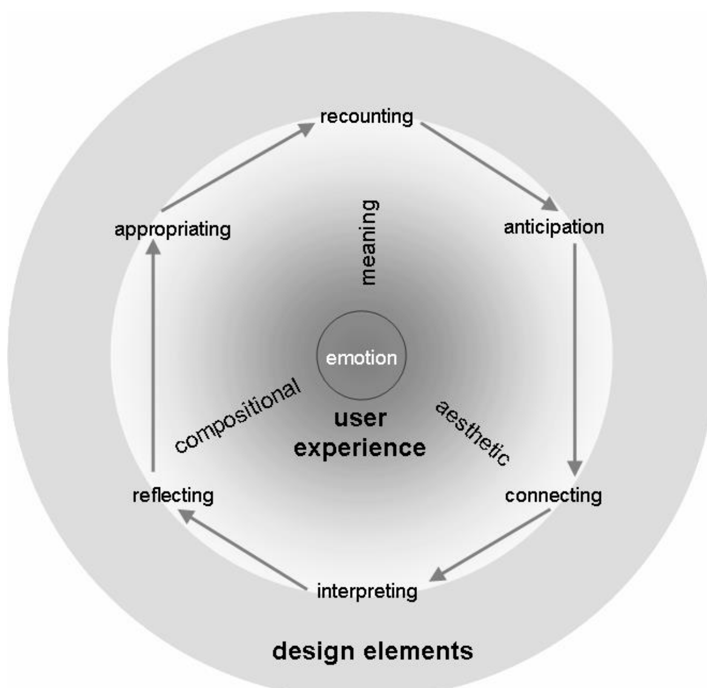


Figure 3.11 User Experience framework (Kort, Vermeeren and Fokker, 2007)

The inner layer of Kort el al.'s (2007) user experience framework consists of the following aspects:

- **Compositional aspects:** Compositional aspects refer to how the users interact with the product. These aspects are closely related to usability and the results reflect the users' experience when interacting with the product. Compositional aspects can assist with understanding how a product works, what has happened and what will happen, which users used the system, where they were and how satisfied they were with using the product. The compositional aspects also cover the functional and practical properties.
- **Aesthetic aspects:** Aesthetic aspects refer to the look and feel of the product — the font, colours, graphics and sound used. The experience that the user will have with the aesthetic aspects may lead to feelings such as excitement, joy or fear when looking at the product.
- **Aspects of meaning:** Aspects of meaning are experience aspects that a designer creates by identifying users' goals, needs and desires. These aspects can result in feelings of joy, anger, satisfaction or fulfilment.

Each of the aspects mentioned in Kort et al.'s (2007) framework represent design elements used to create an experience at a specific experience level. The design elements that influence user experience are:

- **Recounting:** Recounting occurs when the user shares his or her experience of a product with others. Through sharing, the user relives the experience of finding new possibilities, which means that the experience is re-evaluated.
- **Anticipating:** Anticipation means that a user will bring prior familiarity with a similar product to an experience.
- **Connecting:** Connection deals with components that might have an impact on the types of user responses. Experiencing a connection might result in a sense of being enthralled based on the aesthetic aspects of the product's design.
- **Interpreting:** Interpretation refers to the feelings that arise when a user interacts with a product as well as the user's expectations when performing the tasks. The user might experience a sense of excitement or anxiety that leads to emotions

such as the desire to either get away from the situation or to continue using the product.

- **Reflecting:** Reflection refers to the judgement made regarding the user's experience with the product while interacting with it. A positive user experience can be associated with a feeling of satisfaction while a negative user experience can lead to a feeling of boredom.
- **Appropriating:** Appropriation means that experiences are compared to previous experiences and the comparison then becomes a benchmark for future experiences.

3.4.3 Framework of User Experience influencing factors (Schulze and Krömker, 2010)

According to Schulze and Krömker (2010) designers need to identify the direct and indirect factors that influence user experience in order to make user experience measurable. Figure 3.12 illustrates the user experience framework as formulated by Schulze and Krömker (2010) which includes these influencing factors.

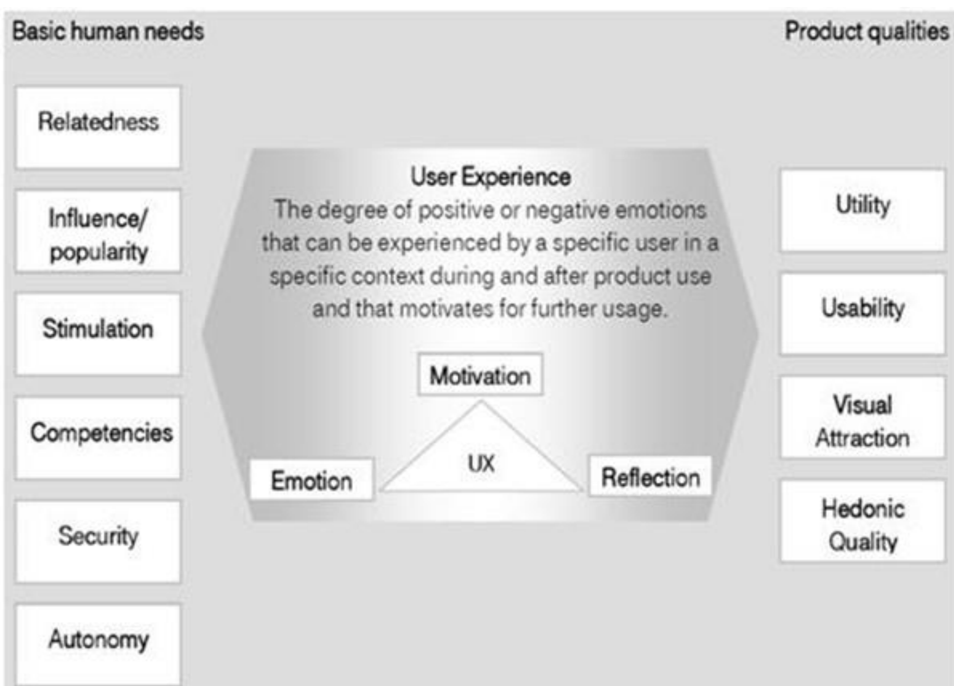


Figure 3.12 Framework of User Experience (Schulze and Krömker, 2010)

The users' experience during and after product use are utilised as the influencing factors. The satisfaction and or frustration levels experienced by users when using interactive products are usually influenced by product qualities, e.g. utility, usability, visual attraction and hedonic qualities as defined by Hassenzahl (2008a) and Hassenzahl et al. (2015).

3.4.4 M-health User Experience framework (Ouma, 2013)

Ouma (2013) designed a framework for use in the South African health sector. The M-health User Experience framework is divided into three domains:

- **Mobile use user experience components**: Mobile user experience components that contribute to the M-health user experience include mobile design, mobile context, marketing and mobile use.
- **M-health technology requirements**: The technology available to support M-health interaction can influence users and their user experience, and can even discourage users from using the system. Factors that Ouma (2013) considered under M-health technology requirements include:
    - M-health applications that look into issues related to user pragmatic goals, design principles, design processes and user experience goals.
    - Mobile devices that include not only the hardware, but also the software that will be used and which may affect the use of M-health interaction.
    - M-health infrastructure which includes providers, hardware and software required for the use of telemedicine services. Infrastructure also includes quality and sustainability issues.
    - Digital technology which encourages the use of open-source software. Under digital technology privacy issues, usability and interoperability issues were discussed and covered.
- **Domain requirements**: In this framework domain requirements refer to requirements tailored to South African public hospitals. Aspects which could positively add to the enhancement of M-health user experiences include m-health vision and mission, m-health stakeholders, m-health policies, m-health needs, funding issues, research, political will, level of hospitals, stewardship and cultural aspects.

3.4.5 Discussion of existing User Experience frameworks

The concepts and principles used in Mahlke and Thüring's (2007) user experience framework (see Section 3.4.1) can be adapted to support a user experience evaluation framework for eModeration, although the devices on which it was tested were audio players. An eModeration system also involves specific *users* in specific *contexts* and specific *systems*. The framework also acknowledges that how the user interacts with the product will have an impact on the user experience, especially with respect to instrumental qualities, non-instrumental qualities, and user reaction. These findings can be used in the formulation of a user experience evaluation framework for eModeration.

Kort el al.'s (2007) User Experience framework (see Section 3.4.2) includes composition (usability), aesthetics and aspects of meaning that are also important to the user experience of eModeration, but these aspects alone will not generate enough information to create a user experience evaluation framework for eModeration.

Schulze and Krömker's (2010) User Experience framework (see Section 3.4.3), which includes influencing factors, as shown in Figure 3.12, is relevant to this study in terms of product qualities and user experience, but lacks the appropriate context needed for a user experience evaluation framework for eModeration.

Ouma's (2013) M-health User Experience framework presented in Section 3.4.4 contains domains that are relevant to a typical eModerate system which also has user experience components (constructs), technology requirements and specific domain requirements. A user experience evaluation framework for eModeration is created for a specific context or domain and therefore requires specific technology before it can be used to contribute towards a good user experience.

Having discussed all of these frameworks the researcher ascertained that the following areas were important to consider in terms of this study. This study used the existing frameworks as discussed in Section 3.4 to investigate which user experience constructs in different contexts could contribute to a user experience evaluation framework for eModeration using an eModerate system. The researcher also utilised the measurement instruments that were used in the frameworks to assist in the design of this study's survey instrument (the questionnaire), for example Ouma (2013) and Moczarny (2011).

Section 3.4 assists in answering RQ2: "Which existing user experience frameworks are relevant to the evaluation of electronic moderation systems?" The next section will look at how user experience can be measured.

3.5 Evaluating User Experience

The discussions in the previous section demonstrated that user experience is a complex construct, which encapsulates aspects of the users' inner state, product characteristics and usage context. A user experience evaluation framework that works in one environment and context cannot necessarily be applied or adopted successfully into another. The majority of existing user experience frameworks are designed and developed for commercial websites or to determine the users' experience when searching for information (i.e. interacting with a product) and not for interaction with eModerate systems.

As can be seen from the previous discussions in Section 3.2, the definition of user experience includes the user, the product, and the usage situation, which means that these constructs should be included in the evaluation methodology. The developer can control and evaluate the product and its instrumental (e.g. utility, usability) and non-instrumental (e.g. aesthetic, symbolic or motivational aspects) qualities, but it is more difficult to transcend the internal state of the user and the changing context in which the product is used (Zimmerman, 2008). Different perspectives have been identified within the user experience approaches proposed by Batterbee (2004), Hassenzahl and Tractinsky (2006), Law et al., (2014), Mahlke (2008) and Tractinsky (2013) to evaluate user experience. Hassenzahl and Tractinsky (2006:92-95) have identified three threads that contribute to the understanding of users' interactions with technology:

- Beyond the instrumental: Here the focus is on the users' needs going beyond the instrumental aspects of interaction that deals with the achievement of behavioural goals (Hassenzahl, 2004). Hassenzahl and Tractinsky (2006:93) recommend that users should "[enrich] current models of product quality with non-instrumental aspects to create a more complete, holistic HCI". On this basis it is important to focus on the users' needs in order to achieve a goal by supplementing these with non-instrumental aspects to create a more holistic user interaction experience.

- Affect and emotion: Here the focus is on how emotion influences the quality of interaction, while affect is seen as a consequence of interaction or how the users' emotions change when interacting with the product.
- Experiential, holistic, non-reductionist: Here the focus is on the experience as a whole, not just the measurable elements of user experience.

Figure 3.13 summarises Hassenzahl and Tractinsky's (2006) view on which attributes of user experience should be evaluated. Figure 3.13 also shows how technology can fulfil more than the instrumental needs, by acknowledging user experience as a subjective, situated, complex and dynamic encounter.

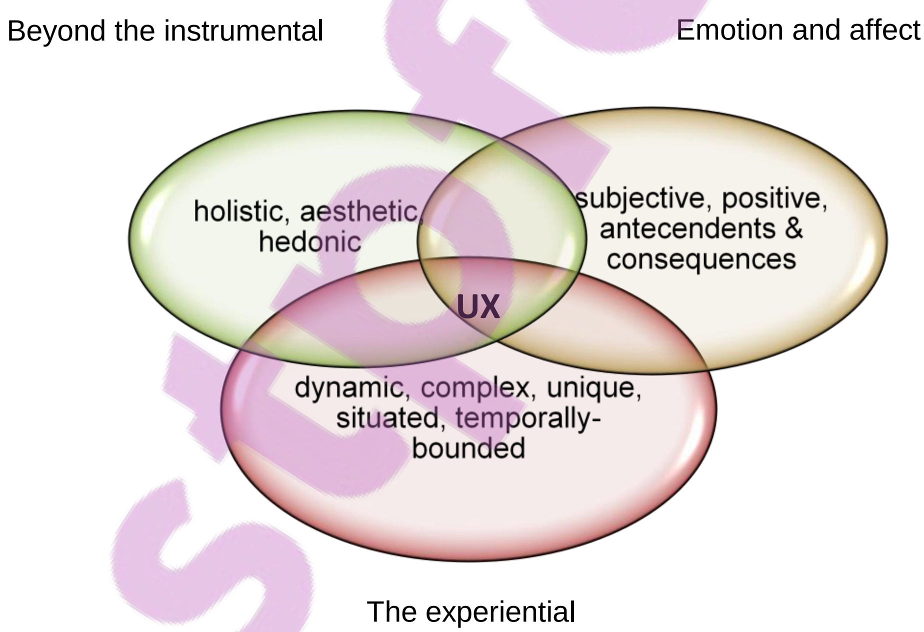


Figure 3.13 User Experience (Hassenzahl and Tractinsky, 2006)

In Mahlke's (2008) opinion the approach to user experience evaluation should be based on non-instrumental qualities, emotion and affect, while Batterbee (2004) places user experience theories into three categories: person-centred frameworks (what do people need), product-centred frameworks (design and research checklists), and focus on the action frameworks (interaction). Batterbee (2004) treats emotions as a separate area of user experience. The researcher agrees with Mahlke (2008) that the user experience evaluation approach should be based on non-instrumental qualities, emotion and affect. The researcher also agrees with Hassenzahl and Tractinsky's (2006) recommendation of focusing on the user's need to achieve a goal by supplementing it with non-instrumental aspects in order to create a more holistic user interaction experience. The focus of evaluation will be a holistic approach to experience not just the measureable elements of user experience.

The holistic view of user experience includes all aspects of the user, the product and the usage situation. Furthermore, it includes the temporal aspects of all of these components. The problem, however, is how to measure and control such an experience in all its complexity. Another concern with regards to emotion and affect is the lack of a common understanding of which emotions are actually important in the context of user experience. Gomez, Zimmerman, Schar and Danuser (2009) identified the following problems with the evaluation of emotions:

- Emotions tend to last a short while thus the measurement has to be precise or retrospective.
- Retrospective assessment can be subject to distortions.
- Emotions are subjective. Although instruments that distinguish a few emotions objectively from each other exist, an accurate account of what the user feels can only come from the subjective self.
- Emotions are not necessarily conscious, and it is not always possible to self-assess emotions.
- It is also unclear which distinct emotions humans can feel and how much they feel.

Evaluation heuristics have been developed specifically for web pages, but the focus is on usability rather than on the experiential aspects of user experience (Nielsen and Molich, 1990; Väänänen-Vainio-Mattila and Wäljas, 2009) and no user experience heuristics have been developed for web services.

As mentioned by Moczarny (2011), user experience is largely related to the emotions that the user has while engaging and interacting with the system. It is, however, not just the emotions of the user that need to be measured, but also the user's perception of the product and his or her overall judgement of the product. Väätäja, Koponen and Roto (2009) believe that in order to study the attributes of user experience practical tools are needed to support the assessment of user experience. According to Law et al. (2009) and the ISO DIS 9241-210 (2010) user experience cannot be evaluated using a stopwatch because of its subjective nature. Measures such as task execution time and number of clicks (Tullis and Albert, 2008) are not reliable measures for user experience due to their objective nature (Moczarny, 2011; Obrist, Roto, Väänänen-Vainio-Mattila, 2009). According to Mäkelä and Fulton Suri (2001), the motivation and expectations of the user affect the experience more than usability. It is, however, necessary to mention and recognise that a level of usability is required for positive user experience (Hartmann, De Angeli, and Sutcliffe, 2008; Law, 2011). Law (2011), Law et al. (2009), and Obrist et al. (2009) believe that user experience is also context dependent (where, when, who and how), which means that the experiences of a user with the same design in different conditions is often different.

Väänänen-Vainio-Mattila and Wäljas (2009) established a set of user experience heuristics that can be used in user experience evaluation. It can be concluded that user experience evaluation cannot be conducted only by observing a user's task in a laboratory test. As mentioned previously in the chapter, user experience is associated with the emotions of the users while interacting with the system.

The evaluation or measuring of user experience tools has been examined in a number of quantitative (Desmet, Tax, and Overbeeke, 2000; Hassenzahl, 2005; Jordan, 2000; Regan, Mandryk, Kori, Inkpen, Thomas, and Calvert, 2006) and qualitative (McCarthy and Wright, 2007) studies. Wimmer et al. (2010) identified drawbacks to methods that continuously measure user experience without disturbing the user. These are complex to set up and difficult to analyse because additional input is needed for interpreting specific aspects of the data. Qualitative approaches extract features via subjective methods such as questionnaires, interviews and video observations (Alexandros and Michalis, 2013). Walji et al. (2014) recommend the use of multiple evaluation methods in order to provide a comprehensive approach to identifying usability challenges and specific problems. A drawback of qualitative video observation is that it is time consuming, not real time and not continuous. To overcome such drawbacks Alexandros and Michalis (2013) used innovative methods such as facial expression recognition, speech tone and key stroke analysis. This approach was supported by Bartneck and Lyons (2007), Epp, Lippold and Mandryk (2011) and Jonghwa and Elizabeth (2006). Müller, Law, and Strohmeier (2010) state that qualitative data is required to supplement quantitative results. Qualitative approaches also appear to be more desirable in the arena of user experience research (Law, 2011). Bargas-Avila and Hornbeak (2011) identified the following list of user experience data collection methods: questionnaires, interviews (semi-structured and open), user observation, video recordings, focus groups, diaries, probes, collage, photographs, body movements, and psycho-physiological methods. For the purpose of this study, questionnaires and interviews were used to evaluate the users' experience of the eModerate system. A survey was used to measure user satisfaction, perceptions and evaluations in order to gain deeper insight into various user experience concerns. This will be discussed in Chapter Six.

Literature based heuristic evaluation was used to identify the constructs that support users' experiences of eModerate systems. These identified constructs have been used as criteria for the evaluation of the artifact in Chapter Six that forms part of the knowledge base in the Design Science Research study of the user experience of electronic moderation systems.

3.5.1 Heuristics as a means of evaluating user experience

Heuristics can also be used to evaluate user experience on websites. Väänänen-Vainio-Mattila and Wäljas (2009) designed and developed six heuristics for the evaluation of user experience on websites as shown in Table 3.2. Table 3.2 also illustrates how heuristics were used in this study to evaluate the user experience of eModerate systems.

Table 3.2 Heuristic criteria by Väänänen-Vainio-Mattila and Wäljas (2009:3680)

Heuristic number	**Heuristic description**	**Heuristic explanation**
1	"Usage and creation of composite services"	Is there functionality for users to add new service components as they become available? This is applicable to sites such as social media where users can join friends, upload images, update their status or post messages. It is also applicable to eModeration where users need to upload examination scripts.
2	"Cross-platform service access"	Can users access the service elements they need on their PCs as well as on mobile phones? Most companies develop a website as well as a mobile site. Will the users be able to access the information they require from both technologies? Will users of eModerate systems be able to access these systems using different devices?
3	"Social interaction and navigation"	"Can users interact with other users and apply the navigation histories of other users to their interaction with the service?" Social interactions are not that relevant to eModeration, but navigation is very important. Users will interact, but not on a social basis.
4	"Dynamic service features"	Can users identify changes in the user interface and determine how to interact with the modified services? This heuristic is highly relevant to eModeration because the users need to know if they have successfully uploaded or downloaded the work.
5	"Context-aware services and contextually enriched content"	"Does the service adapt to the users' context of use and offer meaningful contextual information associated with the contents?"

Heuristic number	Heuristic description	Heuristic explanation
		In the context of eModeration it is important that contextual information provided by the system is associated with the contents.
6	“General user experience-related issues”	Is the user interface usable and aesthetically pleasing, supportive of users’ trust and privacy, and other experiential aspects? The system should be usable, support users in completing their task and be trustworthy.

The principles of heuristics were used to evaluate the user experience of eModerate systems and will be discussed further in Chapter Six.

It is clear that the design of websites is fairly complex and that the designs are influenced by many factors that have an impact on the users’ experience of the system. It is also important for designers to study their target users in order to understand what they prefer and what they base their preferences on, i.e. usability, information quality or aesthetics (Keinonen, 1997).

The next section discusses user experience in the context of eModeration and uncovers some relationships between them.

3.6 User experience in the context of eModeration

In order to assist the designers of an eModerate system with understanding the user experiences involved in the interaction with the eModerate system at a given place and time, it was necessary to investigate the relationship between user experience and eModeration. As indicated in Section 3.2.1, usability attributes can have an impact on user experience. In the context of eModeration it is important to identify which usability and user experience constructs are relevant to the electronic moderation system being evaluated.

A mapping of Rubinoff's (2004, 2009) *factors*, Paluch's (2006), Hassenzahl and Tractinsky's (2006), and Roto's (2006) *elements*, and *eModerate actors* is illustrated in Table 3.3. The authors mentioned in Table 3.3 all refer to key constructs that should be considered in the identification of eModeration user experience constructs, such as system, usability, content, context and user. Rubinoff (2004, 2009) use the term functionality, Paluch (2006) use "fluidity of interaction", while Hassenzahl and Tractinsky (2006) and Roto (2006) refer to the same constructs as system, to demonstrate the requirements associated with how a *system* should work in order to ensure user experience. As indicated in Table 3.3 all the authors agree that *usability* are a very important part of user experience, especially in relation to eModeration. Hassenzahl (2013) as well as Roto (2006) identified *context* as important which also relate to the user experience of eModeration. The last construct internal state of the *user* as described by Paluch (2006), Hassenzahl and Tractinsky (2006, Hassenzahl (2013) and Roto (2006), for example, quick and easy progression when interacting with an system in this case an eModerate system, will have an impact on the user experience of users when using an eModerate system. Although the functionality of the eModeration system is a necessary precondition for the acceptance of the product, the hierarchical organisation of user needs (early or late adapters), the product and or context is dependent on the usage context. In an eModeration environment the usage context includes the aim of the product use, i.e. to electronically moderate examination scripts (Van Staden, Van Biljon and Kroeze, 2014).

Table 3.3 Mapping between User Experience constructs with eModerate systems

Con-struct	Rubinoff (2004, 2009)	Paluch (2006)	Hassenzahl and Tractinsky (2006); Hassenzahl (2013)	Roto (2006)	Relevance of UX for eModerate
System	**Functionality**: • Timely response to submission and query. • Task progress clearly communicated. • Application adheres to security and privacy standards. • Online functions are integrated with offline business processes. • Administration tools enhance administrator efficiency.	**Fluidity of interaction**: • The ability to input information. • Quick response time from system. • Intuitive workflow. Quick and easy progression to feeling comfortable with the system (short learning curve).	**System**: The characteristics of a system comprise the following: • Complexity • Purpose • Functionality	**System**: • Products • Objectives • Services • People • Infrastructure • Involvement in interaction	For the people and processes involved, how functional is the eModerate system with respect to fluidity of interaction and progress? How functional is the task progress? How functional is the security? How functional are the tools that enhance administrative efficiency? How functional is the infrastructure?

Con-struct	Rubinoff (2004, 2009)	Paluch (2006)	Hassenzahl and Tractinsky (2006); Hassenzahl (2013)	Roto (2006)	Relevance of UX for eModerate
Usability	**Usability**: • Navigation and accessibility. • Visitors accomplish common goals and tasks. • Site adheres to its own consistency and standards.	**Usability**: • Effectiveness • Efficiency • User satisfaction	Usability	Usability	How usable will the system be for the users? How effective and efficient are the processes to be followed in the eModerate systems? How usable is the navigation and accessibility of the eModerate system? How consistent is the design and layout and what impact will it have on usability?
Context			**Context**: The context refers to the environment in which the user operates and is affected by: • Organisational setting; and Meaningfulness of the activity.	**Context**: • Infrastructure • Services • People Technology contexts also contribute to the interaction of users with a product.	Which features does the eModerate system provide? The organisational setting should be appropriate for an eModeration context.

Con-struct	Rubinoff (2004, 2009)	Paluch (2006)	Hassenzahl and Tractinsky (2006); Hassenzahl (2013)	Roto (2006)	Relevance of UX for eModerate
Content	**Content**: • Links density and provides clarity and easy navigation. • Content is structured in a way that facilitates the achievement of user goals. • Content is up to date and accurate. • Content is appropriate to customer needs and business goals.	**Content:** • Comprehensibility of the information and features. • Accuracy of information presented.			Is the information provided accurate? Is the information comprehensive and meaningful? Is the information up to date? Is the content relevant to eModeration?
	Branding	Not applicable			Not applicable to the eModerate system because the system will not be selling any product.

Con-struct	Rubinoff (2004, 2009)	Paluch (2006)	Hassenzahl and Tractinsky (2006); Hassenzahl (2013)	Roto (2006)	Relevance of UX for eModerate
User		**User:** Quick and easy progression to feeling comfortable with the use of a product or system. Pleasing appearance of the interface which user will be interacting with.	**User:** The user's internal state can be made up of: • Expectations • Needs • Motivation • Moods; and • Predisposition. Thus it can be said that user experience is a consequence of a user's internal state.	**User:** • Physical context • Social context • Temporal context • Task context	To what extent does the user's internal state, specifically their emotional state, play a role in the user's experience? The user's physical, social, temporal and task context should be appropriate to eModeration. Identify the user's expectations, needs, motivations and predisposition.

As with the term “user experience”, there is no clear definition for “eModeration user experience”. Appropriate research has not been done to provide constructs that make up the eModeration user experience. Research exists in the area of eLearning, eCommerce and mobile user experience, but research in the area of eModeration and user experience is lacking. The proposed framework for the evaluation of user experience includes aspects of user experience that will support academic processes which users will follow in the virtual learning environment known as eModerate. Section 6.2 will further discuss the design and development of the conceptual framework based on the literature review conducted in the Chapter Two and Three. Section 3.6 assists in partially answering RQ1: “What are the most important user experience constructs for the electronic moderation system’s framework?”.

3.7 Conclusion

This chapter has defined the terms “usability”, “user experience” and “user satisfaction”. The relationship between usability and the user experience constructs has also been discussed (see Section 3.2). With regards to the debate between usability and user experience, the researcher views usability as part of user experience. In addition, the definition of user experience has been elaborated on in Section 3.3 where factors, elements and users’ internal states, as explored by different researchers, were also discussed. In this research the term “construct” has been used to describe the elements that make up user experience (see Section 3.3).

An investigation into existing user experience frameworks that could possibly be used for or adapted to a user experience evaluation framework for eModeration was discussed in Section 3.4.

In addition, various factors associated with the evaluation of user experience and usability (such as usability goals and user experience goals) have been described in Section 3.5 and will be used further in Chapter Six to design appropriate measurement instruments.

In Section 3.6 the researcher discussed and considered user experience constructs in the context of eModeration.

A challenge to the eModerator experience with an eModeration system concerns the number of times that eModerators access and use the system. It should be noted that many eModerators only used the system every six months or once a year. Therefore, it is important to ensure that the information architecture and flow goals are clear to the users so as to ensure that they can perform the activities and use the artifact (tools) successfully. During the research it was necessary to communicate the information needed in order to successfully complete the task to the eModerators. In an eModerate environment the users (deans and eModerators in terms of this study) must be able to access the information needed to perform their task satisfactorily. Success is determined by the functionality, content and usability of the system, as an overall positive user experience will be required. The constructs associated with user experience will also be influenced by the internal emotional state and motivation of the user, which forms part of user satisfaction as illustrated in Figure 3.5.

It can be concluded, based on definitions and frameworks associated with user experience, that a user experience evaluation framework for eModeration should have the following levels:

- Environment (context);
- eModeration Requirements (system); and
- eModeration User Experience constructs.

Work done by Hassenzahl (2014), Hassenzahl and Tractinsky (2006) as well as Roto (2006) indicates that the user, system and context form part of the user experience. In this study, the system is the eModerate system, the users are the managers (deans) and eModerators, while the context is private higher education institutions (see Section 6.2).

The next chapter will discuss the research design framework that was followed in order to design and develop the artifact called User Experience Evaluation Framework for eModeration.

Chapter Four: Research design

4.1 Introduction

This study made use of the Design Science Research approach. This chapter provides a discussion of the research design also see Figure 1.1, Research Onion integrated with Design Science Research and Figure 1.2 overall structure of thesis. Design Science Research involves building an artifact to solve a problematic situation, and then evaluating that artifact (Hevner et al., 2004). This chapter details the research design specifications that were used to conduct the study, the process followed and how the research arrived at viable findings.

The first section of this chapter pays attention to the identification of the problem that motivated the research. The problem and the research area were analysed according to Design Science Research requirements and outcomes. Thereafter, the research objectives and scope were identified by looking at the design considerations for a user experience evaluation framework for eModeration for private higher education institutions, with a focus on user experience and eModeration. A Design Science Research iterative process as suggested by Hevner and Chatterjee (2010), and Peffers et al. (2006) was used to design, test and evaluate (Sonnenberg and Vom Brocke, 2012a) the user experience of eModerate systems as follows:

- The first iteration involved the design and development of a conceptual framework based on the literature review.
- The second iteration identified the user experience constructs that were relevant to eModeration and then refined the conceptual framework.
- The third iteration tested the conceptual framework with eModerators.
- The fourth iteration evaluated the conceptual framework with a second private higher education institution.

The research was undertaken in an area with little pre-existing research as discussed in the literature review presented in Chapter Three. Systematic searches were conducted using EBSCOHOST, and the electronic libraries ACM and AIS.

The second section considers the research ontology and epistemology. Before the research methodology can be discussed, it is important to first understand the epistemological and ontological stances adopted for this particular research, namely how the research identifies and defines “the truth” and the view of “the world”. It is important to define these concepts in terms of the research as these guide the way in which the research questions were answered and also had an influence on the methodology used in the study. This study adopted an interpretive approach as its “world view” and made use of mixed methods for data collection.

The third section discusses Design Science Research as a methodology used to answer the research questions. The Design Science Research was chosen because of the practical nature of the problem. Design Science Research offers a means of combining design and development with research. In order to provide the necessary insights into the research area and research problem, a case study was undertaken which has been discussed in the methodology section.

The research process consists of components such as motivations, a literature review, research question(s), conceptual framework, strategies (case studies), data generation methods (interviews, questionnaires) and quantitative and or qualitative data analysis (Oates, 2006). Myers (2013) recommends that a complete research project should consist of essential building blocks as shown in Figure 4.1. The figure also illustrates the logical flow of the research design chapter.

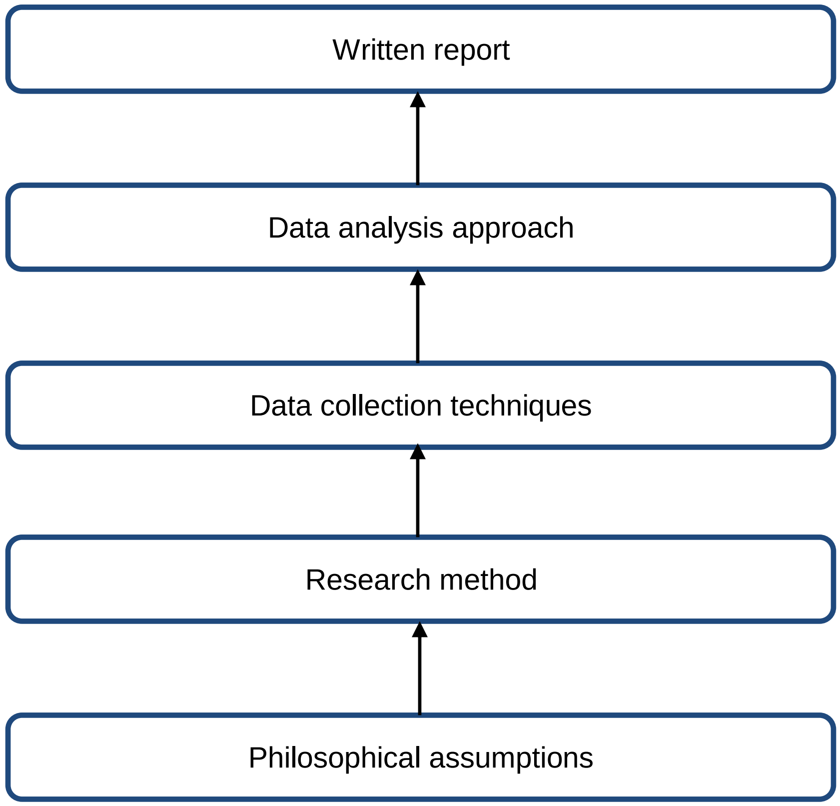


Figure 4.1 A model for Qualitative Research Design (Myers, 2013)

In the pursuit of understanding people, processes and user experiences related to electronic moderation, Design Science Research was used to construct and refine an artifact that evaluates the user experience of eModeration.

4.2 Research questions and approaches to answering them

The main research question that guided this study was:

What is an appropriate framework for measuring the user experience of an eModeration system?

In order to answer the main research question, key sub-questions needed to be answered first. These are outlined in Table 4.1, which maps each research question to the research strategy that was followed, indicates which chapter the sub-question is discussed in and provides details of the proposed objectives.

Table 4.1 Mapping of research questions to strategies

Mapping of research questions to strategies		
Research question	**Research strategy**	**Objectives**
What would be the most important user experience constructs for the electronic moderation system's framework?	This study made use of a Design Science Research strategy, and interpreted qualitative data collected through interviews.	To use a case study with an explicit focus on investigating eModerate systems. To identify criteria by conducting a study of existing literature in order to provide information on ways to evaluate usability and user experience. To gain an understanding of how user experience characteristics impact the design and development of the artifact.
What user experience frameworks already exist in literature which are relevant for evaluating electronic moderation systems?	Literature review found in Chapter Three.	To determine how existing user experience frameworks can be used/adapted/changed to suit a user experience framework for a virtual learning environment called eModerate. To gain an understanding of the user experience constructs and how these relate to one another.
Why do user experience issues influence the adoption of eModeration?	Communication and reporting during the Design Science Research process.	To gain an understanding of user experience issues and how these influence the users' adoption of eModeration. It is important to note that this study limits the focus to user experience and does not consider general adoption as modelled by technology acceptance models.
How do the insights gained influence the design of the framework?	Open-ended questions were used in the interviews with the deans of the faculties to determine their views on the user experience of the eModerate system, with the inquirer generating meaning from the data collected in the field. See Chapters Four, Five and Six. More details concerning design and development are provided in Chapter Six.	To obtain rich insight into the "life" of the case (faculties and moderators) and its complex relationships and processes. To understand how to use the process of design and development as a means of research. To understand how design knowledge can be captured and analysed.

Mapping of research questions to strategies		
Research question	**Research strategy**	**Objectives**
		The final outcome was to determine which of the constructs would form part of the framework used to evaluate the user experience of an eModerate system.

4.3 Research

Hasan (2003:3) defines research as, "Diligent and systematic enquiry or investigation into a subject in order to discover facts or principles which are accepted or professed rules of actions". Ellis and Levy (2010:111) define research as, "Addressing an acknowledged problem building upon existing literature and making an original contribution to the body of knowledge".

It is clear from the definitions that research seeks to address problems through the application of a systematic process of investigation, otherwise referred to as an enquiry, to generate knowledge. This knowledge can then be added to the current body of academic knowledge.

Research design refers to the plan or proposal to conduct research (Creswell, 2009) or a plan of how one intends to accomplish a particular task (Athanasou et al., 2014). In research, this plan provides a structure that informs the researcher as to which theories, methods and instruments the study will be using (Athanasou et al., 2014). Research design is the process of deciding on all of the components of a research project, namely philosophical assumptions, research method, data collection techniques, approach followed to analyse qualitative and quantitative data, and the approach to writing up (Creswell, 2009; Myers, 2013).

In this study, Design Science Research which incorporates the design and development of an artifact was used as a research method. According to Hevner et al. (2004:85) design can be defined as "the purposeful organisation of resources to accomplish a goal". Hevner et al. (2004) identified design as a process consisting of a number of expert activities with a product or an artifact being the end goal of these expert activities.

Design and development in the fields of IT and IS solutions is a creative process and is based on the application of systematic and diligent methods. IT and IS solutions are created for two reasons (Van Der Watt, 2011):

- to perform a specific function; and
- to address a specific need or identified problem.

The goal of Design Science Research is to utilise knowledge generated through the development and evaluation process (Hevner et al., 2004), while the goal of Behavioural Science Research (BSR) concerns "truth" (Joubert, 2012), discovery and justification (March and Smith, 1995). Design Science Research must pass the tests of both science and practice (Markus, Majchrzak and Gasser, 2002) and it is for this reason that the researcher has decided to use Design Science Research. The research problem is practical and Design Science Research allows the researcher to construct and evaluate an artifact, as discussed in Chapters Six through Eight. As Pirenen (2009:6) has stated:

> "Design Science must necessarily make a dual contribution to epistemic and practical utility. Any piece of research must add to existing theory in order to make a worthwhile scientific contribution and the research should assist in solving the practical problems of practitioners, specifically problems that are either current or anticipated".

The next section will briefly discuss the objectives and scope of the study followed by the various philosophical stances on Design Science Research.

4.4 Research objectives

As a result of the problems encountered in user experience and electronic moderation as described in Chapter One, this study aimed to develop a user experience evaluation framework that can be used to evaluate the user experience of electronic moderation.

To achieve this objective, the fundamental theoretical foundations of user experience and eModeration needed to be investigated. The investigation included finding out what fundamental user experience constructs were required in order to facilitate a satisfactory user experience in eModeration. It aimed to identify the fundamental “things” in user experience and eModeration that should be modelled into a framework. This was done by using the relevance cycle in Design Science Research which assists with defining the objectives, the focus of the research and a solution.

The Design Science Research design cycle was used to determine how the insights gained influenced the design of the eModeration framework for user experience, i.e. a user experience evaluation framework to evaluate the user experience of eModeration systems.

The iterative process of Design Science Research allowed the researcher to refine the framework and to test it at a different institution with a similar context, where new data elements could be effectively captured and represented thus leading to a better understanding of the user experience constructs that would from part of the proposed framework. The testing and evaluation of the framework also contributed to the rigour of the Design Science Research.

4.5 Research approach

The following section describes the philosophical underpinnings and worldview of the chosen research methodology: Design Science Research.

4.5.1 Philosophical underpinnings of research

It is important to identify the philosophical assumptions underpinning research as these influence its practice (Creswell, 2009). Myers (2013) states that every research project is based on some philosophical assumption about the nature of the world (ontology) and how knowledge about the world can be obtained (epistemology). According to Creswell and Plano Clark (2011) philosophical assumptions include how the researcher gained the knowledge about what they know, which then informs the use of a theoretical “stance”. The stance will determine the methodology used (strategy, plan of action or research design). Different stances influence how the researcher will conduct research and report on inquiries (Creswell and Plano Clark, 2011). In mixed methods research the philosophical assumptions consist of a set of beliefs or assumptions that guide the inquiries (Guba and Lincoln, 2005).

A research paradigm is defined as a set of conceptual frameworks which assist in explaining a particular theoretical approach to research (Coleman, 2006). It also covers aspects such as ontology, epistemology, teleology and methodology (Athanasou et al., 2014). Creswell (2009) describes worldviews as being a general orientation about the world and the nature of research that a researcher holds. Creswell (2009) identified four philosophical worldviews: postpositivism, constructivism, advocacy or participatory research, and pragmatism. However, Myers (2013) identified three philosophical worldviews: positivist, interpretivist and critical. The researcher has used Myer's interpretivist philosophical worldview, although Creswell's pragmatic worldview is also discussed in relation to this study.

Postpositivism represents the traditional form of research and its assumptions hold true for quantitative research more so than for qualitative research (Creswell, 2009). It is also known as the scientific method. Creswell (2009) asserts that knowledge gained through a postpositivist lens is based on careful observation and measurement of the objective reality that exists in the world.

Constructivist researchers often address the interaction among individuals, seeking to understand the specific context in which people work and live, as well as the historical and cultural settings of the participants. Researchers in constructivism also recognise and acknowledge that their own backgrounds shape their interpretation of the world around them and that this is influenced by their personal, cultural and historical experiences (Creswell, 2009).

Interpretivism focuses on reality as a human construction while its purpose is to acquire meaning and understanding (Kroeze, 2012). It is the intention of the researcher to make sense of (or interpret) the understandings that others have about the world. Kroeze (2012:47) states that "positivist IS research assumes a single reality and truth, while interpretivist research uses the point of departure of many realities and diverse explanations of the world". According to Hughes and Howcroft (2000) interpretivists usually favour qualitative methods, but also utilise quantitative methods. According to

Myers (2013), when using interpretivism the correct meaning of data is determined by the context (theory), a theory that helps the researcher understand the meaning and intentions of the people being studied. Interpretivists also assume that “meanings are emergent and depend on the context — it is these emergent meanings that they seek to elucidate” (Myers, 2013:41).

The advocacy and participatory worldview is typically seen in qualitative research but it can also be the foundation for quantitative research. Advocacy as a philosophical worldview focuses on the needs of groups and individuals in a society that might be marginalised or disenfranchised (Creswell, 2009).

Pragmatism as a worldview arises out of actions, situations, and consequences rather than conditions as in postpositivism (Creswell and Plano Clark, 2011). Pragmatic researchers emphasise the research problem and will use all approaches available to understand the problem (Rossman and Wilson, 1985). Pragmatism is also seen as a philosophical underpinning for mixed methods studies (Creswell and Plano Clark, 2011; Morgan, 2007; Oates, 2006). Pragmatism focuses attention on the research problem in social science research and then uses pluralistic approaches to derive knowledge about the problem (Morgan, 2007). Pragmatism focuses on the “what” and “how” of research, especially in Design Science Research.

This study supports the use of pragmatism which is also seen as a philosophical underpinning for mixed methods studies; it emphasises the problem and uses all approaches available to understand the problem. The research also used an interpretive philosophical worldview because of the subjective interpretation of participants’ views. Participants speak from meaning shaped by social interaction with others and from their own personal histories (Creswell and Plano Clark, 2011). In this study the eModerators’ previous experiences informed their expectations of the system.

In academic literature Design Science Research provides a means to conduct “practical” research in IS by combining design and development. Development is associated with practical or industry components in IT and IS and is not often associated with research. Combining design and development in this research is viewed as the most effective means of solving the problem in this case. Design Science Research assisted the researcher with the identification and understanding of what was required in order to design and develop an artifact that would assist educators and managers in private higher education institutions with evaluating the user experience of eModerate systems. Design Science Research is also used in the application of theoretical knowledge to achieve a goal. There is a continuing discourse on the worldview of Design Science Research which will be discussed in Section 4.5.2.

Ontology is the study of "being", existence or reality and includes assumptions that are made about certain phenomena (Du Plooy-Cilliers, Davis, and Bezuidenhout, 2014). Ontology deals with the main question of what reality is and if we can establish that it is real (Athanasou et al., 2014). The fields of moderation (quality assurance) and user experience are human constructs, and the proposed eModerate framework is a human construct that integrates characteristics from various academic fields into a coherent evaluation tool. Therefore ontologically the researcher is a relativist and believes that multiple realities exist since moderators and educators construct their own realities.

Epistemology attempts to clarify relations (the process) between the object of knowledge (the thing being examined or evaluated) and derived knowledge (product) (Niehaves, 2007). Epistemology is concerned with how something can be known (Athanasou et al., 2014; Mouton, 2001). Epistemology also guides how this knowledge is to be verified in order to constitute "true knowledge" and what the limits of knowledge are (Du Plooy-Cilliers et al., 2014). As Du Plooy-Cilliers et al. (2014) have rightfully indicated, all research is about knowledge, and each research study is expected to contribute towards the body of existing knowledge. On the epistemological level research was conducted from a subjective viewpoint (where knowledge is constructed from the subjective interpretation of participants). The subjectivity arose from the fact that there was a closeness between the researcher and the participants as the researcher was, at the time of the study, the dean of the Faculty of IT at MGI.

Table 4.2 provides a summary of the dominant research traditions in terms of their position in research (Du Plooy-Cilliers et al., 2014).

Table 4.2 Summary of dominant research traditions inferred by the researcher (Creswell and Plano Clark, 2011; Du Plooy-Cilliers et al., 2014)

	Positivism	**Interpretivism**	**Advocacy or Participatory worldview**	**Pragmatism**
Reason for research	Positivists want to discover causal relationships in order to predict and control events.	Interpretivists want to understand and describe meaningful social action and experiences.	Critical realists want to expose myths and empower people to transform society radically.	Pragmatists want to expose what works in practice.
Ontology — the nature of reality.	According to positivists reality is external and objective and the laws that govern it can be discovered (Creswell, 2009). A singular reality where the researcher rejects or accepts hypotheses (Devedzic, 2002; Creswell and Plano Clark, 2011).	Interpretivist researchers see reality as fluid and subjective and created by human interaction (Myers, 2013). Multiple realities where quotes are provided to illustrate different perspectives (Creswell and Plano Clark, 2011).	Critical realists think reality changes over time and is governed by underlying structures. Political reality where the findings are negotiated with the participants (Creswell and Plano Clark, 2011).	Pragmatists use singular and multiple realities, for example they test hypotheses and provide multiple perspectives (Creswell, 2009; Creswell and Plano Clark, 2011).
Epistemology — the relationship between the researcher and that being researched.	Experience is taken to be objective and independent of theoretical explanation (Myers, 2013). The generalisation is derived from experience and is independent of the investigator, methods and object of study (Myers, 2013). Epistemology is seen as distance and impartiality where the researcher objectively collects data on	Something is seen as knowledge when it feels right to those being studied. Common sense is an important source of knowledge. Data is determined through some theoretical interpretation and facts have to be reconstructed in light of the interpretation (Myers, 2013). The generalisation is derived from experience and is dependent on the	Knowledge should supply people with the tools needed to change their own world. Collaboration of researchers and participants as collaborators in the research (Creswell and Plano Clark, 2011).	Pragmatic researchers will collect data through “what works” to address the research problem (Creswell and Plano Clark, 2011).

	Positivism	**Interpretivism**	**Advocacy or Participatory worldview**	**Pragmatism**
	instruments (Creswell and Plano Clark, 2011).	researcher’s methods and interaction with the subject of study (Myers, 2013).		
Axiology — what is the role of values?	Unbiased where checks are used to eliminate bias.	Biased where the researcher actively shares his or her biases and interpretations.	Negotiated, for example, the researcher will negotiate their biases with participants.	Multiple stances — biased and unbiased perspectives.

In summary, in terms of the chosen paradigm the researcher's worldview in this study is of an interpretive and practical nature. The practical nature is important in the chosen research methodology which is Design Science Research. The following section will elaborate on the discourse surrounding the worldview of Design Science Research.

4.5.2 Worldview of Design Science Research

Hevner et al. (2004), Hevner and March (2003), as well as March and Smith (1995) argue that Design Science Research in IS research should adhere to two complementary views:

- the Behavioural Sciences in IS as a social science; and
- the Design Sciences in IS as a technical science — the science of the artificial.

Niehaves (2007), however, argued that Behavioural Science Research and Design Science Research are simply two complementary perspectives in IS research instead of two paradigms. Both Niehaves (2007) and Hevner et al. (2004) agree that Behavioural Science Research and Design Science Research are distinguished by:

- Behavioural Science Research being knowledge-producing or problem understanding, while
- Design Science Research is knowledge-using or problem solving.

Figure 4.2 illustrates the complementary research cycle between Design Science and Behavioural Science (Hevner and Chatterjee, 2010).

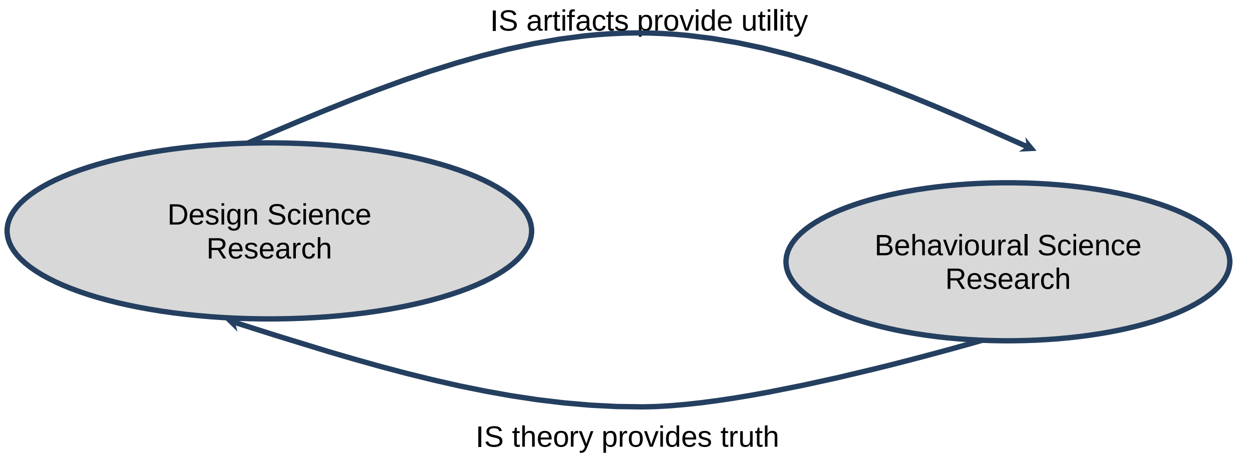


Figure 4.2 Complementary nature of Design Science and Behavioural Science Research (Hevner and Chatterjee, 2010)

Figure 4.3 demonstrates Niehaves (2007) views on Design Science Research and Behavioural Science Research as complementary types of research conducted within the IT and IS fields. Behavioural Science Research can produce knowledge through the study of artifacts together with the context in which these artifacts are used, while Design Science Research can apply knowledge to create artifacts (Van Der Watt, 2011; Niehaves, 2007). According to Van Der Watt (2011), an overlap exists between Behavioural Science Research and Design Science Research where Design Science Research can include aspects of Behavioural Science Research and Behavioural Science Research can include aspects of Design Science Research.

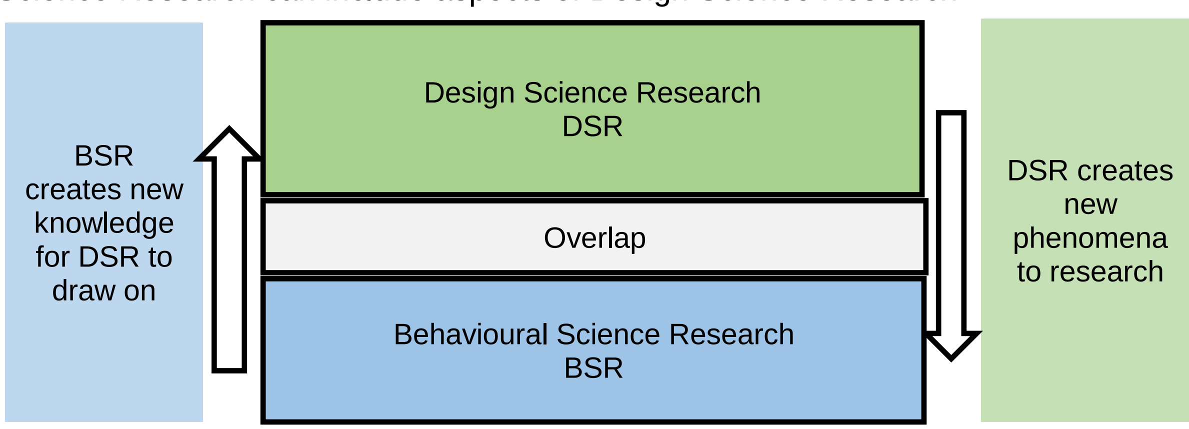


Figure 4.3 Interplay between Design and Behavioural Science Research (Van Der Watt, 2011)

Van der Watt (2011) and Purgathofer (2006) agree that the overlap is very important when discussing design methods, especially with regards to analysis and synthesis as fundamental concepts of the design process. Furthermore, it is recommended that before an attempt can be made to undertake solution development, the problem first needs to be understood or analysed (Van Der Watt, 2011). Where academic literature is insufficient to define and construct a solution, it is necessary first to use Behavioural Science Research methods to create some level of understanding and insight. It is therefore argued that it is acceptable for Design Science Research to use research methods that focus on “understanding” in order to apply research methods oriented towards “solving” because of the overlap between Behavioural Science Research and Design Science Research. A similar situation was faced in this research because of the limited pre-existing academic knowledge related to eModeration in the context of private higher education institutions.

Hevner and Chatterjee (2010) believe that arguments within Behavioural Science Research and Design Science Research philosophically draw on a pragmatic approach which argues that truth (justified theory) and utility (artifacts that are effective) are two sides of the same coin. They further suggest that scientific research should be evaluated in light of its practical implications. This means that the practical relevance of the research results should have the same value as the rigour of the research performed to achieve the results. Design Science Research should thus pass both tests of science and practice (Markus et al., 2002).

Behavioural Science is a theory-based research method that seeks to create and validate theories, which in turn explain and predict the behaviour of humans or organisations in relation to some form of IS-based artifact or solution (Hevner et al., 2004). It is the intention of Behavioural Science Research to understand the research problem (March and Smith, 1995; March and Storey, 2008). Design Science Research is a form of research in the field of IT and IS which seeks to solve IT-related problems by using and applying knowledge generated by Behavioural Science Research and kernel theories (Hevner et al., 2004; Van Der Watt, 2011). According to Hevner et al. (2004) and Niehaves (2007), kernel theories can be described as knowledge outside the IT and IS field. Hevner et al. (2004) assert that because artifacts are viewed as containing knowledge they can be used to accomplish the processes of analysis, design, implementation and management of the IS discipline. Indulska and Recker (2008) found Design Science Research to be strongly prevalent in the research domains of process, knowledge and information management.

This section has provided the philosophical underpinning of Design Science Research. The following section details the Design Science Research methodology undertaken as part of the research which was based on the concepts of design, construction and evaluation.

4.6 Design Science Research methodology

The research problem was discussed in detail in Chapter One. It is clear from the discussion that the problem is complex and contextual in nature. A detailed literature review followed in Chapters Two and Three on moderation, eModeration, and user experience. The literature review provided useful knowledge concerning moderation and user experience that aided the development of the initial conceptual framework. However, as there were few sources that were directly relevant or related to the area of research, there were still uncertainties even though the literature review provided good insight into the research domain. The literature review was conducted to supplement the literature analysis and to provide relevant information for the design science components. The literature review was also used to contextualise the research and to align the research findings with the academic literature.

As seen in the discussion in Section 4.5.2, it is possible for Design Science Research to make use of Behavioural Science Research. Design Science Research was used to find a solution to the problem by utilising knowledge and creating design artifacts, while Behavioural Science Research sought to gain insights and understanding into the problem being solved. Part of the study involved gaining deeper insight into the problem domain after the first iteration in order to refine the solution to the problem.

The following section first considers the way Design Science Research is perceived according to literature. Following that, the emphasis is on the justification in literature as to why design may be considered an acceptable research process. The final section looks at the nature of artifacts in the Design Science Research process. The next section considers how the academic literature perceives Design Science Research.

4.6.1 Different views of Design Science Research

Various names have been given to design-based research in IT and IS academic literature. These names include engineering type research (1994) (Gregor, 2002; Nielsen, 1994a), Design Science (1995) (Hevner et al., 2004; March and Smith, 1995), System Development approach (1997) (Hevner and Chatterjee 2010; Peffers et al., 2008), constructive type research (1998) (Gregor, 2002), Software Design Methodology (2003) (Hasan, 2003) and later, Design Science Research (Hevner et al., 2004; Peffers et al., 2012).

In the early 1990s the IS community began to recognise the importance of Design Science Research in improving the effectiveness and utility of the IT artifact in the context of solving real-world problems (Hevner and Chatterjee, 2010). Simon (1996:131) believed that “both the shape of the design and the shape and organisation of the design process are essential components of a theory of design”. Design Science, as conceptualised by Simon (1996), supports a pragmatic research paradigm, which calls for the creation of innovative artifacts to solve real-world problems. Design Science Research combines the IT artifact with a high priority on relevance in the application domain (Hevner and Chatterjee, 2010). The nature of the research problem is also a real-world problem that requires the creation of an innovative artifact to solve it.

The next section discusses Design Science Research as seen by the authors listed below, followed by a description of how Design Science Research has been used in this study:

- Nunamaker, Chen and Purdin (1991) defined five milestones in design and development;
- March and Smith (1995) developed a framework that concentrates on research outputs and activities;
- Peffers et al. (2006) developed a six phase model;

- Ellis and Levy (2010) developed the six phase design and development research approach;
- Hasan (2003) described the four stages of Design Science Research;
- Hevner et al. (2004) created the Information Systems Framework to conduct Design Science Research.

4.6.1.1 Nunamaker Design Science Research milestones

Nunamaker et al. (1991) identified the five milestones in design and development research as follows:

- construct the conceptual framework;
- develop the system architecture;
- analyse and design the system;
- build a prototype; and
- test and evaluate the prototype.

Nunamaker et al. (1991) were interested in integrating systems development into the research process and proposed a multi-methodological approach which included theory building, systems development, experimentation and observations. All of these elements are essential for complete research products.

4.6.1.2 March and Smith Design Science Research framework

March and Smith (1995) proposed a framework that distinguishes between research *outputs* and research *activities*. The first dimension of the framework is based on Design Science Research outputs or artifacts, i.e. constructs, methods, models and instantiations. The second dimension is based on broad types of design science and natural science research activities, i.e. build, evaluate, theorise and justify. March and Smith (1995) assert that IT research builds and evaluates constructs, models, methods and instantiations. It further theorises about these artifacts and attempts to justify these theories, while building and evaluating artifacts which have design science intent. Justification and theorisation have a natural science intent.

Hevner, March, Park and Ram (2004) and Simon (1996) adapted the design research traditions from other fields to the unique contexts of IS design research. This is especially evident in the work done by Simon in *Sciences of the Artificial* (Hevner et al., 2004; Simon, 1996).

4.6.1.3 Peffers et al.'s Design Science Research six phase model

Peffers, Tuunanen, Gengler, Rossi, Hui, Viranen, and Bragge (2006) argued that not enough research has been done in IS that explicitly focuses on the development of a conceptual process and mental model for carrying it out and presenting it in Design Science Research. Peffers et al. (2006) maintain that such a process and mental model might help IS researchers produce and present high-quality Design Science Research, that would be accepted as valuable, rigorous, and publishable. Peffers et al. (2006) decided to expand on Nunamaker et al. (1991) and Hevner et al. (2004) and developed the following six phase model:

- Identify the problem motivating the research.
- Set out objectives of the solution.
- Design and develop the artifact.
- Subject the artifact to testing by demonstrating the artifact's ability to solve one or more problems.
- Evaluate the results (artifact).
- Communicate the results.

Figure 4.4 illustrates Peffers et al.'s (2006) proposed Design Science Research Process Model. In their article Peffers et al. (2006) assert that their Design Science Process Model is consistent with the guidelines set out by Hevner et al. (2004) for the required elements of design research. The Design Science Research Process Model (Peffers et al., 2006) further provides a nominal process for conducting Design Science Research. In their paper they use two case studies to demonstrate the operation of their Design Science Research Process Model.

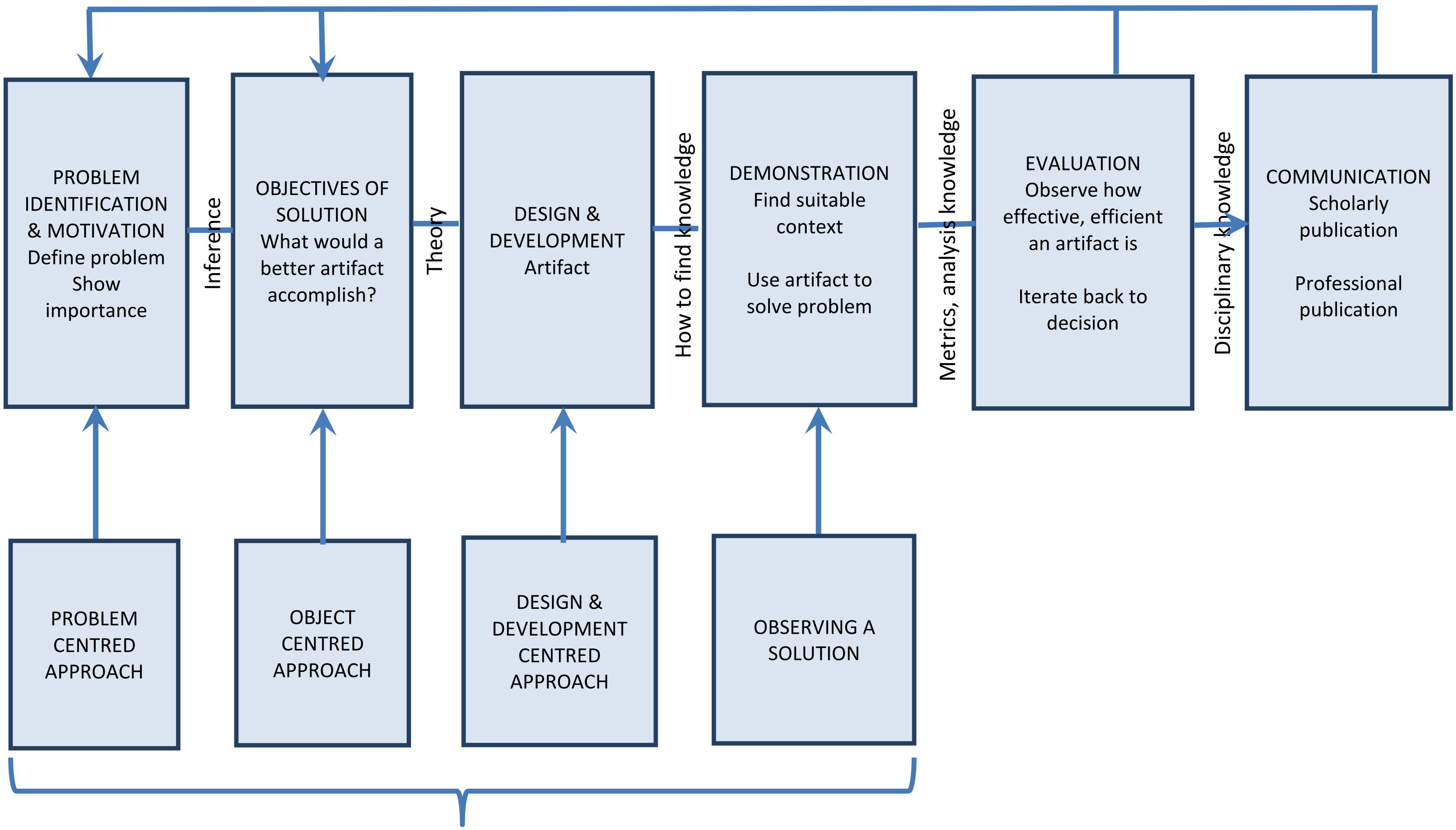


Figure 4.4 Design Science Research process model (Peffers et al., 2006)

Although the methodology presented by Peffers et al. (2006) differs from most of the other methodologies, it is worth noting that they demonstrate that produced research artifacts do address the research problem. It is also important to note that the applicability of the artifacts to solving the problem occurs before the artifacts are evaluated. These two activities should be done at the same time.

4.6.1.4 Ellis and Levy's six phase design and development Design Science Research approach

Ellis and Levy (2010) assert that Design Science Research attempts to bridge the gap between theories and practice. Researchers in the field of Design Science Research not only produce theoretical knowledge but also apply practical knowledge about a situation to the creation of an artifact (March and Smith, 1995; Van Der Watt, 2011). After applying knowledge to create the artifact, researchers in Design Science Research aim to explain why the artifact works or why it does not (Hasan, 2003) by means of evaluation of the artifact against criteria such as value and utility as discussed by March and Smith (1995). In listing the requirements for general academic research, Ellis and Levy (2010) stated that the research needs to:

- be driven by a problem appropriate to the research type ;
- be based on questions that can be answered by the type of research followed;
- acknowledge the assumptions, limitations and delimitations of the research;
- produce research results that can only be produced by applied methods; and
- produce conclusions that are based on the results produced.

Ellis and Levy's (2010) methodology for conducting Design Science Research includes a six phase design and development research approach: identify the problem, describe the objectives, design and develop the artifact, test the artifact, evaluate and test the artifact, and finally communicate the test results.

The first phase of Ellis and Levy's (2010) Design Science Research approach, "identifying the problem", is based on Hevner et al.'s (2004) factors of design-based research. These factors include environmental factors (requirements and constraints poorly defined), inherent complexity of the problem and solutions, the flexibility and/or the potential to change the possible solutions, solutions that are partly dependent on human creativity and interaction with some dependence on collaborative efforts to solve the problem.

In the design and development phase Ellis and Levy (2010), Hasan, (2003) and Nunamaker et al. (1991) recommend three important factors:

- Building a conceptual framework that includes system functionalities and requirements as well as techniques that can be used during the development of the requirement's specifications including interviews and literature review.
- Designing a system architecture based on a framework and analysing alternative solutions which include the identification of important decisions made during the design process, describe the alternatives considered, as well as provide a discussion of the rationale followed to support the alternative selected.
- Finally, building a prototype for testing and evaluation. The prototype is normally the artifact created in the design and development research endeavour. The building of the prototype is necessary in order to proceed to the testing and evaluation of the artifact.

Ellis and Levy (2010) identified three essential considerations during the testing and evaluation phases. First, ascertain whether the product does or does not meet the functionalities and requirements identified. Secondly, the evaluation must make use of processes supported by literature, and lastly evaluation must ensure acceptance of the value of the artifact.

The majority of the phases in Ellis and Levy's (2010) proposed approach to Design Science Research are more in line with their own guidelines for general academic research. Van Der Watt (2011) sees Ellis and Levy's (2010) proposed approach to Design Science Research methodology as a more general approach to research. The approach does not mention or emphasise the need for grounding research in existing knowledge in order to be relevant.

4.6.1.5 Hasan's four stages of Design Science Research

In opposition to Ellis and Levy's (2010) proposed Design Science Research methodology is Hasan's (2003) stages for Design Science Research. Hasan (2003) focuses on existing knowledge, originating both inside and outside the academic body of knowledge, with well-defined phases in which knowledge can be created. However, Hasan (2003) excludes the evaluation phase because he defines it as the third stage which intends to prove the concept and validity of the overall research. Table 4.3 shows Hasan's (2003) four stages of Design Science Research.

Table 4.3 Hasan's (2003) four stages of Design Science Research

Stage	Description
Concept design	During the concept design phase an in-depth literature review is conducted along with interviews and communication with knowledgeable practitioners. During this phase the researcher finds existing knowledge in order to apply it to the problem domain, making, adapting and amalgamating the existing knowledge where needed.
Constructing the architecture of the system	In the construction of the architecture of the system the researcher creates new knowledge, defines components' models, algorithms and data structures by using previously designed concepts.
Prototype	In the prototype phase the researcher attempts to prove the concept or to evaluate the prototype. In this phase the prototype will also provide new insights into the problem it is attempting to solve and about the system.
Product development	During the product development stage the researcher will formalise the system specification to create and test a robust system. During this phase the product is made for a client or sponsor or for commercial purposes.

Hasan's (2003) proposed methodology for Design Science Research seems to be more concerned with the development of commercial products than with research. Hasan's (2003) proposed framework bears a stronger resemblance to a software development methodology than a research methodology. If Hasan's (2003) framework is compared to Ellis and Levy's (2010) general research requirements, it bears a definite resemblance. Hasan (2003) attempted to align research and software development but Hasan's attempt lacks sufficient development as a research methodology, especially in this study where the focus is on the development of an evaluation tool.

4.6.1.6 Hevner's Information Systems Framework to conduct Design Science Research

Hevner et al. (2004) presented a conceptual framework — specifically an Information Systems Framework — for understanding, executing and evaluating information systems research that combines behavioural science and design science paradigms, as shown in Figure 4.5. Design Research consists of activities concerned with the construction and evaluation of technological artifacts to meet organisational needs together with the development of associated theories (Hevner et al., 2004; March and Smith 1995; Pirenen, 2009).

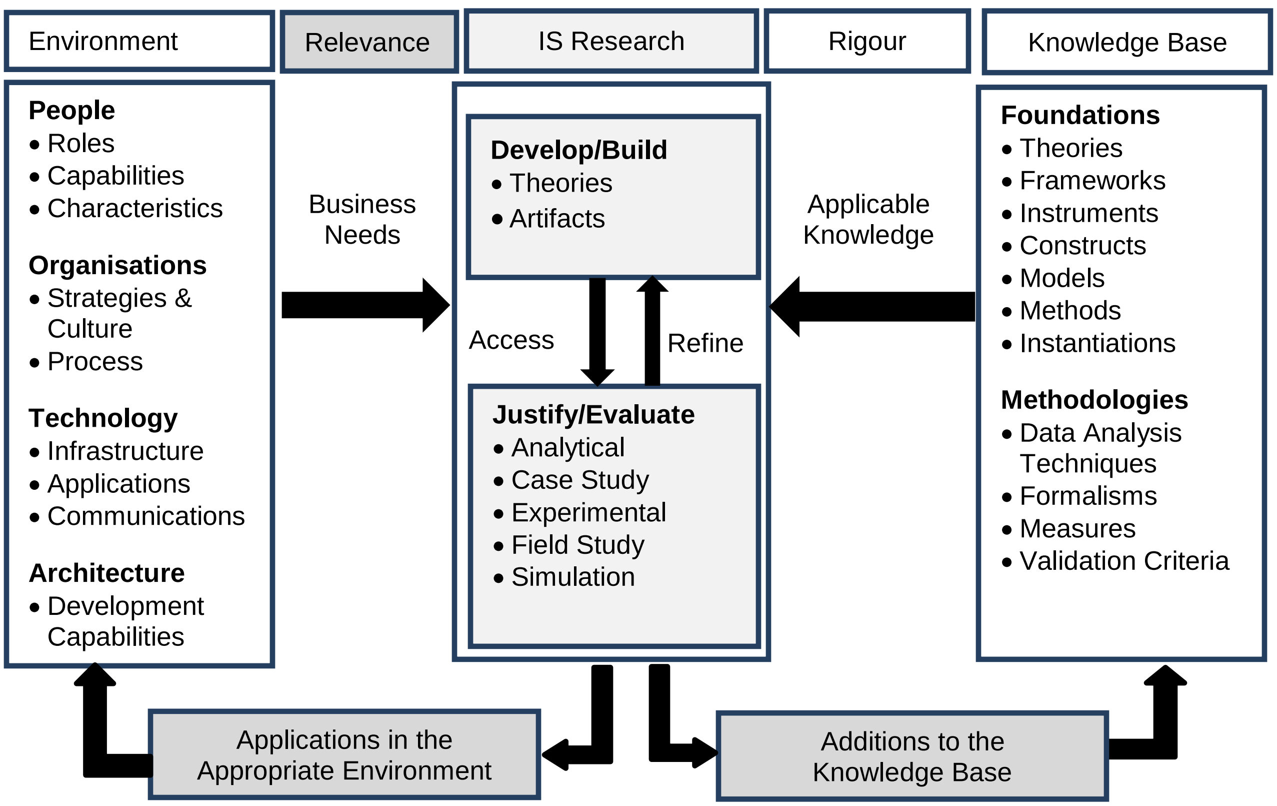


Figure 4.5 Information System Framework (Hevner et al., 2004)

The next section briefly considers each of the cycles as discussed by Hevner et al.(2004); Hevner (2007) and Joubert (2012), as illustrated in Figure 4.6:

- It is the intent of the **relevance cycle** to take the requirements from the environment of the research and place them in the research domain. It further takes the artifacts created during the research and places them in the environment for field testing. The purpose of the relevance cycle is to bridge the contextual environment of the research project with the design science activities (Hevner and Chatterjee, 2010). The application domain consists of the people, organisational systems and technical systems that interact and work towards a common goal (Hevner and Chatterjee, 2010; Hevner et al., 2004).
- The **design cycle,** supports the research activity for the creation and evaluation of design artifacts and processes. The design cycle iterates between the core activities of building and evaluating design artifacts and the process of the research project.
- The purpose of the **rigour cycle** is to provide grounding theories, methods, domain experience and expertise from the foundations knowledge base for the research. It further adds new knowledge to the knowledge base generated from the research. Hevner and Chatterjee (2010) and Iivari (2007) also agreed that the rigour cycle connects the design science activities with the knowledge base of scientific foundation, experience and expertise that informs the research project. It is important to note that Design Science draws on a vast knowledge base of scientific theories and methods which provide the foundation for rigorous Design Science Research (Hevner and Chatterjee, 2010).

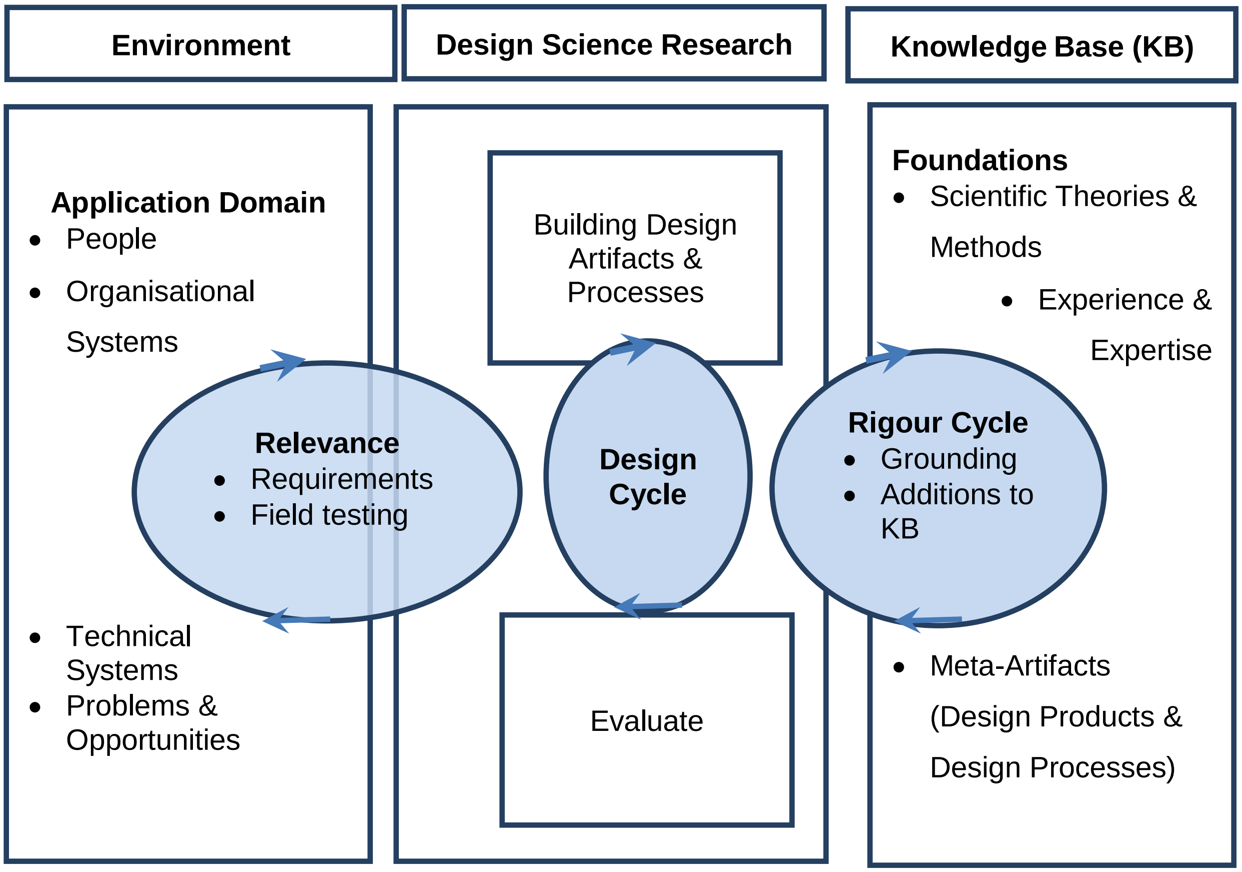


Figure 4.6 Design Science Cycles (Hevner et al., 2004)

Hevner et al. (2004) provide seven guidelines for Design Science Research. These guidelines are summarised in Table 4.4.

Table 4.4 Guidelines to Design Science Research (Hevner et al., 2004)

Guideline	**Description**
Guideline 1:	Design an artifact. The research must produce a purposeful *innovative* artifact that can be a construct, model, method or an instantiation.
Guideline 2:	Relevant problem. The objective of Design Science Research is to develop a *relevant* solution to a problem for a *specific domain* using technology-based solutions.
Guideline 3:	Design evaluation. Due to the purposeful design of an artifact, it must yield utility for the specific problem. Hence, thorough *evaluation* of the artifact is required. The research should demonstrate well-executed evaluation methods that incorporate utility, quality, efficacy and rigour.
Guideline 4:	Research contribution. Hevner et al. (2004) said that, “Novelty is similarly crucial since the artifact must be innovative, solving heretofore an

Guideline	Description
	unsolved problem or solving a known problem in a more effective or efficient way". The research must demonstrate its *contribution* in the form of artifacts as well as foundations and new methodologies.
Guideline 5:	Research rigour. By following these guidelines Design Science Research is differentiated from the practice of design. It is important to *rigorously* define the artifact, and formally represent the artifact ensuring coherence and internal consistency. Rigorous methods should be implemented in the construction and evaluation of the designed artifact.
Guideline 6:	Design a search process. The process of designing and creating the artifact incorporates or enables a *search process*, where a problem space is constructed and a mechanism is posed to find an effective solution.
Guideline 7:	Communication of research. The final objective of Design Science Research is to *communicate* the results effectively. The target audience must be taken into consideration, e.g. academic (satisfy rigour requirements), technology-oriented as well as management-oriented (satisfy relevance requirements) audiences.

Table 4.4 provides clear guidelines as outlined by Hevner et al. (2004) on how to carry out detailed Design Science Research. The guidelines outlined by Hevner et al. (2004) were also used in this study. The guidelines do call for the research to be proven valid, by emphasising problem relevance, evaluation, research rigour and communication of the research contribution.

4.6.1.7 Discussion of Design Science Research

Design Science Research provides another view complementing the positivist and interpretive perspectives in IS research. As a discipline, Design Science Research is rooted in the sciences of the artificial and distinguishes between natural science and the science of the artificial by concentrating on phenomena that are created (designed artifacts) rather than naturally occurring objects (Joubert, 2012; March and Smith, 1995; Pirenen, 2009). The term "artifact" is used to describe something that is artificial or constructed by humans (Hevner and Chatterjee, 2010; Simon, 1996). The purpose of the artifacts should be to improve existing solutions to a problem or to provide a solution to an important problem (Hevner and Chatterjee, 2010). IT artifacts, which are the end goal of any Design Science Research, are defined in Table 4.5.

Table 4.5 IT artifacts: End goal of Design Science Research

IT artifacts — end goal of Design Science Research	**Meaning (Hevner and Chatterjee, 2010; Hevner et al., 2004; Hevner and March, 2003; March and Smith, 1995)**
Constructs	Vocabulary and symbols. Provide language through which problems are defined and communicated.
Models	Abstractions and representations. Models use constructs to represent real-world problems, the design problem and its solution space. Models aid in problem and solution understanding. Models further represent connections between problem and solution components, enabling exploration of the effects of design decisions and change in the real world. A model is also a set of propositions or a set of expressing relationships. Models define processes (Hevner et al., 2004).
Methods	Algorithms and practices; ways of performing goal-directed activities. Methods are used to define solution processes. Methods can range from formal, mathematical algorithms that define the research process to informal, textual descriptions of *"best practices"* approaches.
Instantiations	Implemented and prototype systems. Instantiations show how to implement constructs, models and methods in working systems. Instantiations can be used by researchers to learn about the real world, how artifacts affect it, and how users appropriate it.

Peffers, Rothenberger, Tuunanen and Vaezi et al. (2012) classified artifacts under two categories: conceptual artifacts and methods (conceptual actionable instructions). Under conceptual artifacts are: "constructs, models and frameworks and methods: formal logic instructions are classified as algorithms and actual hardware or software implementations are instantiations" (Peffers et al., 2012:401). Peffers et al. (2012) added two additional artifacts to what March and Smith (1995), Hevner and March (2003), Hevner et al. (2004), as well as Hevner and Chatterjee (2010) agreed on, namely frameworks and algorithms.

Theories — the ultimate product of the natural sciences — are absent from this list of Design Science Research goals (March and Smith, 1995). Rather than theories, Design Science Research strives to create models, methods and implementations that are innovative and valuable (March and Smith, 1995; March and Storey, 2008). Design

Science Research is inherently a problem-solving process (Hevner et al., 2004), which involves the presentation and representation of design-related problems and the subsequent generation and evaluation of design-based solutions, also referred to as the artifacts, produced during the Design Science Research process (March and Storey, 2008). Design Science Research further expands the capabilities of humans and the organisation (Hevner et al., 2004). IT deals with the creation of artificial phenomena rather than natural phenomena.

To summarise, Behavioural Science Research considers how things are while Design Science Research considers how things ought to be attained to produce a desired outcome (Hasan, 2003).

The process of evaluating artifacts within Design Science Research assists with understanding the problem that the artifact seeks to address. Furthermore, it allows the quality of the artifact and the process used to create the artifact to be improved and evaluated (Hevner et al., 2004). Because the development process involved in the creation of artifacts that will solve a problem is one which is long and complex, artifacts can only be used to look at specific aspects of the research (Hevner et al., 2004). The purpose of the artifact is to solve a specific problem in a specific domain or contextual environment (Hevner, 2007). Underlying and embedded in the artifact are design considerations and assumptions as well as proof that the artifact does successfully resolve the problem.

To conclude the discussion on Design Science Research, different guidelines and frameworks have been presented, most of which are only partly applicable to the research study. The most relevant steps and guidelines have been combined in an amalgamated approach that could produce the desired results. Table 4.6 summarises the commonalities and similarities between the different frameworks presented in the academic literature in order to find a framework that fits the research.

Table 4.6 Summary of Design Science Research constructs

Category	Activity	Resource
Research problem	Construct a conceptual framework.	Nunamaker et al. (1991)
	Concept design.	Hasan (2003)
	Identify a relevant problem and motivate the research.	Hevner et al. (2004)
	Identification and motivation of relevant problem.	Peffers et al. (2006)
	Identify the research problem.	Ellis and Levy (2010)
	Problem identification and motivation.	Geerts (2011)
Objectives	Implicit in relevance. Identify objectives.	Hevner et al. (2004)
	Identify and motivate objectives of solution.	Peffers et al. (2006)
	Describe the objectives.	Ellis and Levy (2010)
	Define objectives of a solution.	Geerts (2011)
Knowledge search	Design and develop the artifact as an iterative research process.	Hevner et al. (2004)
Conceptual design	Develop the system architecture. Analyse and design the system. Build a prototype.	Nunamaker (1991)
	Concept design.	Hasan (2003)
Design and development	Construction of system architecture. Prototype.	Hasan (2003)
	Design as an artifact.	Hevner et al. (2004)
	Design and development research artifacts.	Peffers et al. (2006)
	Design and development of the artifacts.	Ellis and Levy (2010)
	Design and development.	Geerts (2011)
Test and evaluate	Test and evaluate the prototype.	Nunamaker (1991)
	Experiment and observe the system.	Hasan (2003)
	Subject the artifact to testing by demonstrating the artifact's ability to solve one or more problems.	Hevner et al. (2004)
	Design and evaluate the results (artifact).	Hevner et al. (2004)

Category	Activity	Resource
	Demonstration of artifact's ability to solve research problem. Evaluation of research artifact.	Peffers et al. (2006) Geerts (2011)
	Test the artifact. Evaluate the test results.	Ellis and Levy (2010)
Research rigour	Research rigour.	Hevner et al. (2004)
Communication	Communicate the research.	Hevner et al. (2004)
	Communication of research.	Peffers et al. (2006)
	Communicate the results.	Ellis and Levy (2010)
	Communication.	Geerts (2011)
Research contribution	Knowledge contribution.	Hevner et al. (2004).
Other	Product development.	Hasan (2003)

The majority of researchers concur that the following categories of Design Science Research are essential: research problem, objectives, knowledge, design and development, testing and evaluation, communication and contribution to knowledge base.

Having summarised the categories associated with Design Science Research, the next section will explore the Design Science Research methodology that was followed in the study.

4.6.2 Design Science Research methodology used in this study

The work done by Hevner and Chatterjee (2010) and Peffers et al. (2006) is in alignment with the nature of this research. Although Hevner's guideline to carrying out Design Science Research does not provide a "step-by-step" instruction list, it does provide a set of requirements for the methodology. As discussed earlier in Section 4.6.1.3, Peffers et al. (2006) expanded on the work done by Nunamaker et al. (1991) and Hevner et al. (2004) by developing a six phase model that is also consistent with Hevner et al.'s (2004) guidelines for the required elements of design research. Peffers et al.'s (2006) Design Science Research Process Model provides a nominal process for conducting Design

Science Research. Their Design Science Research Process Model demonstrates that Design Science Research produces research artifacts that address the research problem.

The Design Science Research framework used in this study was adapted from Hevner et al.’s (2004) framework with adjustments being made to where and when the relevance cycle would take place. The relevance cycle was applied earlier in the process and not just after the design of the artifact. Peffers et al.’s (2006) steps to conducting Design Science Research have been adapted for use in this study, although whether or not the artifact was suitable for solving the problem was only determined after its evaluation. The Design Science Research methodology for this study involved the steps set out in Table 4.7:

Table 4.7 Design Science Research process for this study

Steps	**Explanation**
Step One: Identify, understand and motivate the relevance of the problem — what is the problem?	Opportunities and problems such as the user experience of eModerators and managers of an eModeration system in an actual application environment were identified. Step One also defined acceptance criteria for the evaluation of the research results. Furthermore, Step One determined the relevance of the application context in that it not only provided the requirements for the research as input but also determined whether the designed artifact would improve the environment and how this improvement could be measured. The following research questions were identified: • What are the most important user experience constructs for the electronic moderation system’s framework? • Which existing user experience frameworks are relevant to the evaluation of electronic moderation systems? • Why do user experience issues influence the adoption of eModeration? • How do the insights gained influence the design of the framework?
Step Two: Define the objectives and focus of the research area and the solution — how should the problem be solved?	The quantitative objectives considered and analysed whether there existed solutions that would be more viable than those currently used, while the qualitative objectives described how the new artifact was expected to support solutions to problems. The objective of this study was to develop a user experience evaluation framework for eModeration.

Steps	Explanation
Step Three: Design and development of an artifact — create an artifact that will solve the problem through knowledge search and an iterative process.	This involved the construction of a conceptual user experience evaluation framework for eModeration to solve the problem by means of: • conducting an investigation into system functionalities and requirements; • understanding the system's building processes and procedures; • studying the relevant disciplines for new approaches and ideas. An iteration evaluation process was followed where the User Experience Evaluation Framework for eModeration was evaluated by a second higher education institution before it was refined and presented. Appropriate theory from the fields of user experience and eModeration were incorporated into the development of the artifact. During this step the functionalities of the system components and interrelationships amongst them were defined.
Step Four: Testing [2]of the artifact with appropriate metrics analysis knowledge — what is the use of the artifact?	In order to perform proper testing of the User Experience Evaluation Framework for eModeration the utility, quality and efficacy of the design artifact had to be rigorously demonstrated through well-executed evaluation plans. Testing of the artifact was done by analysing the knowledge gained from the interviews.
Step Five: Evaluation of the artifact — how well does the artifact work?	Design Science relies on the application of rigorous methods in the construction and evaluation of the design artifact. During the evaluation the utility, quality and efficacy of a design artifact must be rigorously demonstrated using well executed evaluation methods. The relevance was evaluated by the utility that it provided to the organisation, in this case private higher education institutions. Once the prototype was ready, it was evaluated according to functional specifications suggested in the design and development of the User Experience Evaluation Framework for eModeration. Part of the evaluation process involved the observation and measurement of how well the artifact supported a solution to the problem. This was done by comparing the objectives of the solution to the actual observed results when the artifact was used. The resources that were required included knowledge of relevant metrics (user experience) and analysis techniques. The artifact's functionality within the solution objectives as defined in Step Two can be compared to the artifact's objective quantitative performance measures, such as the eModerate system and results of the user experience survey on eModeration and moderators.

[2] It is important to note that testing is a technical term used in Design Science Research processes. The researcher acknowledges that testing in qualitative terms has a different meaning associated with it.

Steps	Explanation
Step Six: Research communication and contribution to knowledge — communicate the utility and effectiveness of solution.	The final process was to communicate the contribution to the body of knowledge in the field of user experience with reference to the problem definition and its importance, the literature review, the developed artifact (User Experience Evaluation Framework for eModeration), its utility, the rigour of its design, and its effectiveness to researchers.

Steps One and Two outlined the conceptual principles that define what is meant by Design Science Research, while Steps Three through Five were used as the iterative process of carrying out Design Science Research. The last step was used to present and communicate the research. Figure 4.7 illustrates the Design Science Research steps that were followed in this research.

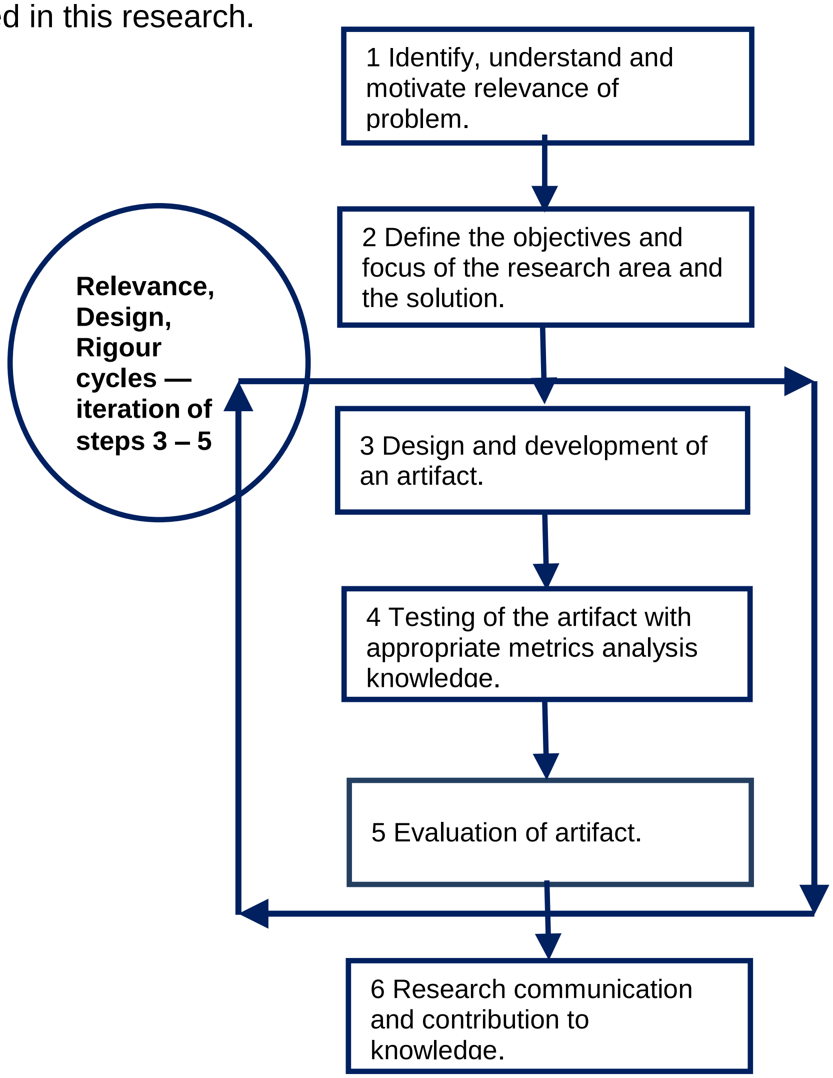


Figure 4.7 Design Science Research methodology for this research

Figure 4.8 demonstrates the Design Science Research framework that was used in this study. This framework is an adaptation of Hevner et al.'s (2004) Design Science Information Systems.

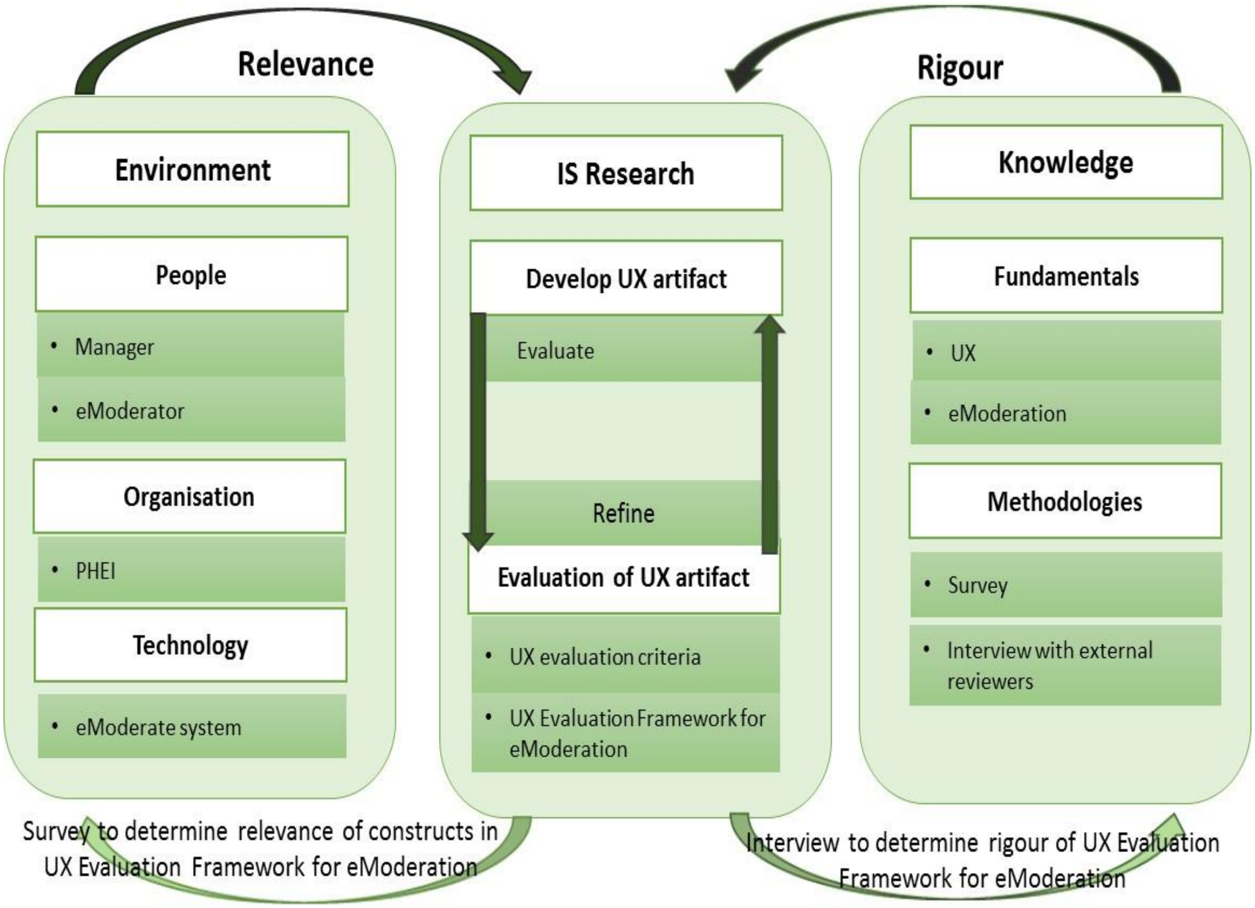


Figure 4.8 Design Science Research Framework integrated into this research

The framework contains three main areas:

- **Environment**

  The environment in which the study took place involved people such as managers who were involved with examination processes, i.e. deans and eModerators. These people had certain roles, capabilities and characteristics. The environment also included organisations such as MGI and Monash University both of which are private higher education institutions. Each organisation had its own strategies, structures and processes. The last element that played a role in this area was technology; in this study this referred to eModerate systems. Technology also included infrastructure, applications, communications architecture and development capabilities.

- **Information Systems Research**

  This area of the framework included Information Systems Research where the artifact was designed, assessed, evaluated and then refined. During the development, theories were used to design the artifact. The case study was used in order to justify or evaluate the research.

- **Knowledge Base**

  The knowledge base consists of two areas, namely foundations and methodologies. Foundations look at theories, frameworks, instruments, constructs, models, methods and instantiations while methodologies pay attention to data analysis techniques, evaluation and validation criteria. In this study existing literature in the areas of user experience and eModeration theories, constructs and frameworks was used as a knowledge base. The methodologies provided guidelines during the justification or evaluation phase and were also used to determine the applicability of knowledge.

Together with the main areas in the framework were three cycles, design and development as well as evaluation that formed a very important part of the Design Science Research methodology used in this study.

4.6.2.1 The Relevance Cycle

The relevance cycle initiates Design Science Research within an application context, which serves as the input, with regards to the problem to be addressed. During this cycle the researcher will determine the requirements and do field testing. The output of Design Science Research must be returned into the environment for further study and evaluation in the application domain (Hevner and Chatterjee, 2010).

In this study the relevance cycle was used to determine whether the application domain addressed the problem of user experience evaluation for eModeration systems. As explained in Chapters One and Two, eModeration has been used by eModerators in different environments. However, there is still no clear standard for the electronic moderation of examination scripts, nor are there guidelines for the processes involved in eModeration. This then is a very relevant problem addressed by the research. Requirements and criteria for assessing appropriate user experience evaluations for eModeration systems were determined and tested by using people in an organisation who were utilising a technical system called eModerate. The people who were used in the second iteration were the deans and eModerators from MGI.

The results obtained from the field testing were then used in the design cycle to design the artifact — the User Experience Evaluation Framework for eModeration. During the third iteration of the Design Science Research project, compliant and non-compliant eModerators were interviewed in order to assess the artifact. The results of the second iteration were used to refine the artifact. The refined artifact was then evaluated by managers from Monash.

4.6.2.2 The Design Cycle

At the heart of any Design Science Research project is the design cycle (Hevner and Chatterjee, 2010). The design cycle in the research activities iterates between the construction of the new artifact, its evaluation, and subsequent feedback to refine the design. The iteration process generates design alternatives and provides an evaluation of the alternatives until it satisfies the design requirements and a satisfactory design is achieved (Hevner and Chatterjee, 2010). The design cycle uses the requirement inputs obtained from the relevance cycle while the design and evaluation theories are drawn from the rigour cycle. The design cycle is dependent on the relevance and rigour cycles, although this is only during the actual execution of the research.

The User Experience Evaluation Framework for eModeration is an identifiable artifact produced by the research. A subsequent research artifact is the designed questionnaire that was used during the evaluation of the artifact.

4.6.2.3 The Rigour Cycle

The rigour cycle also provides past knowledge to the research project to ensure that the proposed research project is innovative. During the rigour cycle it is necessary to consider appropriate theories and methods for constructing and evaluating the artifact (Iivari, 2007). It is essential that the research contribute to the knowledge base (Hevner and Chatterjee, 2010; Iivari, 2007).

This study drew on the literature concerned with moderation, eModeration and user experience theories and models in order to design the User Experience Evaluation Framework for eModeration. During the rigour cycle the researcher considered appropriate theories and methods for the construction and evaluation of the artifact. The rigour cycle was applied during Steps Four and Five of the proposed Design Science Research process when the new artifact was tested and evaluated to verify that the new artifact did make a contribution and that it met the requirements of the rigour cycle.

Besides the three cycles it is also necessary to discuss Step Three: Design and Develop of the artifact, see next section.

4.7 Design and Development in Design Science Research

Design Science Research has a design and construction oriented nature (Van Der Watt, 2011). As mentioned in Table 4.6, design and development involves the construction of systems architecture and prototyping (Hasan, 2003), design as an artifact (Hevner et al. 2004), design and development research artifacts (Peffers et al., 2006), and design and development of the artifacts (Ellis and Levy, 2010). Ellis and Levy (2010), Hasan (2003) and Nunamaker et al. (1991) recommend that the process of design and development should involve the identification of important decisions made during the design process, describe the alternatives that were considered and discuss the rationale followed to support the alternative selected. Design Science Research must produce a viable artifact, which in this study is a framework that can be utilised to evaluate the user experience of eModeration. Step Three of the Design Science Research process, as discussed in Table 4.7, involves the construction of a conceptual user experience evaluation framework for eModeration that will solve the problem through an information search. The construction of the artifact was guided by an investigation of system functionalities and requirements, an understanding of the system, building processes and procedures, as well as the study of relevant disciplines for new approaches and ideas.

The design and development of Information Systems solutions is in itself a creative process based on the application of systematic methods. Information Systems solutions are created in order to perform specific functions that address a specific need or identify a problem. The process of design and development is based in, and builds on, academic knowledge and the research contributions must prove acceptable through rigorous development processes before it is possible for the process of design and development to become valid research.

The design and development of the artifact followed an iterative process where the user experience framework was validated by a second higher education institution before the artifact was finalised. Appropriate theories from the fields of user experience and eModeration were incorporated into the development of the artifact.

In order to ensure rigure the proposed framework need to be evaluated and tested. The next section will explain which evaluation methods were incorporated to test and evaluate the framework.

4.8 Evaluation methods in Design Science Research

Design Science Research makes use of a build-evaluate pattern (March and Smith, 1995) where building is the process of constructing an artifact and evaluation is the process of identifying how well the artifact performs the specific task for which it was designed. Sonnenberg and Vom Brocke (2012a) recommend a more nuanced evaluation pattern for Design Science Research artifacts, namely evaluate-construct-evaluate. At the end of the evaluation activity it is possible to decide whether or not to iterate back to the design and development in order to improve the artifact or to continue to communicate the results (Peffers et al., 2008).

In order to design an evaluation method, the evaluation purpose, principles, documentation, criteria and artifact type need to be explained first. The artifact type will form part of setting the criteria for the evaluation design for an evaluation strategy (Venable, Pries-Heje and Baskerville, 2012). According to Hevner (2007) and Hevner and Chatterjee (2010), there are two forms of artifact evaluations: the evaluation of the designed artifact to refine the design and field testing. Evaluation takes place in the design science build and evaluate cycle. Field testing includes taking the artifact and releasing it into an applicable environment (Hevner and Chatterjee, 2010). In this study evaluation was used to evaluate the artifact in order to refine it after its release into an applicable environment (HEI).

4.8.1 Purpose of Evaluation

The purpose of evaluation should be to address the validation of incremental design decisions from the beginning of the Design Science Research process (Sonnenberg and Vom Brocke, 2012a). Sonnenberg and Vom Brocke (2012b:384) state that evaluation focuses "on providing the usefulness of an artifact and less on the artifact design itself, i.e. on an artifact's rationale and specifications that are a constituent part of the prescriptive knowledge created in DSR". According to March and Smith (1995), the process of evaluation is not only concerned with the artifact that must be evaluated, but also includes determining the evaluation criteria for the artifact in a particular environment.

The Design Science Research process, as discussed in Chapters One and Four, included activities that assisted with the identification of problems, the design and the development (construction) of the artifact, the building and use of the artifact followed by evaluation activities. The artifact being built needs to be evaluated for its feasibility. Thereafter, it becomes the object of study (March and Smith, 1995). Sonnenberg and Vom Brocke (2012b) suggest that evaluation should be conducted throughout the whole process of Design Science Research. During the building of the artifact the following question is relevant, "Does it work?" During evaluation the following question will be asked, "How well does it work?" Artifacts should be rigorously evaluated as this is an essential component of Design Science Research (Hevner et al. 2004; Peffers, Tuunanen, Rothenberger and Chatterjee, 2008; Peffers, Rothenberger, Tuunanen and Vaezi, 2012; Petter et al., 2010).

The process of evaluation should include *ex ante evaluations* (validate the design of the artifact) and *ex post evaluations* (validate an artifact in use) (Sonnenberg and Vom Brocke, 2012a). The *ex ante evaluation* will take place before the design and development of the artifact, while *ex post evaluation* will take place after the construction of the artifact (Pries-Heje, Baskerville, and Venable, 2008). The build-evaluate pattern implies that the truth of an artifact is only known after the evaluation phase. The build-evaluate pattern embodied by Design Science Research methodologies has epistemological implications for the validity of knowledge created by the artifact as it emerges (Sonnenberg and Vom Brocke, 2012b). Hevner et al. (2004) and Iivari (2007) argue that IT artifacts should be built in a disciplined and "informed" way, which implies the necessity of making inferences about the truth contained in the prescriptive knowledge created throughout the Design Science Research process. Sonnenberg and Vom Brocke (2012b:385) conclude that is it is necessary "to infer on an artifact's expected impact on the world ex ante, i.e. before an artifact has been applied to some real world problem".

The design decisions are guided by conceptual and prescriptive knowledge of the emerging design theory and therefore have truth-like value. The decisions also need to be justified and validated through proper evaluation methods before the artifact is put to use. The iterative process or incremental addition of prescriptive knowledge can only happen if it is evaluated and documented accurately in a rigorous way. The research can then be presented to the research community through publications "to build consensus on the relevance, novelty, and importance of a chosen problem domain, to discuss design objectives and features, to disseminate and initial the blue print of an IT artifact … or to demonstrate that an artifact can be put into practice by means of a prototype". (Sonnenberg and Vom Brocke, 2012b:386). The validation of the artifact can be put to the test with the effective practical application of theories.

For this study, the purpose behind the evaluation was to demonstrate that the User Experience Evaluation Framework for eModeration could be put into practice by means of implementation in the environment. The evaluation of the artifact was also achieved through the application of the principles of evaluation as explained in the next section.

4.8.2 Principles of Evaluation

Gregor (2006), Gregor and Jones (2007), and Sonnenberg and Vom Brocke (2012a) argue that if a researcher adheres to the following three principles, the unfavourable epistemological implications of the "build-evaluate" distinction can be eliminated. Gregor

(2006), Gregor and Jones (2007), and Sonnenberg and Vom Brocke (2012a) put forward the following principles for the evaluation of Design Science Research:

- "Distinction between interior and exterior modes of Design Science Research inquiry" — attention is paid to the components of the artifact and the design decisions taken as well as to the evaluation of the usefulness of the artifact.
- "Documentation of prescriptive knowledge as design theories" — it is necessary to document prescriptive knowledge in a structured way, facilitating communication in the Design Science Research process. The documentation should have a truth-like value, which adds to the Design Science Research knowledge base.
- "Continuous assessment of Design Science Research progress achieved through *ex ante* and *ex post* evaluations" — the principle described here requires the researcher to have multiple evaluation episodes throughout a single iteration of the Design Science Research process.

Gregor (2006) proposed a framework that can be used to clarify how knowledge is created and how truth can be assessed in Design Science Research. Gregor's framework makes use of the above mentioned principles and illustrates how different modes of research activity are linked, and how these affect the way artifacts should be evaluated. Gregor (2006) identified two separate, but interconnected modes of research activity that directly affect the way in which researchers choose to evaluate artifacts: an interior mode and an exterior mode. The interior mode refers to: "prescriptive statements about how artifacts can be designed, developed and brought into being" and the exterior mode focuses primarily on "analysing, describing and predicting what happens as artifacts exist and are used in their external environment" (Gregor, 2006:7). If research is conducted in the interior mode, it makes use of inductive reasoning using prior descriptive knowledge or prescriptive knowledge while the artifact is being built (Sonnenberg and Vom Brocke, 2012a). When research is conducted in the exterior mode, descriptive knowledge about the artifact is produced.

It is important to theorise the interior mode by documenting the emerging IT artifact in such a way that it allows for reasoning about the artifact's purpose, its rationale, inner structure, the conditions under which it would be expected to work, and the steps required to use the artifact in practice. It is also possible to evaluate the proposition in the exterior mode for validity.

In order to conduct a continuous evaluation during the design cycle it is necessary to identify evaluation criteria with which to conduct the evaluation. This is explored in the next section.

4.8.3 Evaluation criteria

In order to achieve continuous evaluation two aspects should be considered:

- The evaluation criteria have to be defined in order to systematically demonstrate the progress achieved in the Design Science Research process. The evaluation criteria also serve as a guide to evaluation activities (Aier and Fischer, 2011).
- Clarification must be provided on how *ex ante* and *ex post evaluations* can be positioned in the Design Science Research methodology and how these lead to the definition of the evaluation patterns in Design Science Research (Sonnenberg and Vom Brocke, 2012b).

The evaluation criteria used during evaluation are determined by the type of object being evaluated as well as the time when the evaluation is conducted. Such criteria might best reflect the progress achieved in the design of the artifact. March and Smith (1995) identified a list of Design Science Research evaluation criteria, as shown in Table 4.8, associated with Design Science Research artifacts.

Table 4.8 Design Science Research artifacts output proposed evaluation criteria (March and Smith, 1995)

Artifacts being evaluated	**Criteria for evaluation**
Constructs	Completeness, simplicity, elegance, understanding and ease of use.
Models	Fidelity to real world, completeness, level of detail, robustness and internal consistency.
Methods	Operational: efficiency, generality and ease of use.
Instantiations	Efficiency and effectiveness, impact on users and environment.

According to Aier and Fischer (2011) the evaluation criteria proposed by March and Smith (1995) are comprehensive, but are not independent of the artifact type under consideration. Aier and Fischer (2011) recommend the use of criteria that are independent of an artifact type and that can be applied to the evaluation of design theories such as utility, internal consistency, external consistency, broad purpose and scope, simplicity, and fruitfulness of further research. Another set of evaluation criteria has been designed by Rosemann and Vessey (2008) that focuses on ensuring the relevance of the artifact, i.e. is an artifact expected to be applicable in practice. Rosemann and Vessey's (2008) criteria include the importance, suitability and accessibility of an artifact. According to Hevner et al. (2004), artifacts should be evaluated using criteria relevant to the requirements of the context in which the artifact is implemented. For example, in terms of "functionality, completeness, consistency, accuracy, performance, reliability, usability, fit with the organisation and other relevant quality attributes" (Hevner et al., 2004:85).

One disadvantage of March and Smith's (1995) evaluation criteria is that they do not make provision for the evaluation of frameworks. Peffers et al. (2012) added two additional artifacts to what March and Smith (1995), Hevner and March (2003), Hevner et al. (2004), as well as Hevner and Chatterjee (2010) agreed on, namely frameworks and algorithms (Table 4.5). Hevner et al., (2004:85) stated that "a design artifact is complete and effective when it satisfies the requirements and constraints of the problem it was meant to solve".

A selection of criteria was made from the following list of evaluation criteria available in the literature:

- independent of the artifact type (Aier and Fischer, 2011);
- not independent of the artifact type (March and Smith, 1995);
- relevant to frameworks (Peffers, Rothenberger, Tuunanen and Vaezi e, 2012:401);
- focus on relevance of artifact, i.e. is the artifact applicable in practice (Rosemann and Vessey, 2008);
- focus on the requirements of the context in which the artifact is implemented (Hevner et al., 2004);
- focus on evaluation of models (Olivier, 2009).

For the purpose of this study, the following evaluation criteria were chosen and used in the design of the semi-structured interviews as shown in Table 4.9. Table 4.9 also indicates whether the evaluation criteria were used in *ex ante* (in the building phase — validating the design of the artifact) or *ex post evaluation* (after construction of the artifact to validate the artifact in use), with a description of each criteria and references.

Table 4.9 Evaluation criteria

Evaluation Criteria	***Ex ante***	***Ex post***	**Description**	**Reference**
Completeness or comprehensiveness	Yes	Yes	Ensure that your model covers all aspects of the problem. A designed artifact is complete and effective when it satisfies the requirements and constraints of the problem that it was meant to solve.	Hevner and Chatterjee (2010); Hevner et al. (2004); Hevner and March (2003); March and Smith (1995); Olivier (2009)
Simplicity or ease of use	Yes	Yes	"A simple model makes it possible to comprehend the essence of the modelled concept" (Olivier 2009:49). How easy is the artifact to use?	March and Smith (1995); Olivier (2009)
Effectiveness	NA	NA	The term "effectiveness" has two different meanings in this study. Effectiveness as an evaluation criterion in Design Science Research and effectiveness according to user experience. In user experience it refers to whether the user was able to complete the task. Does the system do the tasks for which it was designed? Effectiveness in this study has a different context from the construct. Effectiveness will not be used as an evaluation criterion to evaluate the framework as defined by March and Smith (1995).	March and Smith (1995)

Evaluation Criteria	*Ex ante*	*Ex post*	Description	Reference
Efficiency	NA	NA	The term “efficiency” as an object has two meanings. The first is associated with the efficiency of the system and the other with the efficiency of the framework. How long did it take the user to complete the task? What is the ratio of outputs to inputs in the activity? (Prat, Comyn-Wattiau and Akoka, 2014) Efficiency will be used as a construct and not as an evaluation criterion used to evaluate the framework.	Hevner and Chatterjee (2010); March and Smith (1995); Prat et al. 2014
Generality	Yes	Yes	The best models are able to address a variety of problems. Generality was included as an evaluation criterion used to evaluate the framework.	March and Smith (1995); Olivier (2009)
Impact on the environment and on the artifact’s users or fits in with the organisation or suitable	Yes	Yes	Does the designed artifact fit into the organisational structure? What impact will the artifact have on the users in the environment? Does the artifact solve the problem completely, provide guidelines and/or direction? Does the artifact provide suitable concrete recommendations?	Hevner et al. (2004); March and Smith (1995); Rosemann and Vessey (2008)
Internal consistency	NA	NA	Not applicable to framework evaluation.	Hevner et al. (2004); March and Smith (1995)
Level of detail	Yes	NA	How much detail is provided in order to explain the functionality of the artifact?	March and Smith (1995)
Importance	Yes	Yes	Importance refers to whether the artifact meets the needs of practice, by addressing a real world problem. Does the artifact provide a solution?	March and Smith (1995); Rosemann and Vessey (2008)
Accessibility of artifact	NA	NA	Refers to whether the artifact is understandable/readable and focuses on results rather than the research process.	Hevner et al. (2004); Rosemann and Vessey (2008)

Evaluation Criteria	***Ex ante***	***Ex post***	**Description**	**Reference**
Functionality	Yes	Yes	Refers to functional items that define the system.	Chong (2005); Hevner et al. (2004)
Accuracy or exactness	Yes	Yes	When the model fits the problem closely it is most likely to be accepted.	Hevner et al. (2004); Olivier (2009)
Performance	NA	NA	Performance is influenced by the intended use of the artifact. This is not an evaluation criteria associated with framework evaluation.	Hevner et al. (2004); March and Smith (1995)
Usability	NA	NA	Will the user be able to work with the artifact successfully? How easy will it be to use? Usability also includes efficacy, i.e. effectiveness in the measurement of people's performance in terms of user experience. Usability will be a construct and will not be used as an evaluation criterion to evaluate the framework.	Hevner et al. (2004)
Clarity	Yes	Yes	Clarity according to Olivier (2009) refers to the interaction or flow between the operation or use of each component in the framework and the purpose of each component which should be evident. Clarity will be used as an evaluation criterion in this study to evaluate the clarity of the framework.	Sonnenberg and Vom Brocke (2012a)

4.8.4 Evaluation patterns

In order to conduct a proper evaluation it is necessary to structure evaluation activities and corresponding evaluation criteria using the concept of evaluation patterns for Design Science Research artifacts as proposed by Sonnenberg and Vom Brocke (2012a). Peffers et al. (2010:9) state that patterns incorporate "high-level solutions to classes of problems that can be converted into specific best practices".

Sonnenberg and Vom Brocke (2012a) sketched out a cyclical high level Design Science Research process that incorporates a design-evaluate-construct-evaluate pattern as shown in Figure 4.9. It is suggested that the Design Science Research process should use *ex ante* evaluations to validate the design of the artifact and then *ex post evaluations* to confirm that the artifact in use is solving the problem. It is important to remember that *ex ante evaluations* are conducted prior to the construction, while *ex post evaluations* are conducted after the construction of an artifact (Gregor, 2006; Gregor and Jones, 2007; Sonnenberg and Vom Brocke, 2012a).

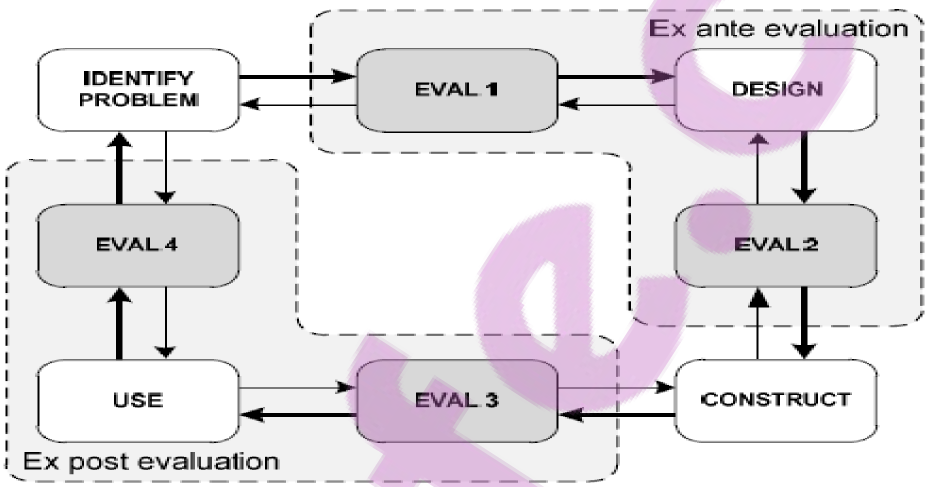


Figure 4.9 Evaluation activities within the Design Science Research process (Sonnenberg and Vom Brocke, 2012a)

This generic sketch (Figure 4.9) of the Design Science Research process can be used by researchers in a variety of research contexts in order to validate research findings. The first step in the Design Science Research process is to determine if the envisioned problem is important for practice, whether it is novel, and if it will add to the existing knowledge base. In the end Design Science Research should prove the utility of the artifact. Table 4.10 sets out to explain the activity, input, output, evaluation criteria and evaluation methods required during evaluations (Sonnenberg and Vom Brocke, 2012a).

Table 4.10 Design Science Research activities and evaluation criteria (Sonnenberg and Vom Brock, 2012a)

Activity	Input	Output	Eval. Criteria	Eval. Methods
Eval 1	Problem statement or observation of the problem. Research needed. Design objective. Design theory. Existing solution to a practical problem.	Justified problem statement. Justified research gap. Justified design objectives.	Applicability, suitability, importance, novelty, feasibility	Literature review, review of practitioner initiated expert interview, focus groups, survey. This study used a literature review to abstract the concept framework (see Section 6.2).
Eval 2	Design specification. Design objectives. Stakeholders of the design specification. Design tool or design methodology.	Validated design specification. Justified design tool or methodology.	Feasibility, accessibility, understandability, clarity, simplicity, elegance, completeness, level of detail, internal consistency, applicability, optionality	Mathematical proof, logical reasoning, demonstration, simulation, benchmarking, survey, expert, interview, focus group. This study used a survey and interviews (see Section 6.3 - 6.5).
Eval 3	Instances of an artifact (prototype).	Validated artifact instance in an artificial setting (proof of applicability).	Feasibility, ease of use, effectiveness, efficiency, fidelity with real world phenomena, operationality, robustness, suitability	Demonstration with prototype, experiment with prototype, experiment with system, benchmarking survey, expert interview, focus group. This study used interviews with eModerators (see Section 7.2).
Eval 4	Instance of an artifact	Validated artifact instance in a naturalistic setting (proof of usefulness).	Applicability, effectiveness, efficiency, fidelity, with real world phenomena, generality,	Case study, field experiment, survey, expert interview, focus group. This study used interviews

Activity	Input	Output	Eval. Criteria	Eval. Methods
			impact on artifact environment and user, internal consistency, external consistency	with Monash University lecturers (see Section 8.3).

Sonnenberg and Vom Brocke's (2012a) evaluation criteria correlate and correspond with the evaluation criteria proposed by March and Smith (1995). For the purpose of this study the evaluation procedure and approach as suggested by Sonnenberg and Vom Brocke (2012a) was adopted and implemented as indicated in Figure 4.10. Sonnenberg and Vom Brocke (2012a) recommended and outlined a cyclical high level Design Science Research process that incorporates the design-evaluate-construct-evaluate pattern as shown in Figure 4.10. The Design Science Research process should use *ex ante evaluations* to validate the design of the artifact and then *ex post evaluations* to confirm whether or not the artifact in use is solving the problem. *Ex ante evaluations* are conducted prior to the construction, while *ex post evaluations* are conducted after the construction of an artifact (Gregor, 2006; Gregor and Jones, 2007; Sonnenberg and Brocke, 2012a).

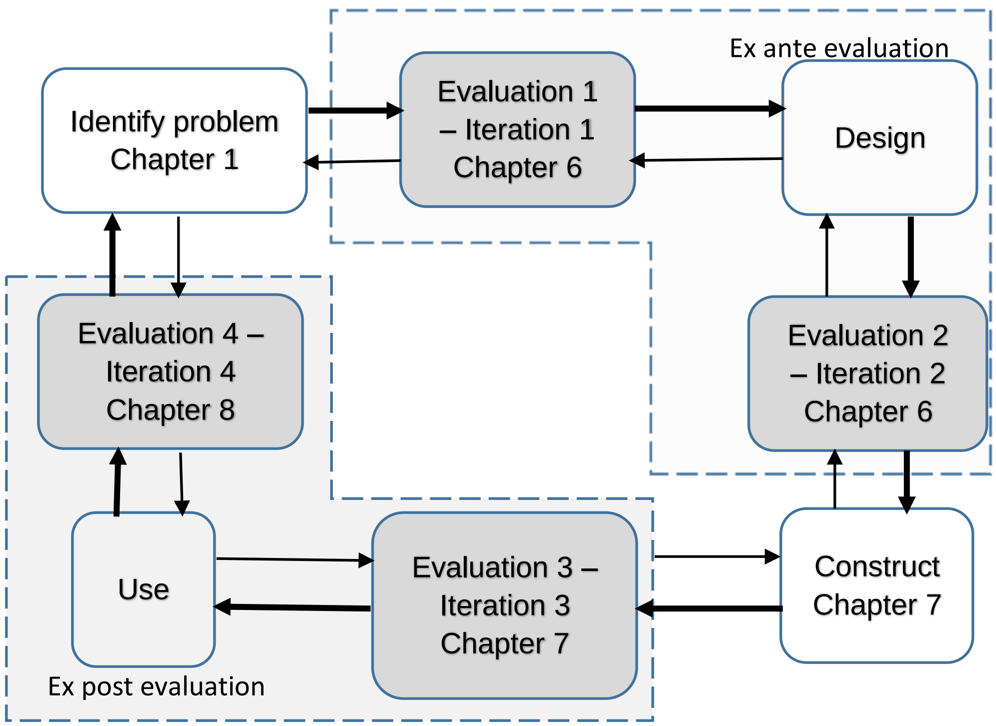


Figure 4.10 Evaluation activities adapted within the study (Sonnenberg and Vom Brocke, 2012a)

4.8.5 Integration of Design Science Research steps with Evaluation process

The discussion commences by explaining how the instruments used to aid in the design and development of the artifact were designed using Sonnenberg and Vom Brocke's (2012a) suggested Design Science Research process. This included a set of criteria used to evaluate eModerate systems, as well as the existing material attained through the literature review both of which were used to assist in the design and development of the framework.

Identification of the problem was presented in Phase One of the study: the literature review. Evaluation one was discussed in Section 6.2 where literature was used to abstract design and develop a theoretical conceptual framework, which is also referred to as 'evaluation and iteration one'. The conceptual framework guided the design of the instruments that would be used as input for evaluation two, the second iteration (Section 6.3). The results from evaluation two were used to '*construct'* the User Experience Evaluation Framework for eModeration before it was tested in evaluation three, which is discussed in Chapter Seven. In summary, the design and development process was conducted using four evaluation iterations as indicated in Figure 4.11:

- Evaluation One — the literature review was used to design and develop an initial conceptual framework (Section 6.2).
- Evaluation Two — case study at MGI where a questionnaire was used and interviews conducted to gather data (Chapter Six). The results guided the researcher in the design of the first version of the conceptual framework for the artifact (Section 6.3).
- Evaluation Three — case study at MGI where interviews were conducted with eModerators after presentation of the first version of the artifact in order to refine the conceptual framework (Section 7.3).
- Evaluation Four — case study at Monash University where a focus group was used to test the User Experience Evaluation Framework for eModeration before presentation (Section 8.2).

Iivari (2007) emphasised the rigorous construction of Design Science Research artifacts, a characteristic which distinguishes design-based research from practical applications in Information Systems. Iivari (2007) also believed that the process of construction should be transparent and that the researcher should indicate the origins of the various Design Science Research artifacts. It is for this reason that it is important to explain the construction process, the design process and to be clear about how data is to be gathered in order to meet the requirements of transparency.

Figure 4.11 illustrates the structure of the chapters that report on the *design and development* as well as on the *testing* and *evaluation* of the artifact. Figure 4.11 demonstrates the process that was followed during the design and development of the artifact after the problem had been identified and the objectives of the solution had been defined in the previous chapters. After identification of the problem and objectives, an initial conceptual framework was sought in an effort to synthesise the information from the literature review presented in Section 6.2.

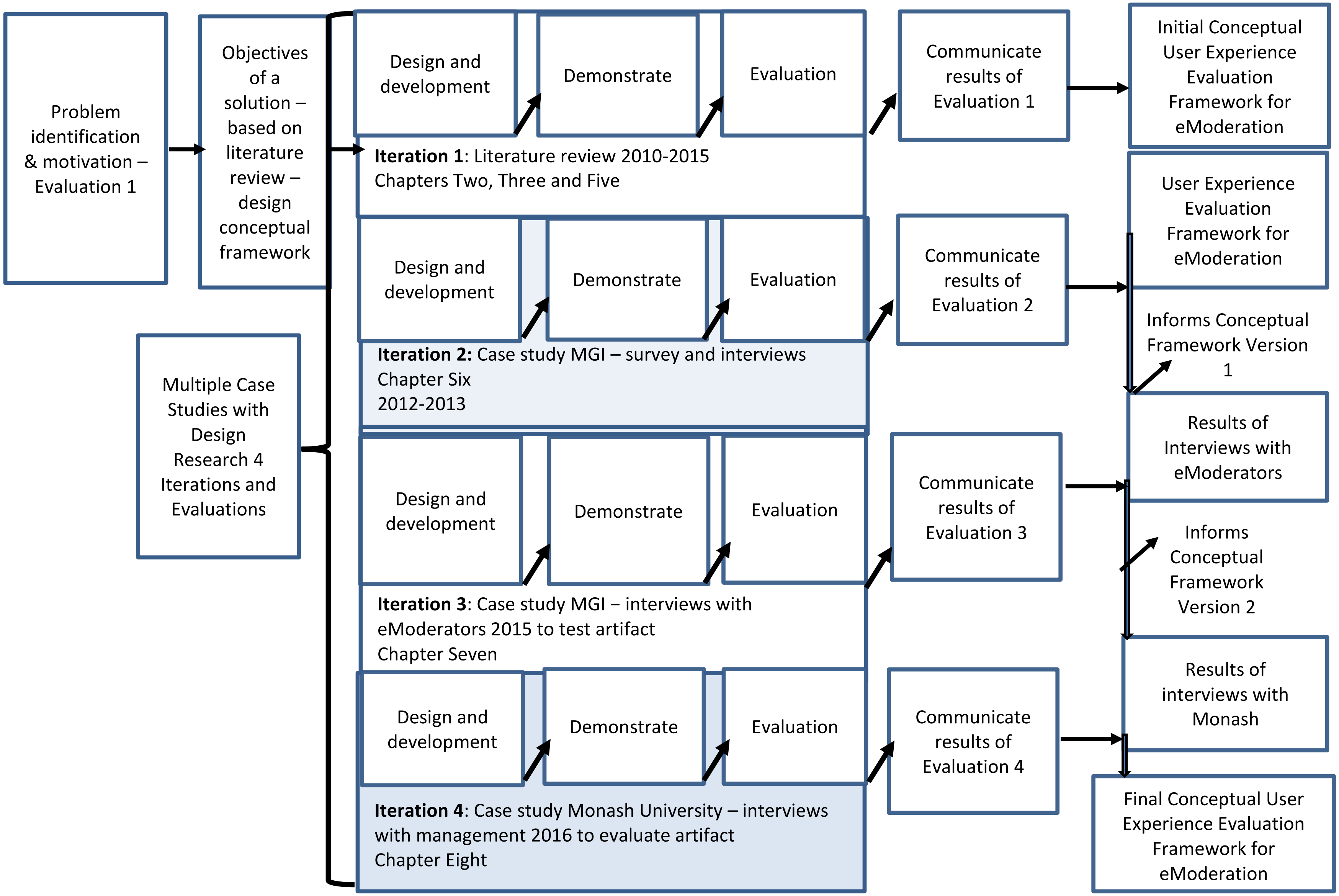


Figure 4.11 Research Design and development process

4.9 Data collection

It is not only important to select a *method* of study, such as quantitative, qualitative and mixed methods, but also a type of study which refers to the strategy of inquiry (Creswell, 2009; Myers, 2013; Oates, 2006). The research strategy for this study was the case study. Interpretive case studies generally attempt to understand phenomena through the meanings that people assign to them (Myers, 2013).

For the purpose of the research a case study was used to collect data from the two identified higher education institutions. Interviews and surveys were used for data generation regarding the people using eModerate systems. A case study, which concerns the interpretation of qualitative data collected through interviews (language and shared meanings) and documentation provided (Klein and Myers, 1999; Myers and Klein, 2011). It was the intention of the researcher to interpret the meanings that others might have of the world. Lazar, Feng and Hochheiser (2010) and Oates (2006) assert that by using triangulation the researcher can look at the same research questions using different methods, different approaches and different lenses, with the goal of identifying and discovering some scientific truths. Therefore open-ended questions were used in the interviews with the deans of the faculties to determine their views on the user experience of the eModerate system, with the inquirer generating meaning from the data collected in the field.

Data collection took place throughout the process of constructing (building) the Design Science Research artifact within the design and development phases in the research methodology as demonstrated in Figure 4.11. During this stage the concepts identified in the objective design phase were used to create and design an initial framework that could be used to create artifacts. Data created in the building and evaluation phase concerned the design decisions, choices made during design and development, relevance cycle, issues faced and identified, as well as the overall design and development methodology. The policies and procedures used in both institutions were also used as text data to guide the design and development.

It is possible to use more than one data generation method, which enables the researcher to look at the phenomena of interest in different ways (Athanasou et al., 2014; Oates, 2006). Mixed methods research permits researchers to answer both the “what” and the “why” questions and to gain a more complete understanding of the research problem by comparing the quantitative and qualitative data (Athanasou et al., 2014; Ivankova, 2007; Oates, 2006; Olivier, 2009). Ivankova (2007) identified three main research designs associated with mixed methods: exploratory design, triangulation design and embedded design. Creswell and Plano Clark (2011) agree with Ivankova’s (2007) exploratory and embedded design, but added convergent parallel design, transformation design and multiphase design. An advantage of using more than one method is that the researcher is likely to produce more data which could improve the quality of the research. For the purposes of this study embedded mixed method design was used. Embedded design includes a qualitative strand within a quantitative design such as experiments, or a quantitative design in a qualitative design such as case studies (Creswell and Plano Clark, 2011). Table 4.11 summarises the embedded design that was followed in this study, which was based on work done by Creswell and Plano Clark (2011). Table 4.11 represents the data collection method, number of participants and product after data collection.

Table 4.11 Adapted embedded mixed method design (Creswell and Plano Clark, 2011)

Phase	Procedure	Product
Quantitative and Qualitative data collection	Email based survey (N = 34) Interview (N = 4)	Numerical data Text data (policies, procedures, interview notes, transcripts)
Quantitative and Qualitative data analysis	Data screening.	Descriptive statistics, identifying missing data, normality and outliers. Theme and pattern identification.
Case selection: interview protocol development	Purposefully selecting two participants from each faculty (N = 10) based on number of participants. However only six participated. Developing interview questions.	Cases (N = 6) Interview protocol.
Qualitative data collection	Individual email, follow-up telephone interviews with eModerators (6). Also interviews with (5) Monash participants.	Text data (interview, notes, transcripts).
Qualitative data analysis	Coding and thematic analysis. Within-cases and across-cases theme development.	Case analysis. Codes and themes. Similar and different themes.
Integration of the quantitative and qualitative results	Interpretation and communication of the quantitative and qualitative results.	Discussion Implications Future research

This study made use of quantitative data that was generated by using a survey that comprised a questionnaire that was given to the moderators and managers after they used the eModerate system of MGI. The survey provided a quantitative or numerical description of trends, attitudes or opinions of the moderators as a population. A purposive random sampling strategy was used to select participants with specific inclusion criteria (see Section 6.3.1).

The following steps were adhered to during the administration of the survey: first, a letter of invitation, which also served as a consent form, was sent to all of the moderators and deans at MGI inviting them to participate (see Appendix B). Out of a total of 75 moderators, 30 moderators agreed to participate. In order to collect data from the participants a questionnaire was designed and used to elicit significant eModeration user experience constructs which could contribute to the User Experience Evaluation Framework for eModeration (see Section 6.3.2). The survey was conducted using a structured questionnaire presented in a soft copy Microsoft Word format and emailed to those who had agreed to participate, as well as to the deans (see Appendix C).

This study also used qualitative data. The user experience of the moderation process was explored using the results from interviews (qualitative instrument) with six of the deans from the faculties at MGI. The process followed to generate qualitative data is explained further in Chapter Six. The findings from the survey and the interview results were then summarised and triangulated. Similarities and differences were identified and pointed out.

Data was also collected from five compliant and five non-compliant eModerators in order to refine the artifact. This constitutes stratified purposeful sampling.

After re-design, the artifact was demonstrated to volunteers at Monash University after which they were interviewed. Monash University of South Africa was approached for participants who would be willing to participate in the study. The only criterion for participants from Monash was that they should be involved in or be using some form of eModeration. A total of five people were approached, all of whom agreed to participate. The researcher wanted to conduct a focus group, but due to busy schedules and not being able to get the participants all together at the same time interviews were found to be preferable. Individual interviews were scheduled with the participants and were conducted either face-to-face or via Skype. The design and development of the evaluation instruments is discussed in Chapter Eight.

By combining both quantitative and qualitative data a better understanding of the research problem emerged. By triangulating both quantitative numerical trends and qualitative detailed views of data it became possible to advocate change for moderators and the deans of faculties.

In all of the situations mentioned, closed-ended quantitative data and open-ended qualitative data were collected.

4.10 Data analysis

The next section considers the analysis of the research data created during the conceptual design, and design and development phases in the Design Science Research methodology.

It is interesting to note that Hasan (2003) did not include data analysis in his Design Science Research framework. However, the Design Science Research methodologies mentioned by Hevner et al. (2004), Ellis and Levy (2010), and Peffers et al. (2006) all contain evaluation, although they differ in focus in the methodology (refer to Section 4.6.1).

As can be seen in the work of Hevner et al. (2004) and Peffers et al. (2006), the process of Design Science Research involves iteration between phases, particularly between the design and evaluation phases with the primary goal of creating and analysing research data. This study takes the stance that the iteration between design or construction and evaluation is a valid means of data collection and analysis. In addition to the validity, data has been collected by means of surveys and interviews. Validation and reliability of data collection using instruments are associated with quantitative research methods (Cresswell, 2015). Validity refers to the extent to which the data collection strategies and instruments measure what they are suppose to measure. While reliability are associated with consistency of data and evaluation judgements which in turn relates to the quality of the instruments, procedures and analysis used to collect and interpret data.

Data analysis occurred during several phases of the research methodology including the design and development phase, testing and evaluation phases, and the contribution phase. Data analysis that took place in the design phase was used to create concepts and to conceptualise the research in context. These conceptualisations were then analysed and evaluated. Some of the concepts were based on current academic literature or knowledge and needed to be analysed accordingly (as demonstrated in Chapter Six).

In mixed methods research data analysis should relate to the type of research strategy chosen (Creswell, 2009). Data analysis will take place in both the quantitative (descriptive inferential numerical analysis) and the qualitative (descriptive and thematic text analysis) approach, as well as between the two approaches (Creswell, 2015).

The data analysis process is influenced by a number of independent variables. Examples of this include the researcher's background, experience, frame of reference and beliefs. These independent variables can influence the lens through which the data is analysed. It is therefore important to disclose that at the time of the study the researcher was a dean at MGI. The researcher also has practical working knowledge of eModeration. The background of the researcher contributed to an in-depth understanding of the users' experience of eModerate systems. Myers (2013) supports the point of view that the researcher must have some level of knowledge about the topic under investigation. However, research bias can be viewed as a problem in qualitative research. The challenge is to acknowledge the fact that the researcher worked in the environment and ensured that the research, specifically the data analysis, was approached while considering possible bias influences. Such practical knowledge contributed to an appreciation of the challenges and complexities introduced by eModerate systems with respect to user experience evaluation. Due to the researcher's involvement and interest a theoretical approach to the study was adopted where literature was reviewed prior to any attempts at data analysis.

After using a survey to collect the data, the results were captured by an independent statistician — named Academic Research Business Research Statistical Training Data Processing, Audit Statistical Analysis and Modelling Business Analytics. These results were captured according to the questionnaire design Sections A to E. Various question types were used, consisting of open-ended questions and Likert scale questions. Thereafter, graphs were generated to highlight and summarise the key findings. The data was analysed using SAS JMP version 12. Results were further analysed and key findings derived and summarised. The researcher used Cronbach alpha, factor-based scores, means, Shapiro-Wilk test, and Kruskall-Wallis test results to determine if constructs should be included or removed from the framework.

The internal consistency of participants' responses to items relating to the same construct were analysed via Cronbach's alpha values. Reliability of constructs was also determined by the consistency of the measurement. The reliability refers to the way in which the instrument measures the consistency of the instruments' measurements under similar conditions. The following interpretation of the Cronbach's alpha values was used in analysing the reliability:

- response values higher than 0.8 were accepted as representing good reliability,
- while values between 0.6 and 0.8 were accepted as reliable, and
- values below 0.6 were discarded as unacceptable reliability.

The internal reliability was used to determine and identify the constructs needed in the design and development of the artifact's different levels. Should the Cronbach's alpha value be higher (usually at least 2%) than the overall Cronbach's alpha (entire set) then the individual item was removed.

A second test was used to measure and confirm the reliability and feasibility of constructs. If a construct was found to be reliable, it was possible for a single score to be determined for each construct by calculating the average of the individual's items or statements. Factor-based scores were also used to determine the reliability of constructs, for example to calculate the factor-based score for "satisfaction", the participants' responses to these items were added and then divided by the number of items. Thus "Satisfaction score" = (C54 + C55 + C56 + C57)/4. If the mean score was closer to one it indicated that the participant strongly disagreed, while scores towards five indicated that the participant strongly agreed. The items with an average above three were selected for inclusion as constructs.

A Likert scale from 1 - 5 was used for all constructs. The following statistical scores ranging from strongly disagree SD = 1, disagree D = 2, neither agree nor disagree N = 3, agree A = 4, strongly agree SA = 5, were used in the data collection. An average for each question was calculated within each user experience evaluation construct. The purpose of calculating means was to facilitate the exploration of the importance of each construct against other constructs and overall. Items with an average above three were selected for inclusion as constructs.

The Shapiro-Wilk test, was used and tests for normality by comparing the shape of the sample distribution to the shape of a normal curve. The assumption that the Shapiro-Wilk test follows, is that the sample has a normal shape, the population from which it come is also normally distributed and therefore one can assume normality. If the test result is significant then it means that the same distribution is not shaped like a normal curve and the assumption of normality is rejected. The non-parametric Wilcoxon rank sum test (also referred to as Kruskall-Wallis), was conducted in cases where the construct score was not distributed normally. In this research, due to a lack of normality, the Wilcoxon rank sum test was used in more than two categories. For example to test the users' satisfaction regarding their internet speed when connecting from home, work, etc. If the p-value obtained from the test was more than 0.05 it indicated that there was no significant difference between the mean ranks when considering satisfaction (at a 95% level of confidence).

A thematic data analysis approach was selected to analyse data obtained from the primary data source, namely interviews with eModerators and then with academic staff at the second institution. Braun and Clarke (2006:86) defined thematic analysis as searching "across a data set — [through] a number of interviews or focus groups, or a range of texts — to find repeated patterns of meaning". Thematic analysis was used to perform in-case analysis in order to identify individual themes. This was followed by cross-case analysis that compared the themes identified in the case study at MGI to those found in the case study done at Monash University of SA.

The steps below were followed during the data analysis process (Braun and Clarke, 2006):

- The researcher familiarised herself with the data by transcribing, reading and taking notes.

- An initial coding structure was identified and generated that coded interesting themes from the data across the subset of data.
- The initial codes were then grouped together to generate common themes across the data.
- The identified themes were defined in more detail and named accordingly.
- A report was generated on the overall themes that were identified.

The thematic analysis approach was repeated three times: after the interviews with the deans (MGI), then with eModerators (MGI) and lastly with academic staff at Monash University. All transcriptions were evaluated in order to identify possible codes and themes. The evaluation was done according to Braun and Clarke's (2006) guidelines for conducting thematic analysis.

Interviews with the deans were done on the MGI premises with a recorder. The interviews were transcribed by an independent person. It was impossible to meet the eModerators at their premises to conduct the interviews so telephonic or Skype interviews were conducted. The data obtained from the interviews was captured within 12 hours after the interview. Notes were made during the interview process and some information was captured using memory recall. The same interview process was followed with academic staff from Monash University. The correctness of the captured data was verified by sending the captured responses back to the interviewees for confirmation and clarification on the researcher's understanding of the questions and answers posed to the respondents.

The data was analysed without considering theoretical frameworks in order to identify all possible themes not necessarily included in the framework. A thematic map was then constructed with the themes. The themes identified by the eModerators were then used to structure the semi-structured interview questions for Monash University taking into consideration the theoretical framework of the study. The last interviews were done to evaluate the User Experience Evaluation Framework for eModeration at a second higher education institution.

The purpose of the evaluation phase is to provide feedback on the constructed artifacts (Hevner et al. 2004). The artifact was constructed to solve an identified problem and to meet the identified objectives. The artifacts were constructed and built using the assumptions identified in the concept design phase. The evaluation phase provided a means for validating these assumptions and it provided a deeper understanding of the problem and the context in which the problem was to be found. The assumptions can be seen as the underlying logic and were based on the associated body of knowledge.

If the artifact is functional within its given context, it can be assumed that the assumptions about the context are correct in some form. If the artifact managed to solve the identified problem, it can be assumed that the assumptions about the identified problem are correct.

This research will, however, reflect on the creation of the artifacts and the design and development process in order to refine the artifacts and analyse the results further.

It is important to evaluate the solution artifact to ensure that it meets the needs and requirements as identified in the initial steps and that it possesses the desired and required outcomes. The evaluation of the artifact should also serve as a source of research data. Furthermore, it is important to evaluate the design and development process, which in turn will also serve as a source of research data.

4.11 Data presentation

In Design Science Research the end product is an artifact which is a form of data presentation.

The User Experience Evaluation Framework for eModeration (the instantiation) is presented as a proof of concept. The constructs that make up the prototype eModeration system are presented in the form of screenshots (see Section 5.3.2).

Use case diagrams are also used to present the process flow of moderation (see Section 5.3.1).

4.12 Ethical considerations

At the time of the study the researcher was employed by MGI as Dean of the Faculty of Information Technology. It is for this reason that no interview was conducted with the Dean of the Faulty of Information Technology. The following stakeholders were identified because they may potentially be affected by the research:

- Participants:
  - Deans at MGI;
  - eModerators at MGI;
  - Monash University as an institution;
- UNISA as an academic institution and as the funder of the researcher;
- eModerate community; and
- Policy makers who might wish to use the research results to create and improve policy.

The following ethical issues which affected the participants were considered during the research:

- informed consent;
- collecting data from participants;
- dealing with sensitive information; and
- dealing with confidentiality versus anonymity.

Participants were formally approached via email to take part in the research and were sent a letter of informed consent (Appendix B). The letter of informed consent explained to the participants what the research entailed and what would be required of them during their participation. It also outlined whether their identities would be protected, how they would be protected and how the results would be used. Participants, such as eModerators, either accepted or rejected the opportunity to take part in the research. In total 75 eModerators from MGI were identified, but only 30 accepted and agreed to participate. The deans of the respective MGI faculties were also approached by the researcher and four agreed to participate.

The surveys and interviews were conducted after the researcher received the signed letters of consent. The participants were created as users on the eModerate system and supplied with a URL, login and password. The participants then moderated the examination scripts electronically and after the process was finished they were asked to complete the questionnaire. The participants needed to provide their names, the date and their signature on the letter of consent. Participants emailed their surveys back to MGI. These surveys were then kept safe and handed over to an independent statistician for capturing.

A formal part of conducting such research involves obtaining ethical clearance from the relevant institutions, which in this case included MGI, Monash, and the University of South Africa (see Appendix A). Only after obtaining ethical clearance did the researcher commence with the collection of data.

No incentives were given or promised to any participant. All the participants participated voluntarily.

This study was limited to MGI and was restricted to the evaluation of moderators in the respective faculties of IT, Science, Commerce, Social Sciences and Creative Arts. The Pre-degree Programme moderators were excluded from the evaluation as were those modules in the Faculty of Creative Arts which consisted of portfolios and drawings. At the time of the study MGI had 11 remote campuses which offered some of the Commerce and Social Science degrees. Moderation samples were also included from these campuses.

4.13 Conclusion

The aim of the chapter was to elaborate on the epistemology and ontology, philosophical stances, literature on Design Science Research, and which research design would be used in the study in order to answer the research questions. The research explores and identifies what user experience constructs are applicable to a user experience evaluation framework for eModeration. Once the constructs have been identified, the researcher will design and develop an artifact that will be evaluated and verified before the iteration processes of relevance, design and rigour are repeated. The intention of the first iteration of the Design Science Research process is to gain a deeper understanding of user experience of eModerate systems in order to refine the design and development of the artifact.

The Design Science Research approach was chosen for this study because it was one of the primary means found in the academic literature for conducting “practical” research in IS. Design Science Research offers a means of combining design and development. Development is conventionally associated with the practical or industry component of IS and IT, and rarely with research directly.

A Design Science Research iterative process as recommended by Peffers et al. (2006) and Sonnenberg and Vom Brocke (2012a) were used to design, test and evaluate the User Experience Evaluation Framework for eModeration artifact.

In this study the Design Science Research cycles (relevance, design and rigour) as described by Hevner et al., (2004) were used to guide the Design Science Research approach, together with the seven guidelines also identified by Hevner et al. (2004). The guidelines check whether: the artifact is designed, if the problem is relevant, if the design is evaluated, if the research makes a contribution, if rigour was used, what design process was used and how the research was communicated. The research design for this study delineated by Design Science Research: steps, evaluation phases with its activities, methods and outputs can be found in Figure 4.12.

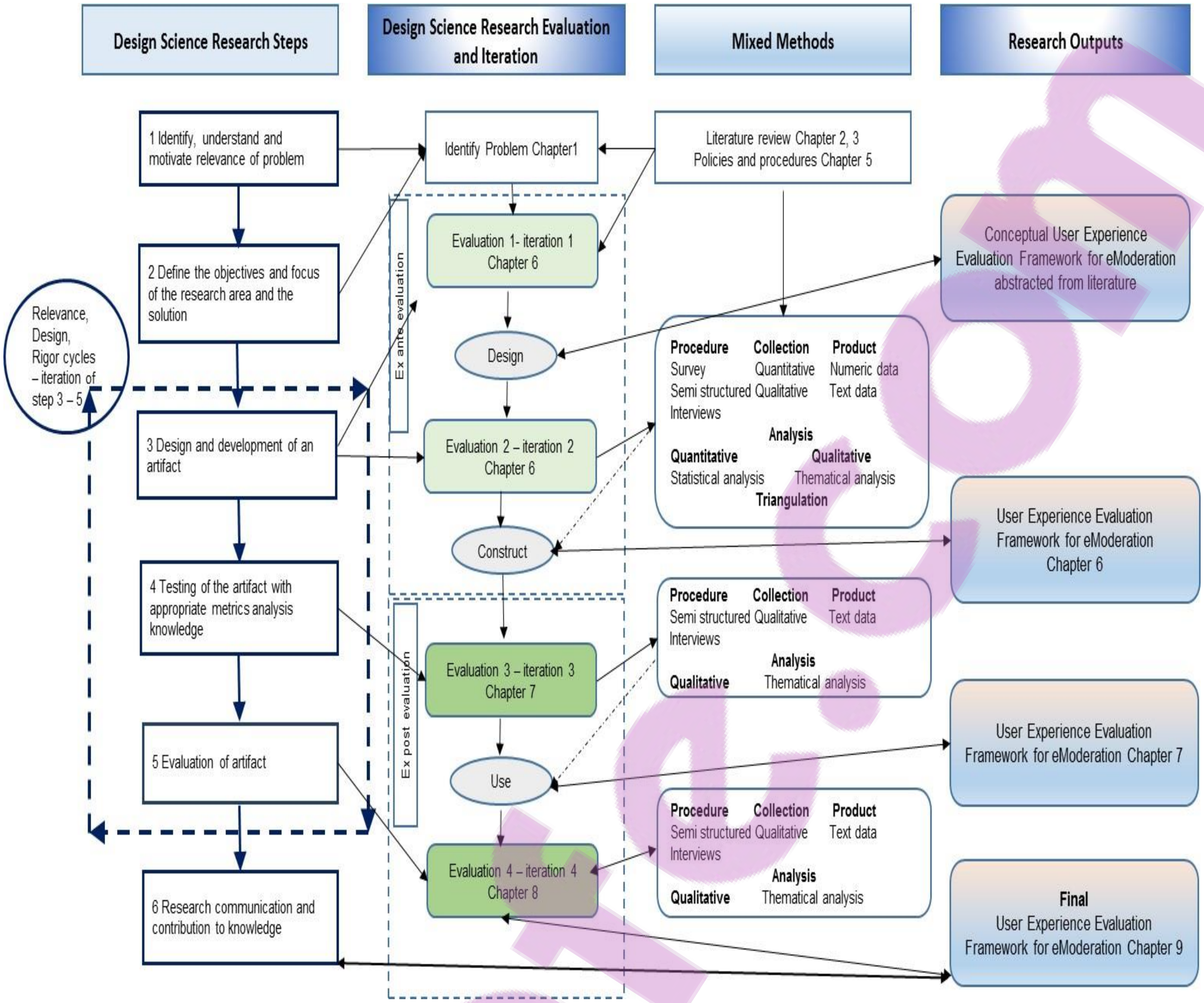


Figure 4.12 Research Design

The evaluation of the artifact assists with the understanding of the problem that the artifact attempts to address. Underlying and embedded in the artifact are design considerations, assumptions and proof of concept that the artifact will solve the problem.

In summary, with regards to the Research Design chapter it can be asserted that the process of design and development in Design Science Research allows the researcher to build on current academic knowledge.

Chapter Five: Research in context

5.1 Introduction

Chapters One to Three constituted Part One of this thesis, namely the theoretical framework — knowledge base and environment. Part Two of this thesis involves Information Systems Research Development which was included in Chapter Four: Research Design, Chapter Five: Research in Context, Chapter Six: Design and Development, and Chapter Seven: Testing. Chapter Five discusses the context in which the research on eModeration and user experience was conducted using two case studies: MGI and Monash University South Africa. The chapter will also explain the role of the deans or managers and moderators in the field of electronic examination script moderation.

Figure 5.1 maps the Design Science Research environment, namely the application domain, with user experience constructs and eModeration. The mapping of these features should also be considered a contribution to academic knowledge.

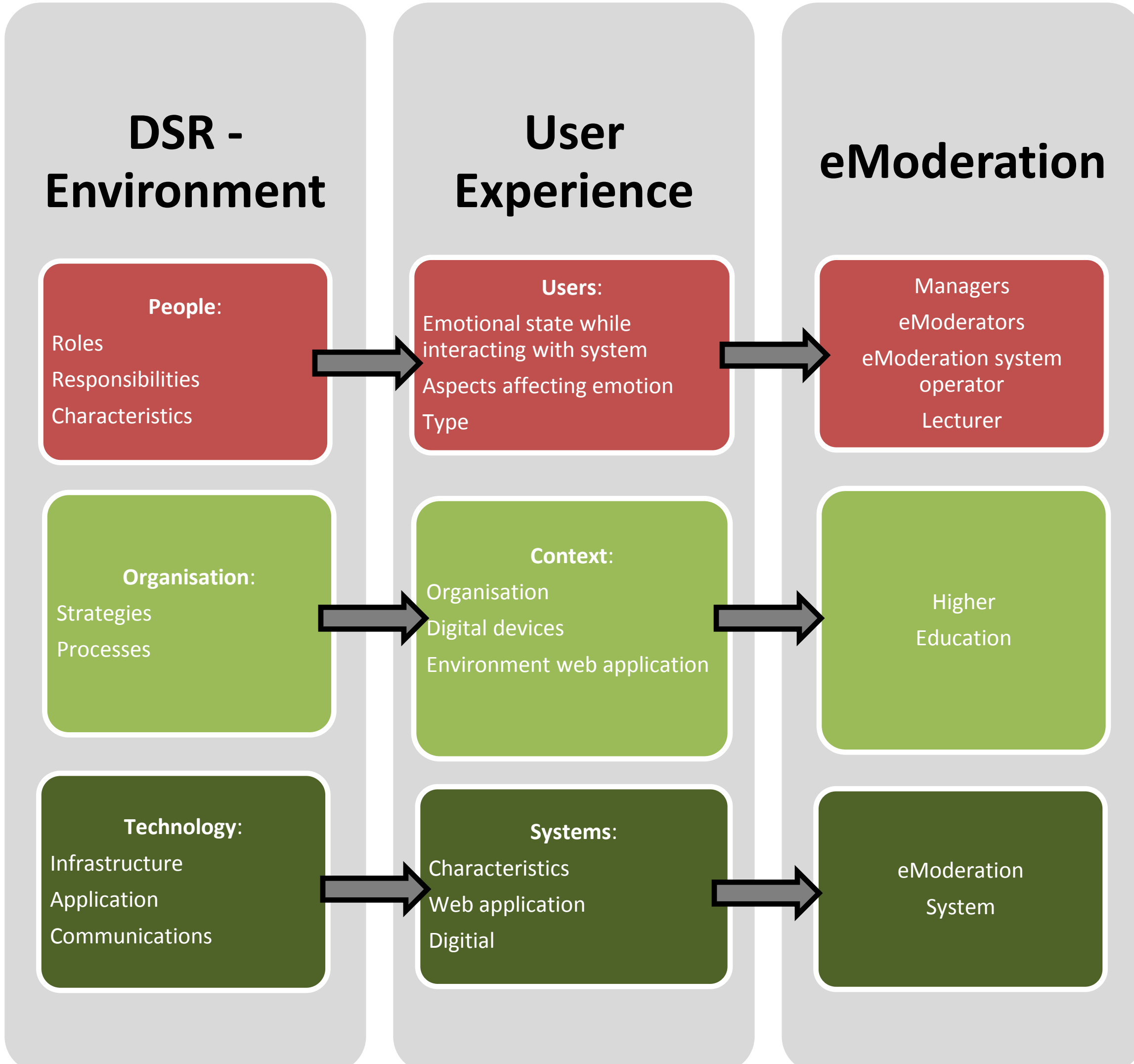


Figure 5.1 Design Science Research: User Experience and eModeration mapping in research

This chapter begins by positioning the research within the context of Design Science Research, user experience and moderation in Section 5.2. The chapter then discusses the environmental application domains of MGI in Section 5.3, and Monash University in Section 5.4. The emphasis of this chapter is on the research context, creating the requirements for the solution, identifying the users of the solution, defining the solution concepts and conceptualising the implications of the proposed solution. In each section attention has been paid to the users involved, the systems used in the organisation, the organisational structures and processes, as well as the technology used. These topics are also aligned with the user experience conceptual framework identified in Chapter Six (see Section 6.2, Figures 6.1, 6.2, 6.3 and 6.4). This is followed by a discussion about the protocol to be used for electronic moderation systems and its challenges in Section 5.4. The chapter then concludes by discussing user experience in the context of eModerate systems.

5.2 Positioning this research setting in Design Science Research

This chapter fits into Step Two of the Design Science Research process as identified in Section 4.6.2 and Table 4.7. In Step One opportunities and problems such as the user experience of eModerators and managers of an eModerate system in an actual application environment were identified. Part of Step One involved the identification of acceptance criteria for the evaluation of the research results, as explained in Chapter Two (a literature review of moderation), Chapter Three (a literature review of user experience) and Chapter Six (abstraction from literature a conceptual framework see Section 6.2). Furthermore, Step One determined the relevance of the application context and whether it provided the requirements for the research as input, whether the designed artifact would improve the environment, and how this improvement could be measured. Step Two focuses on defining the objectives (see Section 4.4), the focus of the research area (Chapter Five) and the solution (Chapter Six).

The application domain which falls under the area of environment consists of the people, organisational systems and technical systems that interact and work towards a common goal (Hevner et al., 2004; Hevner and Chatterjee, 2010).

It is for this reason that Chapter Five pays attention to the area of environment, also known as the application domain, which consists of people, the organisation and technical systems that work together towards the common goal of using an eModerate system to moderate examination scripts electronically. This chapter includes system functionalities and requirements as well as techniques that can be used during the development of the requirements' specifications as advised by Ellis and Levy (2010), Hasan (2003) and Nunamaker et al. (1991). The establishment of criteria for evaluating the expected goals will be used to measure whether the identified goals have been met (Carlsson, Henningsson, Hrastinski and Keller, 2011). The relevance cycle will take the requirements from the environment of the research and place these into the research domain, which is eModeration at private higher education institutions. The design will also consider three criteria: importance, accessibility and suitability (Carlsson et al., 2011; Rosemann and Vessey, 2008). Chapter Five also addresses guideline two of Hevner et al.'s. (2004) formulation of Design Science Research, by developing a relevant solution to a problem for a specific domain using technology-based solutions. The output of Design Science Research must be returned to the environment for further study and evaluation in the application domain (Hevner and Chatterjee, 2010). Chapter Six focuses on the iteration phases of the design and the development of the artifact, which form part of the area of Information Systems Research.

Figure 5.2 illustrates the Design Science Research Framework as outlined by Hevner et al. (2004) and discussed in Section 4.6.1.6. This was addressed again in Section 4.6.2, which described how the framework was adjusted for the purposes of this study. Figure 5.2 specifically focuses on the area concerned with the environment in the framework. The environment in which the study took place involved users such as managers who were involved in examination processes, i.e. deans and eModerators. In user experience terms people are referred to as "users". On this basis people will be referred to as "users" in this study. These users have certain roles, capabilities and characteristics, to be further discussed in Section 5.3. The environment also incorporates the organisations that were used in the case study which included MGI and Monash University, two private higher education institutions. The organisations are referred to as the "context" in user experience terms. Each organisation has its own strategies, structures and processes. The last element that plays a role under environment is technology; in this study this would constitute eModerate systems. Technology also includes infrastructure, applications, communications architecture and development capabilities.

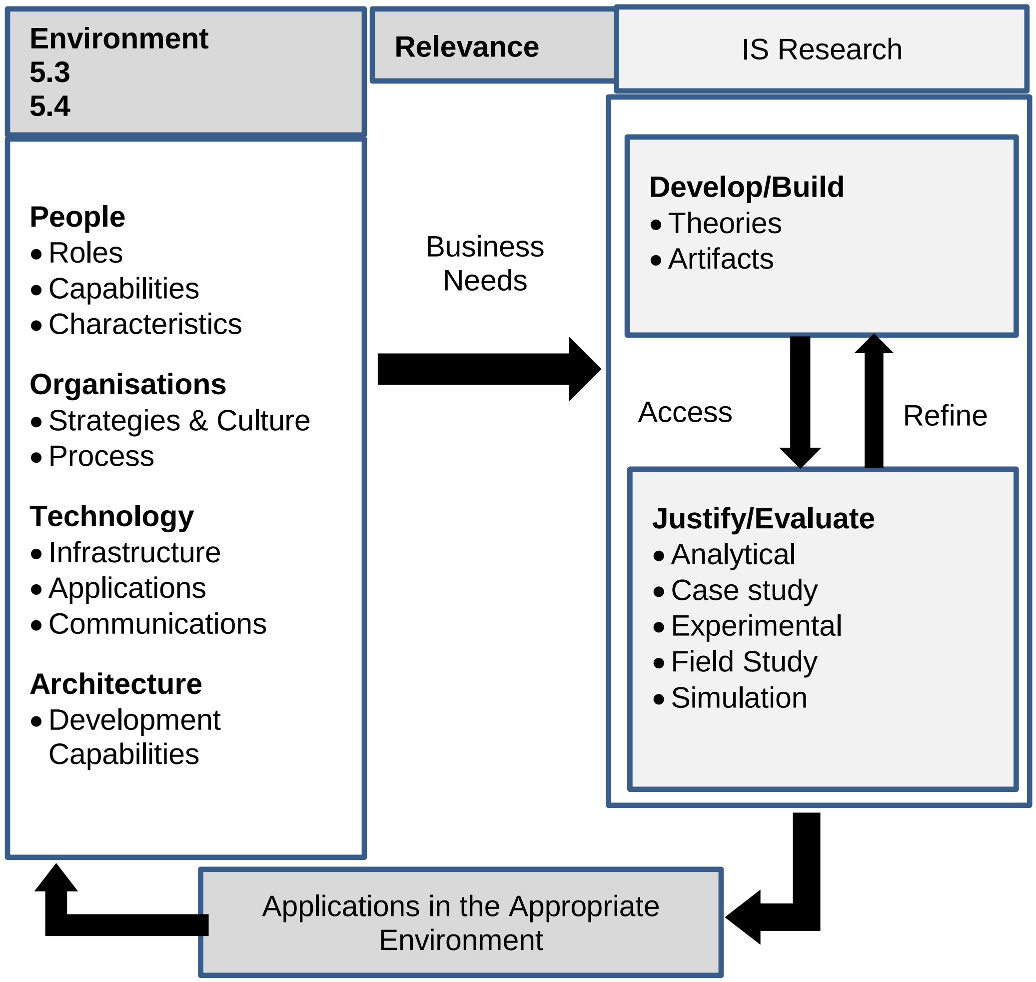


Figure 5.2 Design Science Research with a focus on Environment and Relevance adapted from Hevner et al. (2004)

This chapter will not address the emotional state of users and the aspects that affect user emotion, this will be done in Chapter Six.

This chapter will address the need requirements within the application domain and user experience frameworks in explaining the two cases.

5.3 Moderation in context at MGI

In Chapter Two the term "moderation" was defined and explained. This section positions the different constructs of user experience regarding moderation at MGI by paying attention to:

- **Users** — what type of user, user roles and user responsibilities;
- **Context** — organisational structures and processes, eModeration web application, and what digital devices and technology were involved;
- **System** — characteristics and factors influencing the system.

5.3.1 Users at MGI

The organisational organigram of the institution is discussed in Section 5.3.2 under the environment context. The purpose of the organigram is to demonstrate where the users fit within the institutional structure. For the purposes of this study the focus is only on the users involved in the moderation process. Various users are involved in many moderation processes where the processes can be manual or electronic. For example in the manual paper-based moderation process at MGI the following users were involved: dean, academic administrator, examinations officer, moderators and driver or postal delivery services. In the electronic moderation system at MGI the following users were involved: dean, academic administrator, eLearn developer and eModerators.

Each user has specific roles and responsibilities. The users' roles, responsibilities and characteristics will in turn influence the users' emotional state while interacting with the system, as various aspects can affect the users' emotions (Hassenzahl and Tractinsky, 2006; Roto, 2006; Wimmer et al., 2010). It is for this reason that it is important to understand how the roles, responsibilities and characteristics of users contribute to user experience as explained in Section 3.3.4.

The following section explains the types of users within the context of MGI with a specific focus on:

- Roles
- Responsibilities
- Characteristics of each user

5.3.1.1 Users' roles

The users fulfil many roles within the institution. For the purposes of this study only the roles associated with moderation will be explained:

- Dean of Faculty (DoF): The dean's role is to manage his or her faculty modules by ensuring the quality of the moderation process between the lecturer and the moderator.
- Lecturer: The lecturer's role is to be involved in teaching and learning as well as the development and design of assessment packs.
- Academic Administrator (AA): The role of the academic administrator is to ensure that marks are captured accurately.
- Examinations Officer (EO): The role of the examinations officer is to manage the administration of MGI examinations.
- Driver: The role of the driver is to deliver and collect parcels, for example, from the exams office.
- Moderator or eModerator: The role of the eModerator is to moderate the examination scripts belonging to the institution.
- eLearn developer: The eLearn developer's role is to administer the ePortal system.

In a manual paper-based moderation system a driver or a package delivery company is needed to collect and deliver the paper-based moderation packs. In an eModerate system, there is no need for a driver but there does need to be a network with an administrator. In the case of MGI this function forms part of the role of the eLearn developer, who ensures the creation of the eModerate pages and makes sure that the relevant parties have access to the portal.

5.3.1.2 Users' responsibilities

The users have many responsibilities within the institution, but for the purposes of this study only the responsibilities associated with moderation will be provided:

- Dean of Faculty (DoF) — the dean's responsibilities include:
    - Appointing appropriate moderators to moderate the modules in the faculty.

    - Ensuring that the examination papers are moderated and that the feedback is communicated to the lecturer. If any changes are recommended the dean and lecturer need to agree on how these changes will be implemented.
    - Ensuring that the exams office receives a copy of the examination paper prior to the examinations being written.
    - Compiling a list of modules and related moderators.
    - Communicating the moderators' list to the examinations officer, lecturers and eLearn developer. The examinations officer requires the information for contract purposes, the lecturer must add the name/s to the examination paper/s, and the eLearn developer needs this information in order to create access codes/logins for the moderators.
    - Ensuring that both the security and quality of the examination papers are upheld at all times.
    - Ensuring that lecturers mark according to appropriate standards and submit the marked scripts timeously.
    - Appointing administrative assistants to check whether all questions have been marked and whether all the marks have been correctly calculated.
    - Ensuring that an appropriate sample is selected for moderation.
    - Ensuring that the selected samples are scanned and uploaded for the eModerator onto the eModerate system.
    - Ensuring that the information that the eModerator needs to electronically moderate the scripts is provided to the eLearn developer to upload onto the eModerate pages where appropriate. For example, the examination paper, examination memorandum, mark sheets, moderation report and a sample of the scripts according to the company policy for the selection of samples.
    - Downloading the moderation reports from the eModerate pages that were uploaded by eModerators after moderation.
    - Communicating the feedback from the eModerator back to the lecturer and eventually to the Senate.
- Lecturer — the lecturer's responsibilities include:
    - Setting assessment packs.

    - Providing the assessment packs to the dean of faculty who will arrange for the moderation of the pack.
    - Implementing recommendations from the moderator prior to examinations taking place.
    - After the examination, marking the scripts, calculating the results of the students, submitting the marks to the academic administrator and submitting the marked examination scripts to the dean of the faculty within the time allocated.
    - After feedback has been received from the moderator, applying recommendations or taking note of the feedback.
- Academic Administrator (AA) — the responsibilities of the academic administrator include:
    - Publishing due performance marks before the examination sessions. If a student fails the due performance requirements he or she will not be allowed into the examination venue nor will they be allowed to sit for an examination session.
    - Ensuring that the marks are captured correctly.
    - Publishing marks after examination sessions.
- Examinations Officer (EO) — the responsibilities of the examinations officer include:
    - Collecting examination papers from deans before the commencement of an examination session.
    - Ensuring that examination papers are stored in a safe and secure environment.
    - Making copies of examination papers before examination sessions and administering the examination process associated with examination sessions.
    - Ensuring that lecturers collect papers from the exams office for marking.
    - In the case of manual paper-based moderation, arranging for the delivery and collection of either the examination papers and/or examination scripts

to moderators. Drawing up a schedule for the driver regarding deliveries and collections.
    - In the case of manual paper-based moderation, ensuring that the dean receives the relevant feedback from the moderators once moderation has been completed.
- Driver — the responsibilities of the driver include:
    - Delivering the examination papers, moderators' reports and/or examination scripts to moderators to moderate.
    - Collecting the moderation packs from moderators once moderation has been completed.
    - Communicating with the examinations officer on a regular basis to ensure that the examination process runs smoothly.
- Moderator or eModerator — the responsibilities of the eModerator include:
    - Moderating examination papers before the commencement of examinations.
    - Moderating examination scripts after students have written.
    - Providing feedback on the examination paper and on the lecturers' grading of candidates.
- eLearn Developer — the eLearn developer's responsibilities include:
    - Creating the eModerate pages for each module.
    - Creating access for deans to the eModerate pages.
    - Creating secure access for respective eModerators to appropriate eModerate pages.
    - Communicating logins and passwords for the eModerate pages to eModerators.
    - Assisting deans and eModerators with queries concerning the uploading or downloading of examination scripts.
    - Assisting with the uploading of examination scripts to the eModerate pages per module per campus.
    - Ensuring that all the information needed by eModerators to complete their tasks is available.

  - Ensuring that the infrastructure, backup and security of the system is adequate.

In a manual paper-based moderation system a driver or a package delivery company is responsible for the delivery and collection of the paper-based moderation packs. In an eModerate system it is the responsibility of the eLearn developer to ensure that the examination packs are uploaded successfully, that all the information that the eModerator will need is available on the eModerate pages and that the relevant people have adequate access. In an eModeration process the services of the driver are not required.

5.3.1.3 Characteristics of users

The users have different characteristics, which are in turn influenced by elements such as emotional satisfaction, experience and perception as discussed in Section 3.3.3 (Hassenzahl, 2004; Kuniavsky, 2010; Sproll et al., 2010).

Other factors that can contribute to user experience include navigation, visual appeal, information hierarchy, usability, functionality and satisfaction with content (Porter and Bewer, 2010; Rubinoff, 2004; Rubinoff, 2009). As with the roles and responsibilities, only the characteristics required in the moderation process will be examined:

- Dean of Faculty (DoF): The dean must be able to manage the examination process adequately. He or she must be able to decide when feedback is relevant and applicable to the situation. The dean must be able to deal with both the positive and negative reactions from lecturers when a feedback discussion takes place. The dean must complete tasks on time.
- Lecturer: The lecturer must be responsible, accountable and dedicated.
- Academic Administrator (AA): The characteristics required of an academic administrator are those associated with administration related tasks, such as attention to detail and accuracy. It is the administrator’s role and responsibility to collect and capture results timeously, before the publication of final results.
- Examinations Officer (EO): The characteristics required are similar to those associated with a control officer, with an emphasis on security control and planning.

- Driver: The driver should be courteous, punctual and responsible.
- Moderator or eModerator: The moderators and/or the eModerators should give judgements that are fair and accurate.
- eLearn Developer: The eLearn developer must support the deans/eModerators, be creative, imaginative, and pay attention to detail.

The next section will focus on the organisation and where the users fit in the organisation. The section will examine the specific responsibilities of each user in the moderation process.

5.3.2 Context at MGI

This section specifically considers moderation in the context of MGI in order to better understand the research area. The insights provided by the case study serve to guide the development process by providing the problem, objectives and requirements while the context also provides a lens through which the research findings can be placed into a specific context. The context of the research is a private higher education institution called MGI, with a specific focus on the eModerate system of the institution. In terms of Design Science Research the context also refers to:

- Organisational structures;
- Organisational examination processes;
- eModeration web application; and
- which digital devices and technology are involved.

5.3.2.1 Organisational structure of MGI

Please see Appendix G for a complete organigram of MGI, which will be used to explain the organisational structure of the institution. The organigram reflects the reporting structure used in the institution. For example, lecturers will report to deans, deans will report to the dean of faculties while the examinations officer will report to the registrar. The organigram and structure used by other private higher education institutions might be different from that of MGI. In terms of moderation, some users are a requirement from a regulatory point of view in South Africa, i.e. a lecturer, examinations officer, driver versus eLearn developer and a manager who manages the quality assurance of examination papers and grading — in the case of MGI this manager is the dean. In other institutes the role played by deans at MGI might be carried out by other managers. Figure 5.3 illustrates where the deans and examinations officer fit into the organisational structure.

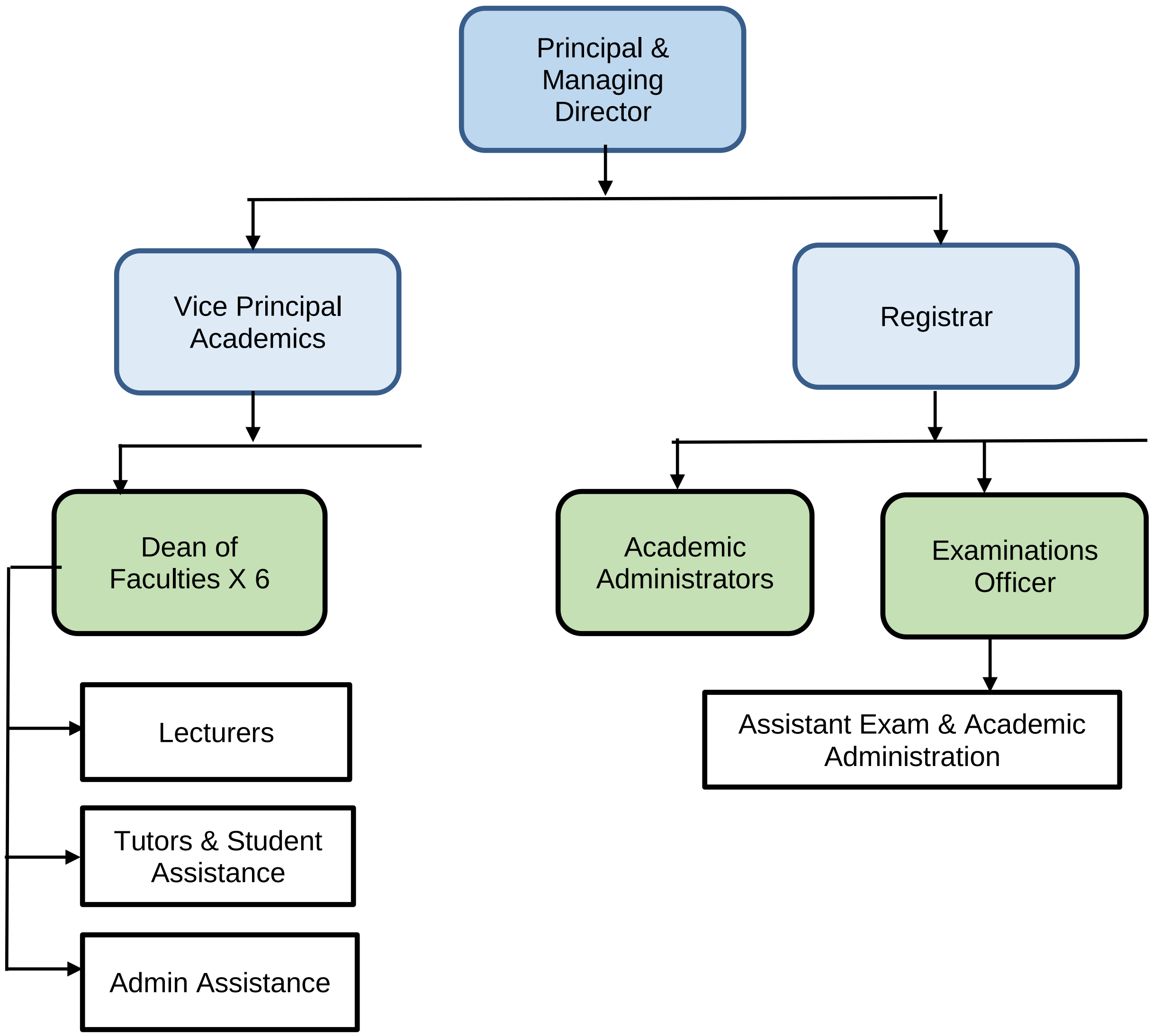


Figure 5.3 Organigram of Midrand Graduate Institute Vice Principal and Registrar involved in examinations

As Hanlon et al. (2005) assert, it is assumed that all higher education institutions operate quality assurance systems as a means of ensuring the integrity of their assessment processes. It is the responsibility of the module team (internal examiner) to ensure the consistency of the assessment process through the use of assessment criteria and the process of moderation. For the purposes of the study the term “moderator” will be used for external examiner and the term “lecturer” for internal examiner. Private higher education institutions are governed by the Council on Higher Education which requires that the institution has certain policies and procedures (such as those relevant to assessment) in place for accreditation purposes. MGI uses an assessment procedure that assists with ensuring the quality of examinations as explained in the next section.

5.3.2.2 Organisational examination process at MGI

The examination process at MGI can be divided into two phases:

- Phase 1 Moderation of summative assessment questions *before* the examination;
- Phase 2 Moderation of summative assessment scripts *after* the examination.

The next section outlines the protocol to be followed for each phase of the moderation process. An explanation of the protocol to be followed for Phase One is provided below, followed by the protocol for Phase Two of the moderation process. The study, however, focuses only on Phase Two of the examination process.

The protocol that should be adhered to during Phase One for the setting of each examination paper is as follows:

- Questions on outcomes within a module are to be set by the assessor or internal examiner or lecturer.
- The paper is to be checked by an external examiner or moderator, either from the academic staff or from another university.
- An external examiner will produce the final draft paper and report on the assessment.
- An internal examiner together with the dean of faculty will apply the recommendations from the external examiner to the paper.
- The paper will then be printed by the examinations officer.
- Students will sit for a formal examination session during which they will receive the examination paper together with an answer book, in which they are required to answer the questions in writing.

- The internal examiner will collect the examination scripts from the examinations officer and mark (grade) the assessment.
- Thereafter the internal examiner will submit the marks to the academic administration to process.
- The dean will arrange for a checker to ensure that all scripts have been marked, that all marks are accounted for and that the marks have been captured correctly on the Learning Management System. This is where Phase Two begins.

The protocol that should be followed during Phase Two for the handling of moderation for examination scripts:

- The internal examiner together with the dean of the faculty will select a sample from the answer books to be moderated.
- The dean compiles the moderation pack consisting of the examination paper, memorandum, sample of the answer books and moderator's report.
- The dean delivers the sample pack to the examinations officer who then arranges for the delivery of scripts to the moderator.
- The designated driver will then deliver the scripts based on a schedule for deliveries set out by the examinations officer. In the case of electronic moderation, scripts are scanned into electronic format and uploaded onto the relevant module's eModerate page ready for the eModerator to download and moderate.
- The moderator receives the scripts and starts with the moderation process. In the case of eModeration, the eModerator will download the scripts and then start to moderate the scripts electronically.
- Once moderation has been completed the moderator will contact the examinations officer at MGI to arrange for the collection of the examination scripts. In the case of eModeration the eModerator will upload the moderated scripts onto the eModerate page.
- The designated driver collects the scripts from the moderator and then delivers these to MGI. With eModeration this step is not necessary. Instead, a notification

email will be automatically sent to the dean indicating that the eModerator has uploaded the moderated scripts.

- The examinations officer will inform the dean when the scripts have arrived and are ready for collection. In the case of electronic moderation the dean will receive an email from the eModerate system.
- The dean will review the report from the moderator and apply the recommendations. In the case of eModeration the dean will then download the report with recommendations.
- After a discussion with the Examinations Board, the marks of the students will either remain the same or be adjusted according to the moderator's report.
- Finally the marks are signed off by the Examinations Board and published.

This section conceptualised the moderation processes used in the setting, marking and grading of students' work at MGI. It is therefore necessary to examine:

- manual paper-based moderation of examination scripts; and
- electronic moderation systems used by MGI.

MGI's manual paper-based moderation process

The manual moderation process used by MGI provided a good starting point for the research and the initial conceptualisation of moderation at the institution. Moderation processes might be used to ensure the generalisability of assessment standards and outcomes (Coates, 2010) as explained in Section 2.2.3. Moderation requires teaching staff to review samples of students' work to ensure the comparability of standards across contexts (Coates, 2010; Hanlon et al., 2005).

Figure 5.4 demonstrates the routing of the manual paper-based moderation process which involves a number of actors (users) with different roles and responsibilities.

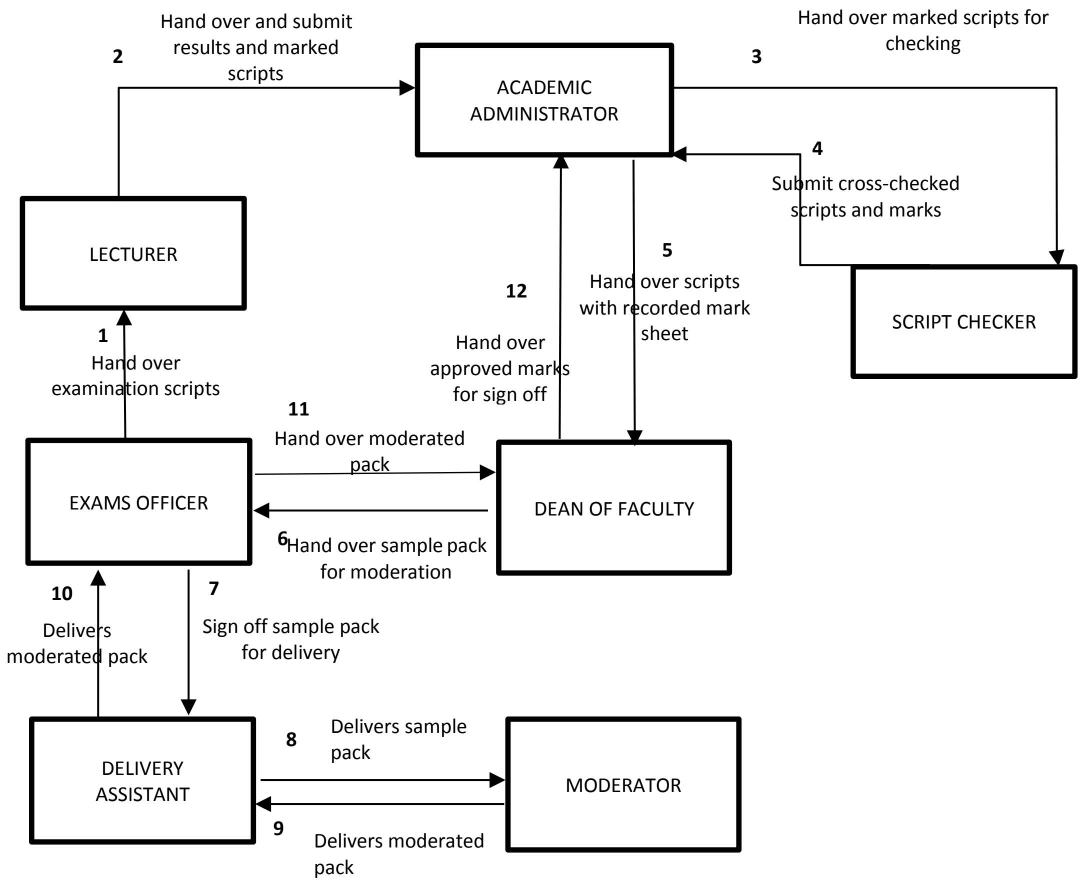


Figure 5.4 Block diagram of the manual paper-based examinations routing

Problems experienced by the institution regarding the manual moderation process include tracking of examination scripts, contacting moderators, delivery of scripts and security — all of which are time-consuming (Van Staden, 2010). Due to these problems MGI decided to investigate the possibility of moving towards an electronic moderation system for all faculties (Van Staden, 2010).

eModeration

Figure 5.5 illustrates how the examination scripts are routed through the examination and moderation process using an eModerate system.

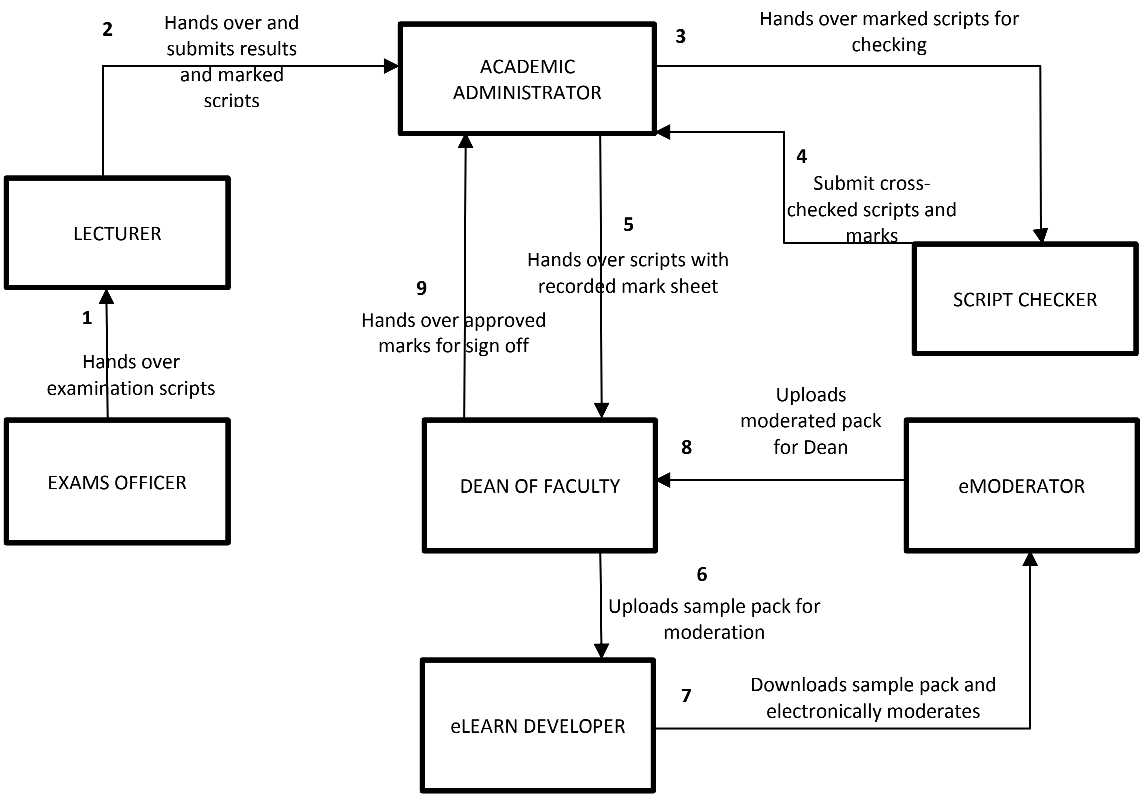


Figure 5.5 Block diagram of the electronic examination process

Against this background the difference between the manual paper-based and eModerate systems will be considered, as illustrated in Table 5.1. The main difference between manual and electronic moderation is how the students' examination responses to markers are presented, usually on-screen instead of on paper, or handwritten instead of typed (Greatorex, 2013). Table 5.1 illustrates the tasks to be completed by the various users involved in the manual paper-based system and the eModerate examination process as described above in Phase Two. The main users involved are as follows:

- Dean of the Faculty (DoF);
- Academic Administrator (AA);
- Moderator;
- eLearn Developer;
- Examinations Officer (EO); and
- Driver.

The table also indicates where the tasks to be completed differ between the manual paper-based and the virtual learning environment. The focus of this table is on the examination process after the marking of examination scripts by the lecturer, the checking by checkers and sampling by the lecturer and the dean of faculty have taken place.

Table 5.1 Manual paper-based versus electronic moderation examination process at Midrand Graduate Institute

	Manual paper-based examination process		Electronic moderation examination script process	
	Users	**Process**	**Users**	**Process**
1	DoF and Lecturer	Select a sample from the pack.	DoF and Lecturer	Select a sample from the pack.
2	DoF	Arranges for copying of scripts.	DoF	Arranges for scanning of scripts.
3	AA	Makes copies of the examination scripts before these are packed for moderation.	Tutor/AA	Cuts the edges of scripts. Scans scripts in colour. Renames scanned scripts to reflect student number into an area ready for the eLearn developer to upload.
4			DoF	Accesses the ePortal of the institution.
5			DoF	Logs into the ePortal.
6			DoF	Selects eModerate.
7			DoF	Selects the module.
8	DoF	Prepares sample pack **hard copies** in envelope: • Examination scripts • Examination paper • Examination memorandum • Moderator's report • Class list with marks	DoF	Prepares sample pack by **uploading** to the eModerate portal into the relevant module: • Examination paper • Examination memorandum • Moderator's report • Class list with marks
9	DoF	Hands sample pack to examinations officer.	eLearn developer	Uploads scanned examination scripts.
10	EO	Contacts moderator to arrange a time and date to deliver the sample pack.		
11	EO	Arranges a delivery schedule for the driver.		
12	EO	Contacts driver and delivers schedule and documents to driver.		
13	Driver	Delivers the papers.		
14	Moderator	Accepts the papers from the driver.	eModerate portal — system	Sends an email to moderator that papers are ready to be moderated.
15			eModerator	Enters the URL for the ePortal of the institution.
16			eModerator	Logs into the ePortal of the institution with secure login and password.

	Manual paper-based examination process		Electronic moderation examination script process	
	Users	**Process**	**Users**	**Process**
17			eModerator	Selects the module to moderate from the eModerate page.
18			eModerator	Downloads the uploaded information: • Scanned examination scripts • Examination paper • Examination memorandum • Moderator's report • Class list with marks
19	Moderator	Moderates the papers by writing on the original examination scripts.	eModerator	Moderates the papers by using one of the following electronic options: • Sticky notes in Adobe • UNISA online marking tool • A Word document with student numbers and questions that are recorded where marking differs.
20	Moderator	Compiles a report and makes recommendations.	eModerator	Compiles a report and makes recommendations.
21	Moderator	Contacts the EO to arrange a time and date to collect the moderated pack.		
22	EO	Arranges a collection schedule for the driver.		
23	EO	Contacts the driver and provides a schedule for the collection of moderated examination scripts.		
24	Driver	Driver drives to the moderator's destination.		
25	Moderator	Hands over the moderated examination scripts to the driver.	eModerator	Uploads the following onto the eModerate system: • Moderator's report • Class list with mark changes (if any) • Examination scripts
26	Driver	Returns to the institution.	eModerate system	Sends an email to the DoF indicating that the moderated examination scripts are ready to be downloaded.
27	Driver	Hands over the moderated examination scripts to the EO.		

	Manual paper-based examination process		Electronic moderation examination script process	
	Users	**Process**	**Users**	**Process**
28	EO	Contacts the DoF to collect the moderated examination scripts.		
29	DoF	Collects the moderated examination scripts.	DoF	Downloads the following: • Moderator's report • Class list with mark changes • Examination scripts
30	DoF	Reads the reports.	DoF	Reads the reports.
31	DoF	Discusses any change(s) with lecturer.	DoF	Discusses any change(s) with lecturer.
32	DoF	Informs the AA of any changes or gives instruction to archive marks.	DoF	Informs AA of any changes or gives instruction to archive marks.
33	DoF	Files the reports.	DoF	Files the reports.
34	DoF	Checks whether after changes (if any), a student qualifies to write a supplementary examination. Informs students who qualify to write a supplementary examination.	DoF	Checks whether after changes (if any), a student qualifies to write a supplementary examination. Informs students who qualify to write a supplementary examination.
35	AA	Prints the marks per qualification.	AA	Prints the marks per qualification.
36	DoF	DoF, AA and Registrar sign off the approved marks at Examinations Board meeting.	DoF	DoF, AA and Registrar sign off the approved marks at Examinations Board meeting.

It is clear from Table 5.1 that the users' roles and responsibilities have shifted and that there are fewer users when using an eModerate system. The next section will describe the eModerate system as a web application.

The recommended overall flow of the eModeration process is illustrated in Figure 5.6.

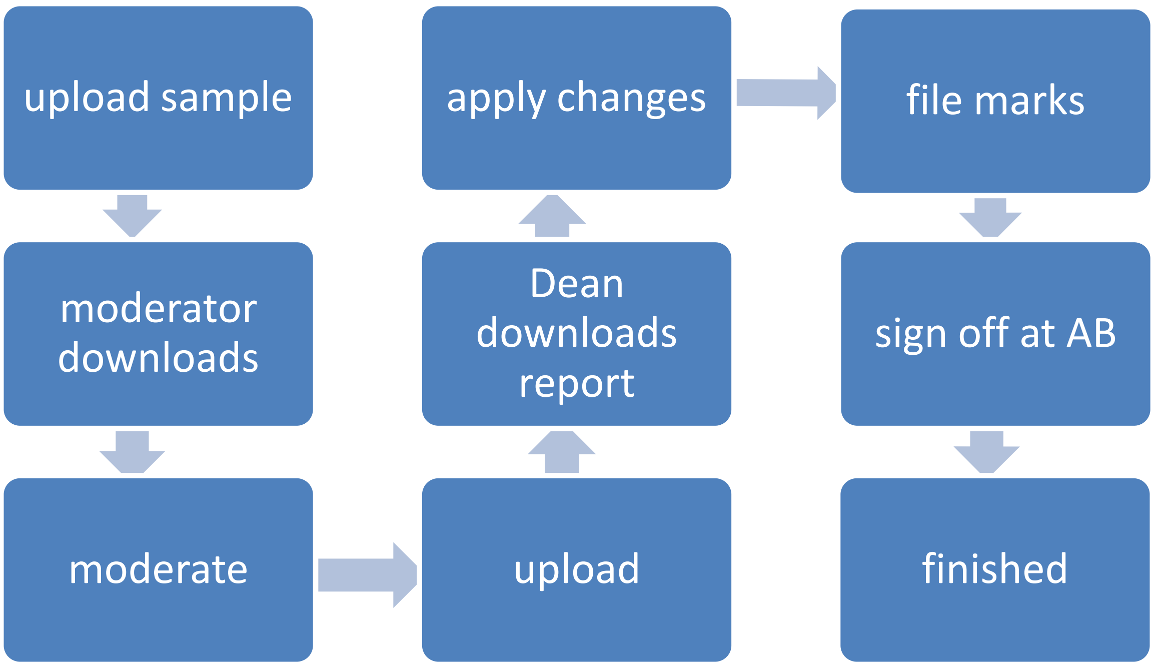


Figure 5.6 Overall flow of the eModeration process

5.3.2.3 The eModeration web application at MGI

An electronic moderation system, eModerate, used by this institution was developed by the eLearn team using Moodle open source software. MGI rolled out the eModeration system to the Faculty of Information Technology in 2009 (Midrand Graduate Institute Minutes of Academic Committee 5 October 2009). MGI used the eModerate system to determine whether such an eModerate system would be cost effective and efficient without compromising assessment standards, quality and integrity. The initial rollout of eModerate had a positive impact on the environment, budgetary limitations and security issues regarding examination scripts. Feedback from moderators also indicated that it afforded moderators the opportunity to moderate at a time that was more convenient for them (Van Staden, 2010). The need to have more IT support was identified in November 2010 (Midrand Graduate Institute Minutes of Academic Committee 12 November 2010) before eModerate could be rolled out to other faculties. For the purposes of this study the electronic moderation system was rolled out across five faculties at MGI to all moderators over a period of two examination sessions starting in 2013.

The eModerate system is a web application embedded in the institution's eLearn system. The users of the system are given secure access by the eLearn developer to specific eModerate pages. For example, if an eModerator is moderating three modules he or she will be given access to these modules. The eModeration then takes place through the web based application.

Figure 5.7 provides an example of the login page of the eModerate web application used by MGI.

Figure 5.7 eModeration login page

After the user has logged in, he or she is taken to the "*My Courses*" page where the user will find the modules to be electronically moderated as shown in Figure.5.8.

Figure 5.8 eModeration My Courses page

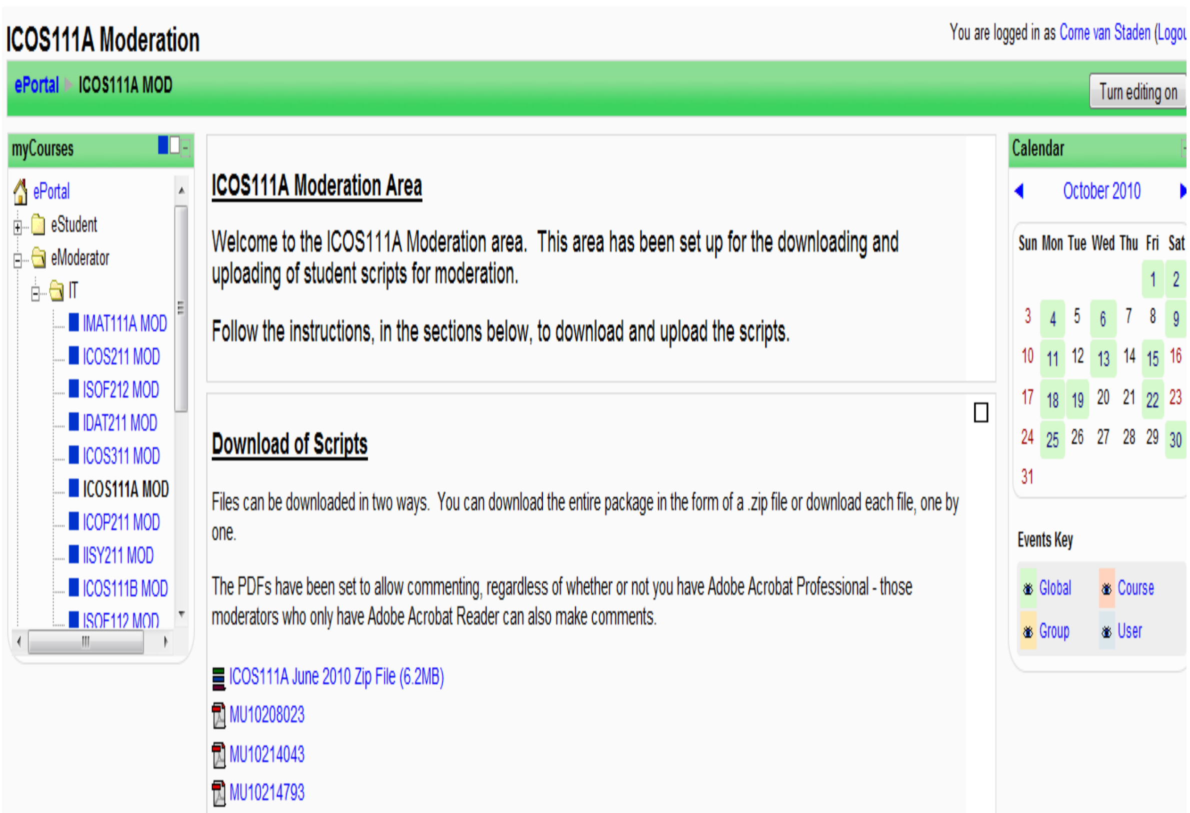


Figure 5.9 eModeration module page

Once the user has selected a module to moderate, a page similar to that shown in Figure 5.9 will appear. Included in the figure is how the user will navigate through the different pages in order to complete the task.

The user will then download the scripts by selecting the link provided as shown in Figure 5.10.

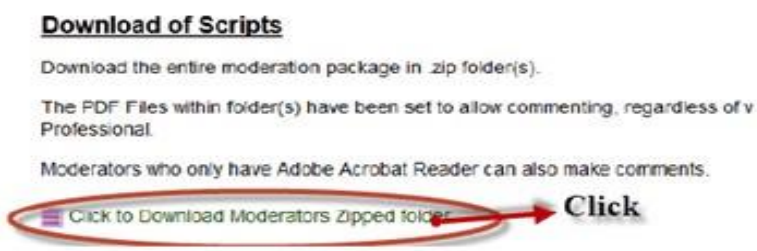


Figure 5.10 eModeration link for downloading scripts

The user can then continue to mark scripts electronically. After completion, the files need to be uploaded to the system again in order for the dean of the faculty to receive the moderator's feedback. Figure 5.11 provides the instructions for the uploading of scripts.

Figure 5.11 eModeration uploading of moderated scripts

The module pages are created by the eLearn developer. The module page makes provision for the uploading of electronic examination scripts, examination papers, memoranda, moderator reports and mark sheets. The module page also makes provision for the eModerator to upload the eModerated examination scripts. General information needed to use the eModerate system is also provided.

5.3.2.4 Digital devices and technology used by MGI

A major area of research is the role of Information Communication Technology (ICT)-based assessment in light of the growing use of virtual learning environments (VLE) in universities (Salmon, 2003), e.g. automated scoring of text (Gipps, 2005). In Chapter Two a discussion of how eAssessment can support the formative assessment processes was presented. At MGI the eLearn eModerate web application was used to eModerate examination scripts electronically.

Bailey and Garner (2010) identified a need to continue research in the area of ensuring that institutional policies and departmental practices related to formative assessment have the intended effect of enhancing written feedback, innovative practices and procedures that can assist lecturers. Studies done by Salmon (2013), Vlachopoulos (2008) and Salmon (2003) also focused on feedback on assessments by an eModerator as discussed in Chapter Two. The internal examiners at MGI and some of the eModerators used the UNISA onscreen marking tool (Van der Merwe, 2010) to mark the electronic examination scripts and for moderation purposes, while the rest of the eModerators used sticky notes or notes in a Word document. The onscreen marking tool allowed the marker to insert ticks, impression scores, reusable comments or individual comments and preconfigured rubrics. The tool added additional marking and commenting toolbars to the Adobe Professional 9 software, which added to its overall functionality. Internal examiners could use the onscreen marking tool to mark in red and then the moderation was done using a green pen. The onscreen marking tool used by UNISA is useful for the marking of assessments such as electronically submitted assignments, tests and/or examinations.

According to Greatorex (2013), it is important for eModerators to view more than one portfolio and be able to see the mark scheme at the same time, rather than having to switch between files. If this is not the case then it is more likely to negatively impact on the moderators' experience of moderating electronically (Greatorex, 2013). Infrastructure, technology limitations, incompatibility between software systems, different moderation approaches and specification requirements of e-portfolios can hamper the wide scale implementation of eModerate systems in an institution. It is, however, important to note that eModerators were not forced to use online marking tools — they could also use a Word document to record comments or use sticky notes in Adobe.

The eModeration web application used by MGI worked best with desktop PCs or tablets. Although the eModerate pages were accessible via tablets the moderators experienced some difficulties when completing the task of moderation. The last element that plays a role in the environment is technology; in this study this would be eModerate systems. Technology also includes infrastructure, applications, communications architecture and development capabilities.

The infrastructure at the institution hosting the eModerate system should be adequate, the application should be satisfactory and communication architecture should communicate the intended message. It is also a requirement that the eModerator has adequate internet infrastructure otherwise this can have a negative impact on the user's user experience.

The next section investigates the various moderation systems used by MGI during the examination process.

5.3.3 Systems used at MGI

MGI used a manual paper-based moderation system and an eModerate system. Both the manual paper-based system and the eModerate system were influenced by different factors and had their own set of characteristics.

The manual paper-based system required more human intervention and financial resources than the eModerate system. The manual paper-based system relied on the manual handling of examination scripts by users. The process involved the distribution of marked scripts to the moderators using a driver or courier services. Challenges experienced by the examinations officer and the deans with the manual paper-based system included the flow and control of information, as well as the time taken to return the moderated scripts (Midrand Graduate Institute Minutes of Academic Committee 5 October, 2009). The cost involved in delivering the scripts to and from moderators was also a key driving force to introduce change. Deans experienced various challenges with the manual paper-based moderation process such as timeous feedback, security and the efficiency of processes and control (Van Staden, 2010). The electronic moderation of examination scripts relied less on human intervention but also included some level of manual handling of examination scripts, for example, the users needed to prepare the manual paper-based examination scripts for electronic uploading. The overall efficiency of the process and control of information was improved and the cost was reduced if an eModerate system was used (Van Staden et al., 2014).

The differences between manual paper-based moderation and eModeration were explained in Section 2.2.3. An in-depth literature review regarding the use of eModeration was discussed in Chapter Two. After the successful implementation of the eModerate system the organisation decided to rollout the eModerate system to all faculties. The characteristics of the moderation systems used by MGI are summarised in Table 5.2.

Table 5.2 Manual paper-based versus eModeration system characteristics

System characteristics	Manual paper-based system	eModeration system
Users involved	User intensive	Fewer users required
Logistical arrangements	Vehicles, drivers and delivery companies needed.	Electronic technology needed such as scanners, servers and a virtual learning environment — in this case study, an eLearn system.
Control over flow of process	Strict control needed regarding flow of scripts.	Control over the flow of scripts more efficient.
Storage capacity	Large physical storage space required.	Electronic storage space
Security	Security physical	Security electronic

Due to the nature of the two systems, different factors could influence the success of either system. For example, in the case of the manual paper-based system, if the driver was ill or the vehicle had broken down, scripts could not be delivered. In order not to disrupt the process, as a back-up, delivery companies would need to be paid to deliver the scripts. With an electronic system, if load shedding occurred and the company did not have a generator, the scanning and uploading of scripts to the server could not happen. The cost involved in running a generator is, however, less than the cost of paying a delivery company. Human factors such as illness, shortage of staff or inability to complete the tasks can also influence whether or not the moderation systems can be executed successfully.

The manual paper-based system relies on manual systems to control the flow of examination scripts which is normally done by an examinations officer. The electronic moderation system relies on an electronic system to manage and control the flow of information. After the electronic scripts have been uploaded to the system the eModerator will receive a notification that the examination scripts are ready to be moderated. When the moderation task has been completed, the eModerator will upload the work and a notification will be forwarded to the dean stating that the process is complete. Reports can then be downloaded and acted on. With the manual paper-based system, the examinations officer needs to communicate with the moderator to find a suitable time for the delivery and the collection of the scripts. The biggest difference between the two systems concerns a reduction in the time frame and the number of arrangements that have to be made.

A use case diagram helps to capture the functional requirements of a system (George, Batra, Valacich and Hoffer, 2007) and makes use of different symbols to represent complex situations. The use case diagram depicted in Figure 5.12 illustrates how the MGI eModerate system operates. The key symbols in the eModerate use case diagram are explained and then illustrated below (George et al., 2007).

- Actor: An actor is a role, not an individual, and starts an event. Individuals are instances of actors. Thus one individual can play many roles simultaneously. The actor's role is connected to the functioning of the system. Actors are represented by stick figures. In the case of the eModerate system, the following actors were identified:
    - eLearn developer (eLEARN ADMIN) — who will create or edit modules, lecturers' accounts, moderators' accounts and the faculty deans' accounts.
    - Lecturer (LECTURER) — who will upload examination scripts.
    - Dean of Faculty (DoF) — who will upload final examination papers (or appoint an assistant to help), upload initial examination sample packs for moderation and download moderation reports after moderation.
    - eModerator (MODERATOR) — who will download or upload examinations, and examination scripts together with moderator reports. Since there are fewer actors in the system, there will be fewer steps involved.
- Use case: Each use case is represented by an ellipse. The name of the use case is listed below it.
- System boundary: The system boundary is represented by a box. In this case all the use cases are included in the box and actors are outside the system boundary.
- Connections: Actors are connected to use cases through lines, while the use cases are connected to each other by arrows. A solid line connecting an actor to a use

case indicates that the actor is involved in that system’s functions. Take note that the arrows between use cases do not illustrate data or process flow.

- Extended relationship: An extended relationship extends a use case by adding new behaviours or actions. In Figure 5.12, for example, the “print” use case extends the “Download sample moderation pack for moderation” use case by capturing the additional actions that can be performed during moderation. If the eModerator decides to use an electronic marking tool, this will not be necessary. It is not necessary for the extension to be performed, only under special circumstances.

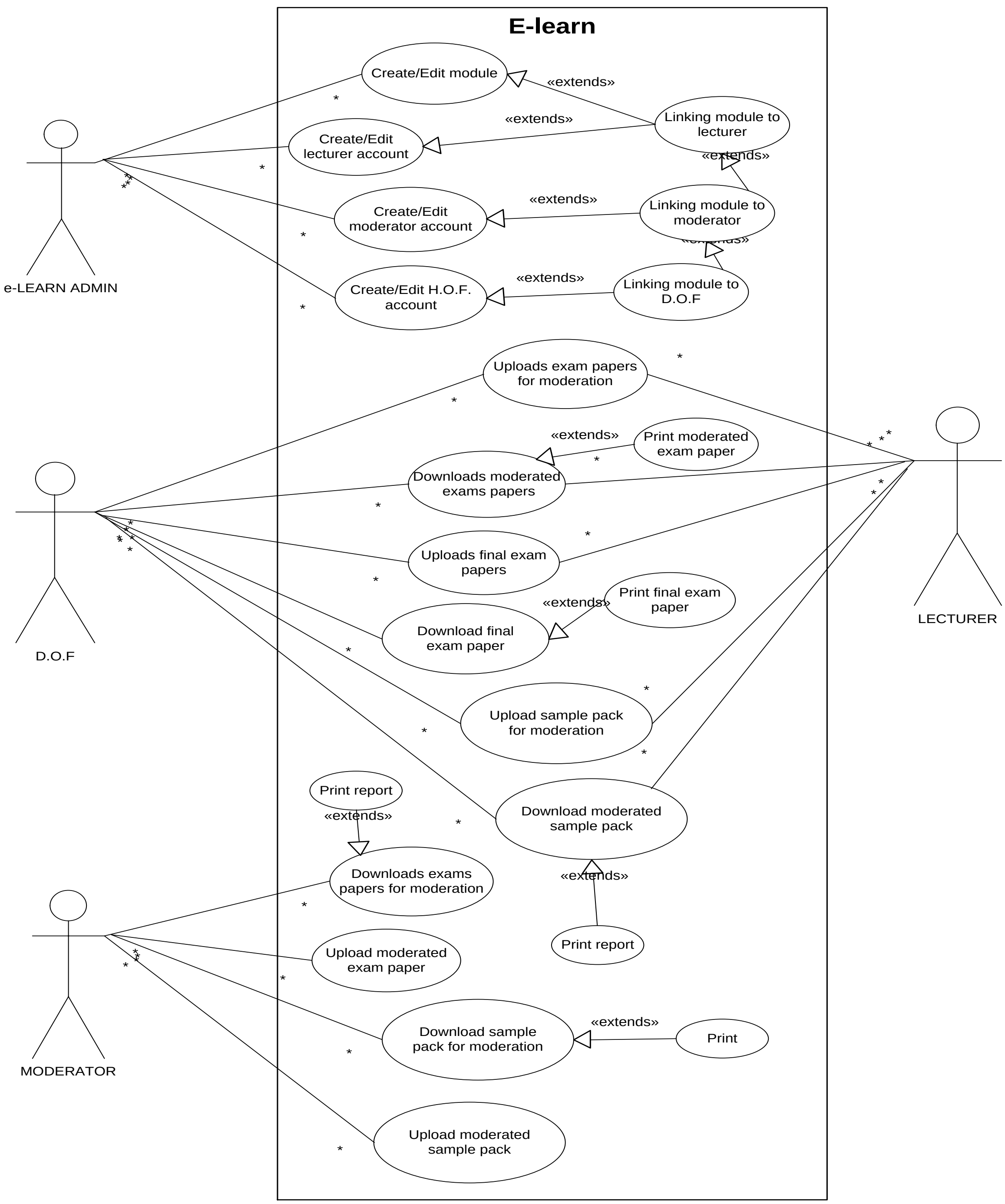


Figure 5.12 eModerate system use case diagram

In the case of MGI peer moderation was used where examination scripts were sent for moderation. Here the eModerator acts as a moderator of examination scripts and compiles a report for the dean on the quality of the marking. The report is in turn communicated back to the lecturer of the module. In this study the electronic moderation took the form of peer moderation. At a private higher education institution, the eModerator will not be the same person as the lecturer who presided over the online discussion in which creative learning processes were designed and utilised to facilitate the construction and dissemination of knowledge between lecturer and student (Morgan, 2008:1). In the context of this study, the eModerator was the moderator of a module who presided over the electronic moderation of examination scripts and provided a moderation report on the assessment.

In this study, the relationship was between the eModerator and the dean of the faculty as established in Section 1.2. The dean reported back to the lecturer of the module hence the involvement of three entities in the electronic moderation process, namely:

- the lecturer who marked or scored the papers;
- the eModerator who moderated the marking (acted as a second marker); and
- the dean who received the moderation report and provided feedback to the lecturer.

5.4 Moderation in the context of Monash University

Moderation was defined and explained in Chapter Two. In Section 5.3 moderation in the context of MGI was discussed. This section considers the users, system and context at Monash University with respect to moderation. Monash University was chosen as a second independent private higher education institution to evaluate the designed and developed User Experience Evaluation Framework for eModeration because of the similarities between the moderation practices of these two private higher education institutions, as well as the offerings and size of the institution. Monash University also implements mechanisms to ensure the fair, reliable, and consistent marking and grading of assessments (Monash University, Units Assessment Procedure, Vice-Provost, 2015a) similar to those used by MGI. Monash University also makes use of external examiners, second markers or moderators to “validate assessment standards and the interpretation of the marking guide across all modules and/or locations” in Monash University’s Units Assessment Procedure (Vice-Provost, 2015a:17). A broad description of the similarities between the contexts of MGI and Monash University is provided below. Both institutions are private higher education institutions operating in the South African context. Monash University makes use of online assessment in some faculties and modules, and partically utilises eModeration in their Faculty of IT as indicated in the Monash University Units Assessment Procedure (Vice-Provost, 2015a). During the semester Monash University makes use of eModeration at a micro level similar to the moderation forums used by Adie et al. (2013) and Wichmann et al. (2009). In these moderation forums discussions take place with new staff and tutors who will be involved in the marking and the moderation process to establish a shared understanding of assessment and standards with detailed guidelines to ensure consistency throughout the semester. The observed relationship in the moderation forum was between the tutor and the lecturer. The institution utilises their ePortal Moodle system to electronically mark students’ assignments during the semester. The institution makes use of eModeration at a macro level in certain situations, such as when honours mini-dissertations need to be moderated or examination scripts require peer moderation by an external moderator. However, Monash University does not make use of their ePortal system for the eModeration of examination scripts. The documents are scanned (in a similar fashion to MGI) and then emailed to the moderator. The eModerators use sticky notes to moderate PDF files and use track changes for Microsoft Word documents.

5.4.1 Users at Monash University

Various users are involved in any moderation process. For example, Table 5.3 compares the users involved in the manual paper-based moderation processes at Monash University and at MGI at the time of the study.

Table 5.3 Monash University versus Midrand Graduate Institute assessment roles — manual paper-based moderation

Role	Monash University	Midrand Graduate Institute
Setting of assessment packs (regime)	Chief examiner	Lecturer — module leader
Module coordination	Unit coordinator (in some cases the chief examiner)	Academic Administrator
Coordinating assessments	Head of School — lecturer and tutor	Dean
Administration of examination process	Examination services	Examination officer
Moderator	External moderator in Australia for exit level modules. For first and second year modules the external moderator is local (based in South Africa) and only the scripts of border case students are moderated.	Moderator
Delivery of assessment packs	Driver or courier services are used for the majority of examination scripts. If moderator is not local scanning is used and scripts are emailed.	Driver or courier services

Similar to the case study at MGI, the following users were involved in the electronic moderation system at Monash University: chief examiner, dean, unit coordinator, eLearn developer and eModerators. Having used paper-based moderation for a number of years, Monash University had decided to investigate a full move to eModeration. It is for this reason that they were interested in participating in the study. The insights provided by the case study done at Monash University served to verify the solution to the research problem, objectives and requirements whilst the context also provided an opportunity to place the research findings in a similar context.

Since Monash University was used as a second independent institute for the evaluation of the framework, only areas bearing similarities have been highlighted with no further detail being provided.

The next section investigates the organisational context in which moderation occurs at Monash University.

5.4.2 Organisational context at Monash University

The organisational structure and moderation process at Monash University will be discussed first before moving onto the digital context.

5.4.2.1 Organisational structure

Monash University's organisational structure is similar to that of MGI. As demonstrated in Section 5.4.1 the same users participated in the moderation process and structure.

5.4.2.2 Organisational moderation processes

Monash University appoints chief examiners to develop the assessment regime (pack), thereafter a competent external examiner who is experienced in the module field is appointed to moderate the assessment regime, according to their Unit's Policy Procedure (Vice-Provost, 2015b). Two types of moderation processes have been implemented by Monash University, namely manual paper-based and/or electronic moderation. It is therefore necessary to examine:

- manual moderation of examination scripts; and
- electronic moderation systems as used by Monash University.

The next section will explain the manual moderation process.

Monash University's manual moderation process

This section specifically considers moderation at Monash University in context, in order to better understand the research area. The general manual paper-based moderation process used by Monash University is the same as the one followed by MGI. It is for this reason (i.e. the similarities in moderation practices) that Monash University was chosen as an institution to evaluate the framework.

Monash University's eModeration process

The eModeration process followed by Monash University was similar to the manual paper-based system, the only difference being that scripts were scanned and emailed to external examiners as opposed to a driver delivering the scripts. The eModeration occurred at micro and macro levels. Micro level moderation was carried out during the semester where tutors were appointed to assist chief examiners with the marking of assignments and tests. Forums for eModeration were created and used to discuss the marking memorandum with tutors. Macro level moderation occurred during examination periods where examination scripts or honours mini-dissertations needed to be moderated. After eModeration moderators completed a report on the moderation and sent it back to Monash University.

5.4.2.3 eModeration web application used at Monash University

Monash University does not have a designed and developed system such as the eModerate system used by MGI. Monash University has, however, used the principles of eModeration in their initial eModeration initiatives and, at the time of this study, was investigating the possibility of using an eModerate system, instead of using their email system as they have done in the past.

For the purposes of this study the User Experience Evaluation Framework for eModeration was evaluated by Monash University in an effort to determine whether the framework could be used by private higher education institutions who were considering an eModerate system.

5.4.2.4 Digital devices and technology used with eModeration at Monash University

Monash University made use of desktop PCs and laptops as digital devices to complete eModeration, which were similar to the systems used at MGI. Although Monash University also made use of Moodle Software for its ePortal, the examination scripts were sent to the external examiner via Google and/or email services. MGI, however, used its ePortal platform to facilitate the eModeration.

5.4.3 Systems used at Monash University

Monash University used a manual paper-based moderation system and an eModerate system (ePortal for micro and email for macro eModeration). Both Monash University and MGI experienced similar challenges related to the manual paper-based system that relied on human intervention and financial resources. The moderation systems used by Monash had similar characteristics to those identified at MGI and presented in Table 5.2. Both systems included users, technology, persons who controlled the flow, storage capacity and security.

5.5 eModeration in context — protocol

The next section sets out the protocol that was followed regarding the electronic examination script moderation in Phase Two of MGI's moderation process:

- The internal examiner together with the dean of the faculty selected a sample of the answer books to be moderated.
- The dean arranged for the sample scripts to be prepared for the electronic process, which included:
    - Cutting the edges of the examination script
    - Removing empty pages from script
    - Scanning pages
    - Renaming the file using the student number
- The dean compiled the moderation pack: examination paper, memorandum, scanned sample of the examination scripts and moderator's report.
- The moderation pack was then uploaded to the appropriate module on the MGI ePortal.
- The moderator received an email informing him or her that the moderation pack was ready for moderation.
- The moderator then downloaded and electronically marked the scripts using either a UNISA online marking tool, sticky notes in Adobe Professional or by recording the changes in a Word document which were to be applied to a particular student's marks.

- Once the moderation process was completed, the moderator uploaded/downloaded the scripts and reports to the appropriate module on the ePortal.
- The system then generated an email to the dean indicating that the moderation was ready to be viewed.
- The dean then downloaded the moderated scripts and reports.
- Having reviewed the report, the dean applied the recommendations.
- The students' marks either remained the same or were adjusted according to the moderator's report, after a discussion with the Examinations Board.
- Finally the marks were signed off by the Examinations Board and published.

Table 5.1 compared the steps in the examination routing process between manual and electronic moderation. Table 5.4, however, identifies the similarities between the roles of the dean of the faculty and the moderator in the execution of the examination process. These similarities were then also used in the design and development of the evaluation criteria as there was some correlation between the tasks, roles and involvement of the manager and the moderator. The researcher also wished to verify whether the user experience of managers and moderators of the eModerate system would differ specifically in areas where they performed the same tasks.

Table 5.4 Similarities between the steps to be followed by the dean and eModerator during the eModeration process

	Similarities and steps between DoF and moderator	
	Dean of Faculty (DoF)	**Moderator**
1.	Arrange for scanning of scripts by: • cutting the edges of scripts; • scanning scripts in colour; and • renaming scanned scripts to reflect the student number.	
2.	Accesses the ePortal of the institution	Accesses the ePortal of the institution
3.	Login to the ePortal	Login to the ePortal of the institution with secure login and password.
4.	Select eModerate	Select the module to moderate from the eModerate page.

	Similarities and steps between DoF and moderator	
	Dean of Faculty (DoF)	**Moderator**
5.	Select the module	
6.	Prepare sample pack by uploading the following into the relevant module on the eModerate portal: • Scanned examination scripts • Examination paper • Examination memorandum • Moderator's report • Class list with marks	Download the uploaded information: • Scanned examination scripts • Examination paper • Examination memorandum • Moderator's report • Class list with marks
7.		Moderates the papers using one of the following electronic options: • Sticky notes in Adobe • UNISA online marking tool • A Word document where the student number is recorded as well as the question(s) where the moderator's marking differs from that of the marker.
8.		Compile a report and make recommendations.
9.	Download the following: • Moderator's report • Class list with mark changes • Examination scripts	Upload the following onto the eModerate system: • Moderator's report • Class list with mark changes(if any) • Examination scripts

The moderators engaged in online discussions and attempted to improve the users' experience of moderation by ensuring that it was *functional* and *usable* and that the *content* was applicable to the context of eModeration.

5.6 Conclusion

The purpose of Chapter Five was to provide a background to the application context and to provide the protocol used in the research as input for the design and development of the design cycle. Section 5.2 positioned the research in terms of Design Science Research, user experience and eModeration. In Figure 5.1 the researcher illustrated how Design Science Research, user experience and eModeration are linked. Section 5.2 paid specific attention to the environmental area of Design Science Research and the relevance cycle of Design Science Research. The requirements needed to perform field testing were discussed in Section 5.3. The environment and application areas concern eModeration at a private higher education institution in SA called MGI that evaluated the user experience of the current electronic moderation system which had been extended to more than one faculty. The environment included three fundamental user experience constructs: users, system and context. These were used as key areas for discussion for each case study.

This research contemplated the design considerations of user experience for moderation at a private higher education institution while underlying development attempted to create the user experience for eModeration. This was done in order to design, develop, implement, test and ultimately propose a framework for the evaluation of user experience of eModeration systems. The development of the artifact fed into the research, providing the research data. The “research” together with the “development” attempted to address different but related problems within the same context, i.e. moderation in private higher education institutions.

The output of Design Science Research must be returned to the environment for further study and evaluation in the application domain. In this study, this took the form of a second institution, Monash University (see Section 5.4). After the researcher had designed and developed the User Experience Evaluation Framework for eModeration using Section 5.3 as a basis, the framework was first tested at MGI (case study one), after which the framework was refined before being evaluated at Monash University (case study two). Section 5.4 explained the similarities between the two institutions and which users, system and context were used by Monash University.

Chapter Five assisted in determining whether the designed artifact would improve the evaluation — in this case the user experience of eModeration systems. The eModeration system functionalities and requirements as well as techniques that could be used during the development of the requirements’ specifications were also discussed. Chapter Six will investigate how the designed artifact can be measured.

Chapter Six: Design and development

6.1 Introduction

Chapter Six forms part of the development of Information Systems Research within Design Science Research. Discussions around Phase Two of the research commenced in Chapter Four, which focused on the Research Design, while Chapter Five covered Research in Context.

Chapter Six sets out to explain the design and development of the proposed artifact, paying specific attention to both the relevance and design cycles as required by Design Science Research. Section 6.2 explains how the artifact was designed and developed through abstraction from literature as specified by Design Science Research. This chapter will define the functionalities of the system's constructs and interrelationships. Section 6.3 discusses the design and development of instruments for the participants from MGI who participated in the survey and interviews. The focus was placed on which user experience constructs would be relevant to an eModeration framework and how such a framework should be evaluated. The data gathered from the second evaluation was then used to design the artifact, i.e. the User Experience Evaluation Framework for eModeration (see Section 6.4 and 6.5).

6.2 Design and Development of a conceptual framework

The purpose of the design and development process is to examine the objectives of the artifact in order to provide a better understanding of the underlying design and development process used to generate the research artifact, which in turn was used to identify the research findings and contributions. In order to meet the objectives of the research it was important to define the required functionality and overall characteristics of the solution and to consider the limitations and advantages of the intended context in which the solution was to function. The specification of the objectives assisted with providing focus and guiding the analysis of the design and development efforts undertaken to achieve these objectives.

The objectives were identified using the users such as moderators, deans and experts and by looking at the private higher education institution environment in context. The objectives of this study were created by integrating the findings from the literature review (Chapters Three and Four), research in context (Chapter Five) and the findings from the gathered data.

The design and development objectives originated from the identified problem (see Section 1.1 and 1.2) with specific reference to the lack of a standard definition for eModeration, the usage and the structure of eModerate systems within private higher education institutions, issues related to the adoption of eModerate systems, issues concerning the understanding of which user experience constructs are relevant to eModeration systems and, finally, the issues concerning manual paper-based and eModeration systems.

The information below outlines the specific objectives of the solution artifact:

- It is to be used as a tool that helps with understanding which user experience constructs are relevant to eModeration in the context of private higher education institutions.
- It is to be used to promote satisfactory user experience amongst eModeration users.
- It must be able to store different types of source material, such as images from Creative Arts, electronic examination scripts, moderators' reports, etc., for future use and reference.
- It should be usable by higher education institutions to evaluate various areas that involve moderation of either examination scripts or the moderation of conference and journal articles.

The design and development process assisted with refining these objectives through additional iterations. In the first iteration of the design and development process most of these objectives had not been fully achieved or refined, and it is for this reason that a second iteration was needed in order to achieve a high level objective that provided clear requirements and guidance for the design and development process. The next section considers the objectives of the research and attempts to align the research objectives with the development objectives.

An initial conceptual framework was designed by using concepts identified in the literature review. The design and development phase in the Design Science Research process involves a creation phase that includes knowledge application and the need for additional knowledge gathering in order to clarify new or unknown issues or concepts. Section 6.2.1 demonstrates the development of the theoretical framework for this study based on the literature review.

6.2.1 Development of the theoretical conceptual framework

This research focuses on the application of construction methods and the application of existing knowledge to create a new artifact in the Information Systems field. During the investigation into the constructs that would potentially contribute to the User Experience Evaluation Framework for eModeration, a literature review was conducted that followed three steps, as shown in Figure 6.1.

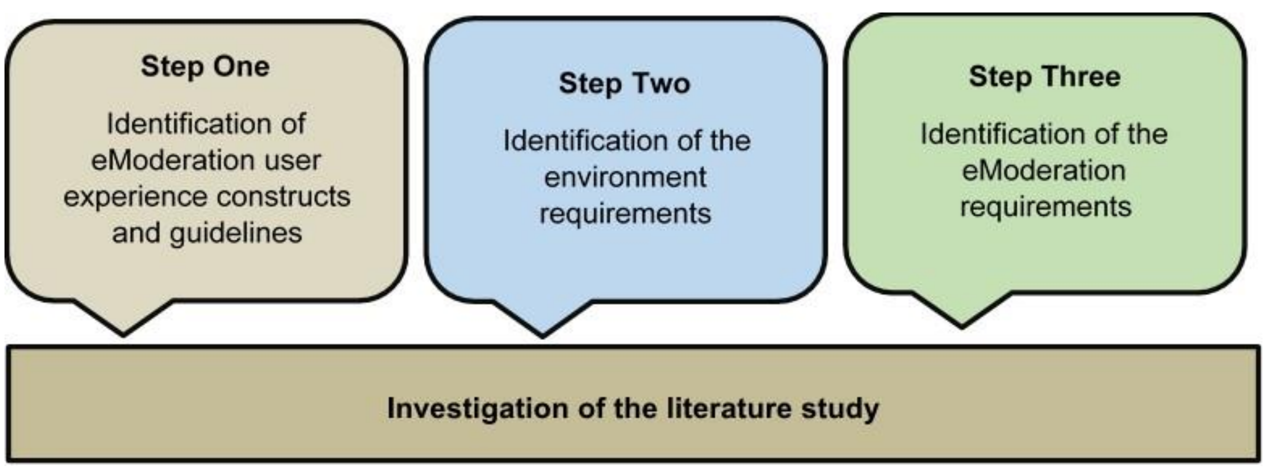


Figure 6.1 Investigation into literature

The answers from each step, as reflected in Figure 6.1, contributed to the proposed abstracted User Experience Evaluation Framework for eModeration. In the next section the factors, which contributed to each step are discussed:

- Step One: Identification of eModeration user experience constructs and guidelines (Section 6.2.1.1).
- Step Two: Identification of the environment requirements (Section 6.2.1.2).
- Step Three: Identification of eModeration requirements (Section 6.2.1.3).

6.2.1.1 Identification of eModeration user experience constructs and guidelines

In order to determine the user experience constructs, an investigation was conducted with the aim of identifying general constructs related to user experience that might be relevant to eModeration systems. The first three constructs (context, system, user's state of mind) used for general user experience as discussed in Section 3.2.2 of this chapter were derived from the definitions provided by Hassenzahl (2013), Hassenzahl and Tractinsky (2006), and Roto (2006). A mapping between user experience and eModeration was then illustrated in Table 3.3 and discussed in Section 3.6. Constructs that were considered to be part of this study are shown in Figure 6.2.

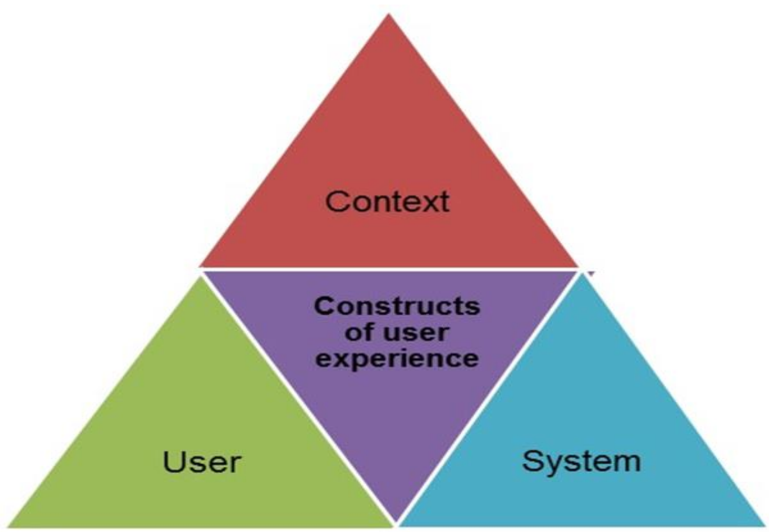


Figure 6.2 Constructs contributing to general user experience

The user experience frameworks discussed in Section 3.4 have also been valuable in identifying the levels that may be required for a user experience evaluation framework for eModeration. Figure 5.1 demonstrates how the constructs of user experience integrate with the Design Science Research environment and eModeration requirements as synthesised by the researcher. Based on the information gathered from the literature (frameworks) and requirements of Design Science Research, three levels were identified for the User Experience Evaluation Framework for eModeration, namely:

- **The Environment level:** In her framework, Ouma (2013) used a domain level that outlined the requirements of the domain in a specific context. In the context of this study the environment is the private higher education institution, which relate specifically to user experience *context*.
- **The eModeration Requirements level:** Ouma (2013) indicated that in order to achieve a satisfactory user experience certain technical requirements needed to be met. Mahlke and Thüring (2007) considered the interaction of the user, the system properties, the user characteristics and the context of the task to be part of the user experience. It is evident that there is a need to identify the constructs required in the eModeration Requirements level, with a specific focus on *system*.
- **The User Experience constructs for eModeration level:** Mahlke and Thüring (2007) identified usability as being made up of instrumental qualities and non-instrumental qualities both of which were considered in the design and development of the User Evaluation Framework for eModeration. Kort el al. (2007) indicate that a user experience framework (Section 3.4.2) should include composition (usability), which also formed part of the development of the researcher’s framework. Factors influencing user experience and how to measure user experience as explored by Schulze and Krömker (2010) have also been taken into account with regards to the design. Lastly, user experience constructs, and the impact of the user’s emotional state as discussed in Section 3.3 were all taken into consideration when identifying the *user experience* constructs required in this level.

As discussed, different factors were identified in the literature as having an influence on the user experience. These include usability, functionality, content (Rubinoff, 2009), navigation, visual appeal, information hierarchy, and satisfaction with product and context (Porter and Bewer, 2010; see Section 3.3.1). All of these factors were taken into consideration during the design of the User Experience Evaluation Framework for eModeration and were referred to as constructs in the framework.

The literature established that emotional satisfaction, experience and perception, influenced the users' characteristics, and are constructs that contribute to acceptable user experience (Hassenzahl, 2005; Kuniavsky, 2010; Sproll et al., 2010; see Section 3.3.3). Part of the investigation was done in order to determine if the users' emotional state was an important construct in a user experience evaluation framework for eModeration, by determining the users' overall experience and satisfaction.

In this study the user experience constructs included system, user and the environment (context) in which the system operates, with its sub-elements: the organisation (private higher education institutions) and users' characteristics (managers, deans, moderators). The system included technology (eModerate system) with the elements required for the system to function. The interaction of the user with all of these aspects over time culminates in the user experience.

In the design of an eModerate system it is important to include the users' needs and the company's objectives as mentioned by Rogers et al. (2011) and Garrett (2011, see Section 3.3.2). In addition, ensuring that the content provided to the user is adequate, that the interaction of the user involves relevant information architecture principles and that the placement of constructs will ensure smooth navigation and adequate flow of process (Nawaz, 2012), are all part of acceptable user experience.

In order to achieve consistency between user experience (subjective, perception and response) and usability (objective, effective and efficient) the user should experience a sense of achievement when using the system. So the user's emotional state will be affected by non-instrumental and instrumental qualities. User experience and usability greatly influence one another.

The constructs of system, user and context associated with general user experience assisted with the identification of the categories of eModeration user experience constructs. Table 6.1 is an abstraction of the user experience constructs related to this study and is based on the literature that forms part of the design and development of the User Experience Evaluation Framework for eModeration.

Table 6.1 Abstraction of user experience constructs from literature

User experience constructs	**Description**	**Authors**	**Section**
System	Characteristics of a system comprising various factors: complexity, purpose, usability and functionality, colour, tone, navigation, visual appeal, information hierarchy, satisfaction with content. Infrastructure, services and people.	Hassenzahl (2014); Hassenzahl and Tractinsky (2006); Porter and Bewer (2010); Roto (2006); Rubinoff (2004).	3.3.1 3.3.4 3.4 3.6
Context	The environment in which the user operates is affected by the following: organisational settings and meaningfulness of the activity.	Hassenzahl (2014); Hassenzahl and Tractinsky (2006); Roto (2006)	3.2.2 3.3.4
User Experience	How do I feel while interacting with the system under different circumstances? Self-expression, identification and stimulation. Aesthetic appeal with the outcome of pleasurable moments for the user. Navigation, visual appeal and satisfaction with content. Internal state of the user is made up of: expectations, needs, motivation, moods and predisposition.	Hassenzahl, Diefenbach and Göritz (2010); Hassenzahl (2014); Hassenzahl (2008a); Hassenzahl (2004); Hassenzahl and Monk (2010); Hassenzahl and Tractinsky (2006); Ju and Kohler (2014); Law et al. (2009); McCarthy and Wright (2007); Paluch (2006); Roto, (2006); Sproll et al. (2010)	3.1 3.2.2 3.3.3
Usability	Characterised and measured against the following attributes: effectiveness, efficiency, safety, utility, learnability, memorability, enjoyability, user satisfaction.	ISO (1998) ; Preece et al. (2009); Rogers et al. (2011)	3.2.1 3.2.3 3.3.1 3.3.3

User experience constructs	Description	Authors	Section
	Usability of a product includes aspects such as: aesthetics, content, architecture of system or products. Needs of the user and overall user experience of a product interaction, context and predisposition.	Bias and Mayhew (2005); Rogers et al. (2011) McCarthy and Wright (2007)	3.3.4

The user experience constructs and guidelines can be found in Table 6.2. User and context are discussed under the eModeration Environment level (see Section 6.2.1.2) and system is discussed under the eModeration Requirements level (see Section 6.2.1.3).

Table 6.2 User experience constructs and guidelines associated with eModeration

Construct	Guideline	Proposed level	Reference
User	**eModerate user** The eModerate user has unique roles, responsibilities, characteristics and expectations that need to be catered for.	Environment	Hassenzahl (2004); Hassenzahl and Tractinsky (2006); Kuniavsky (2010); Roto (2006); Salmon (2003); Salmon (2013); Sproll et al. (2010)
Context	**Organisation** The type of organisation that will make use of eModeration will exist in a specific context, for example, education.	Environment	Hassenzahl and Tractinsky (2006); McCarthy and Wright (2007); Roto (2006); Wimmer et al. (2010)
System	**Environment web application** The type of application and the design process will determine the quality and success of the eModerate web application. **eModerate systems**	eModeration requirements	George et al. (2007); Hassenzahl and Tractinsky (2006); Roto (2006); Vlachopoulos (2008); Wimmer et al. (2010)

Construct	Guideline	Proposed level	Reference
	The eModerate system being used can influence the eModerators' interaction with the system. **Digital devices** The digital device consists of various parts of eModeration hardware and software which in turn influence the eModerators' interaction. **Networks** Access, availability and speed of the networks can influence the eModerators' interaction. **eModerate process** The eModerate process affects the eModeration costs.		
eModeration UX constructs	System usability: Effectiveness, efficiency, safety, utility, learnability, memorability, enjoyability and user satisfaction, aesthetics, content, architecture of systems or products. UX design heuristic: Navigation, visual appeal, information hierarchy, usability, functionality, satisfaction with content, branding, user internal state made up of expectations, needs, motivation, and moods. Subjective feelings, motor expressions and behavioural tendencies. Ergonomics, attitudinal and visual metrics, aesthetic appeal with the outcome of user pleasurable moments.	eModeration user experience	Bias and Mayhew (2005); ISO (1998); McCarthy and Wright (2007); Preece et al. (2009); Rogers et al. (2011) Bevan (2009); Hassenzahl (2008a); Hassenzahl and Tractinsky (2006); Kuniavsky (2010); Law et al. (2009); Porter and Bewer (2010); Roto (2006); Rubinoff (2004, 2009)

As mentioned before, authors use different terms to refer to the same constructs when evaluating user experience. This complicated the selection of the core constructs. To select the most appropriate constructs for eModerate one needs to consider the appropriate level of specification. For example Morville's constructs, such as "desirable", are high level constructs that comprise more basic constructs related to the context. Therefore the eModerate context was considered during the selection of the specific constructs for inclusion in the preliminary User Experience Evaluation Framework for eModeration (see Table 3.3 for the mapping between the different constructs).

The other issue was that some of the constructs referred only to the system or the context. In such cases those constructs were evaluated elsewhere and not under the eModerate user experience construct level. Based on the literature presented in Chapter Three (as summarised in Table 6.1) the user experience constructs for eModerate and eModeration requirements depicted in Table 6.2 have been identified as central to eModeration user experience and have been included in the conceptual framework. Table 6.3 illustrates the elements that were included in the initial conceptual framework under the eModeration user experience construct level.

Table 6.3 User Experience elements included in the evaluation criteria

Elements	**References.**
Learnability	Hernández, Jiménez and Martín (2009); ISODIS9241-2010 (2010); Martim et al. (2009); Moczarny (2011); Moczarny et al. (2012); Nielsen (1994a); Rogers et al. (2011); Sharp et al. (2009); Tullis and Albert (2008)
Efficiency	Bastien (2010); Nielsen (1994a); ISODIS9241-2010 (2010); Sharp et al. (2009); Tullis and Albert (2008); Moczarny et al. (2012); Paluch (2006); Rogers et al. (2011); Rubinoff (2009)
Effectiveness	Bastien (2010); ISODIS9241-2010 (2010); Nielsen (1994a); Paluch (2006); Rogers et al. (2011); Rubinoff (2009); Sharp et al. (2009); Tullis and Albert (2008).
Memorability	Nielsen (1994a); ISODIS9241-2010 (2010); Sharp et al. (2009); Rogers et al. (2011); Tullis and Albert (2008)
Error prevention	Nielsen (1994a)

Elements	References.
Satisfaction	ISODIS9241-2010 (2010); Kuniavsky (2010); Nielsen (1994a)
Communicate the intended message — functionality.	ISODIS9241-2010 (2010); Porter and Bewer (2010); Rubinoff (2009); Zou (2007).
Page display, size and site structure — information architecture and navigation.	Chang and Chen (2009); Garrett (2011); Gardner (2007); Hassenzahl et al. (2010); Hassenzahl and Tractinsky (2006); Martim, Herselman and van Greunen (2009); Paluch (2006); Moczarny et al. (2012); Rubinoff (2009)
Value of information and presentation of information.	Camus and Evans (2009); Hassenzahl et al. (2010); Moczarny et al. (2012); Sung (2006)
Utility	Camus and Evans (2009); ISODIS9241-2010 (2010); Rogers et al. (2011); Schulze and Krömker (2010); Sharp et al. (2009); Zou et al. (2007)
Security	Hoffman, Novak and Peralta (2004); Martim et al. (2009); Rogers et al. (2011); Schulze and Krömker (2010)
Safety	ISODIS9241-2010 (2010); Sharp et al. (2009); Väänänen-Vainio-Mattila and Wäljas (2009)
Content	Porter and Bewer (2010); Rubinoff (2009); Väänänen-Vainio-Mattila and Wäljas (2009)
Visibility of the system	Nielsen (1994b)
User control and freedom	Garrett (2011); Nielsen (1994b)
Consistency and standards	Nielsen (1994b); Powals (1996)
Error prevention	Nielsen (1994b)
Recognition rather than recall	Moczarny (2011); Nielsen (1994b); Powals (1996)
Flexibility and efficiency of use	Nielsen (994b)
Aesthetic and minimalist design	Nielsen (1994b); Powals (1996); Preece et al. (2009); Rogers et al. (2011); Tractinsky (2013)
Help and documentation	Nielsen (1994b)
Overall user experience	Väänänen-Vainio-Mattila and Wäljas (2009)
Visual appeal	Hassenzahl and Tractinsky (2006); Hoffman and Krauss (2004); Kuniavsky (2010); Porter and Bewer (2010)
Context	Hassenzahl (2004) Hassenzahl (2005); Hassenzahl and Tractinsky (2006); Kuniavsky (2010); Sproll et al. (2010); Rubinoff (2004); Väänänen-Vainio-Mattila and Wäljas (2009)
Personalisation	Abbattista et al. (2002)

Elements	References.
Service quality	Chang and Chen (2009); Kuniavsky (2010); Petre, Minocha and Roberts (2006); Porter and Bewer (2010); Väänänen-Vainio-Mattila and Wäljas (2009)
Cross-platform service quality	Väänänen-Vainio-Mattila and Wäljas (2009)
Feelings when using system	Hassenzahl and Tractinsky (2006); Sharp et al. (2009)

It has to be acknowledge that there are other constructs that may have contributed to measuring the user experience, but since it is not practical to measure all possible user experience constructs a selection had to be made.

The constructs illustrated in Table 6.1 and Table 6.2 constitute the eModerate user experience constructs based on the mapping depicted in Table 3.3, a literature review in Sections 2.2 - 2.4 and 3.3 - 3.6, eModeration requirements, and the discussion in Section 3.5 concerning user experience.

6.2.1.2 Identification of environmental requirements

The literature review, as discussed in Chapters Two and Three, identified the environmental requirements which needed to be met in order to support eModeration and the interaction with the eModerate system within the context of a higher education institution. In order to accommodate a good user experience for eModeration, the following areas needed to be considered:

- **Users** (role players): Identifying the key role players, their roles, responsibilities, and characteristics in eModeration (Morgan, 2008; Salmon, 2003; Mahlke and Thüring, 2007; Vlachopoulos, 2008). Factors that should be considered are the user type (Forlizzi and Battarbee, 2004), user characteristics (Mahlke and Thüring, 2007; Preece et al., 2009; ISO 9241-210, 2010), internal state of mind (Bevan, 2009; Hassenzahl and Tractinsky, 2006; Nielsen Norman Group, 2012), and prior experience (Rogers et al., 2011; Schulze and Krömker, 2010; Roto, 2006) as eModerate users.

- **Organisations**: Identifying the organisations in which eModeration would be used (ACU National, 2008). In terms of an eModerate context, factors such as organisation setting and meaningfulness of activity (Hassenzahl and Tractinsky, 2006), the context in which the product is used (Law et al., 2009), physical, social, temporal, and task context (Roto, 2006; Väänänen-Vainio-Mattila and Wäljas, 2009) should be taken into account in the design and development of the framework.

Figure 6.3 illustrates the constructs that have been identified in the Environment level of the framework.

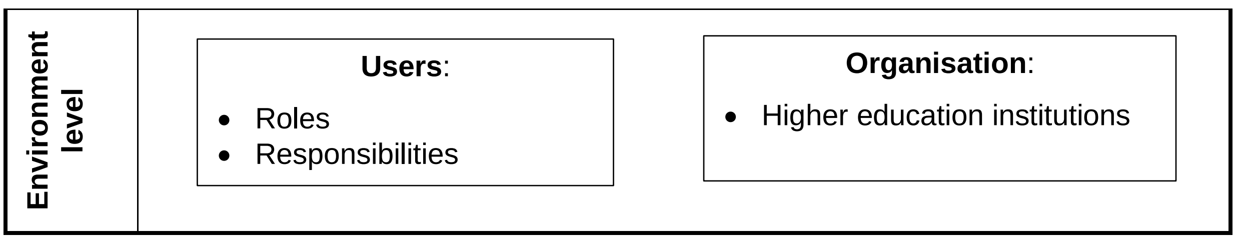


Figure 6.3 Environmental level

The eModeration requirements that may contribute to an eModeration user experience evaluation framework are discussed in Section 6.2.1.3.

6.2.1.3 Identification of eModeration requirements

The requirements for eModeration systems such as the digital devices, networks, eModeration processes, and eModeration web applications are addressed in Chapter Five of this study as part of the eModeration requirements. In her user experience framework, Ouma (2013) identified applications, devices, infrastructure and technology as being key elements (see Section 3.4.4). In Chapter Two the requirements of eModeration were investigated. The requirements as used at two private higher education institutions are investigated in Chapter Five.

The researcher has identified the following items as contributing to the quality of eModeration interaction (see Figure 6.4):

- The implementation of relevant eModeration solutions that can be used in higher education institutions for the electronic moderation of examination scripts (Adie, Lloyd and Beutel, 2014; Bridge and Appleyard, 2008; Hanlon et al., 2005).
- The type of interactions that are necessary for each eModeration solution to be functional, for example, moderation processes (Gipps, 2005).
- Policies that support the use of eModeration (Bailey and Garner, 2010).
- Procedures that allow for the proper flow and control of information in eModeration systems, especially those related to feedback (Salmon, 2003).
- Appropriate infrastructure that will allow for the uploading and downloading of examination scripts and the retrieval of information needed to successfully complete the task of eModeration (Greatorex, 2004).
- The implementation of security measures that support access to specific users (Midrand Graduate Institute, 2010).
- The use of digital devices that support the interaction with eModerate systems (McGaw et al., 2004).
- The use of appropriate eModerate technology that will allow and support eModeration tasks (Van Der Merwe, 2010).
- The implementation of supporting structures for users (SAQA, 2001).

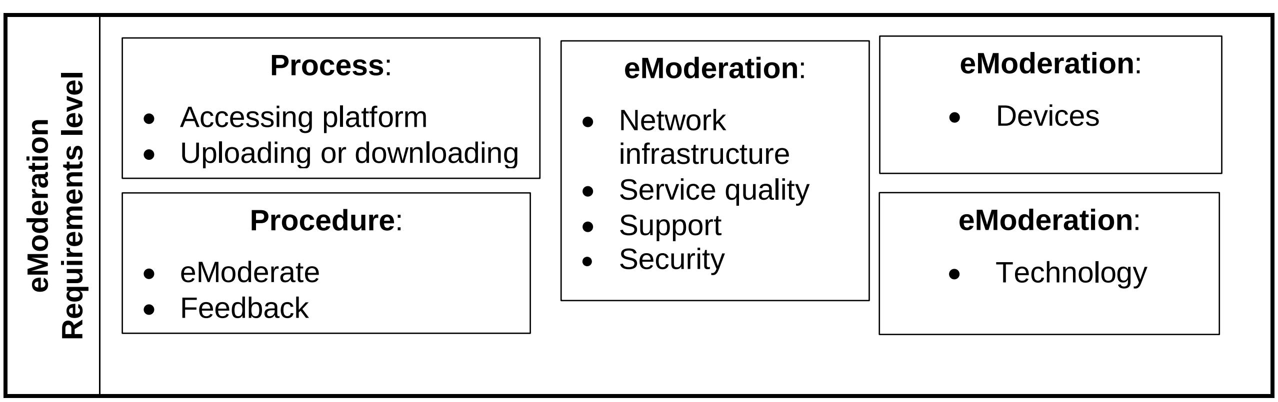


Figure 6.4 eModeration Requirements level

Figure 6.4 illustrates the identified constructs for the eModeration Requirements level. The guidelines as discussed in Sections 6.2.1.1 – 6.2.1.3 of the study contributed to the User Experience Evaluation Framework for eModeration.

6.2.2 Initial Conceptual User Experience Evaluation Framework for eModeration

Through evaluation of the literature and research, in context guidelines (see Table 6.1 and Table 6.2) were identified and used to design and develop an initial conceptual framework. The development took place after the analysis of the eModeration user experience constructs, investigation into the environmental needs and eModeration requirements that contributed to the initial User Experience Evaluation Framework for eModeration. The environmental needs and eModeration requirements were based on Sections 2.2 - 2.4. The framework can be used by educators and managers to evaluate the user experience of the eModerate systems that they have implemented in South Africa within the private higher education institution environment. The researcher used inductive reasoning and utilised prior prescriptive knowledge to design a testable artifact in this study: a conceptual User Experience Evaluation Framework for eModeration. The researcher also synthesised the work practices related to moderation at private higher education institutions, specifically the eModeration of examination scripts, into the initial conceptual framework as part of evaluation and iteration one. The proposed constructs for the framework are shown in Figure 6.5:

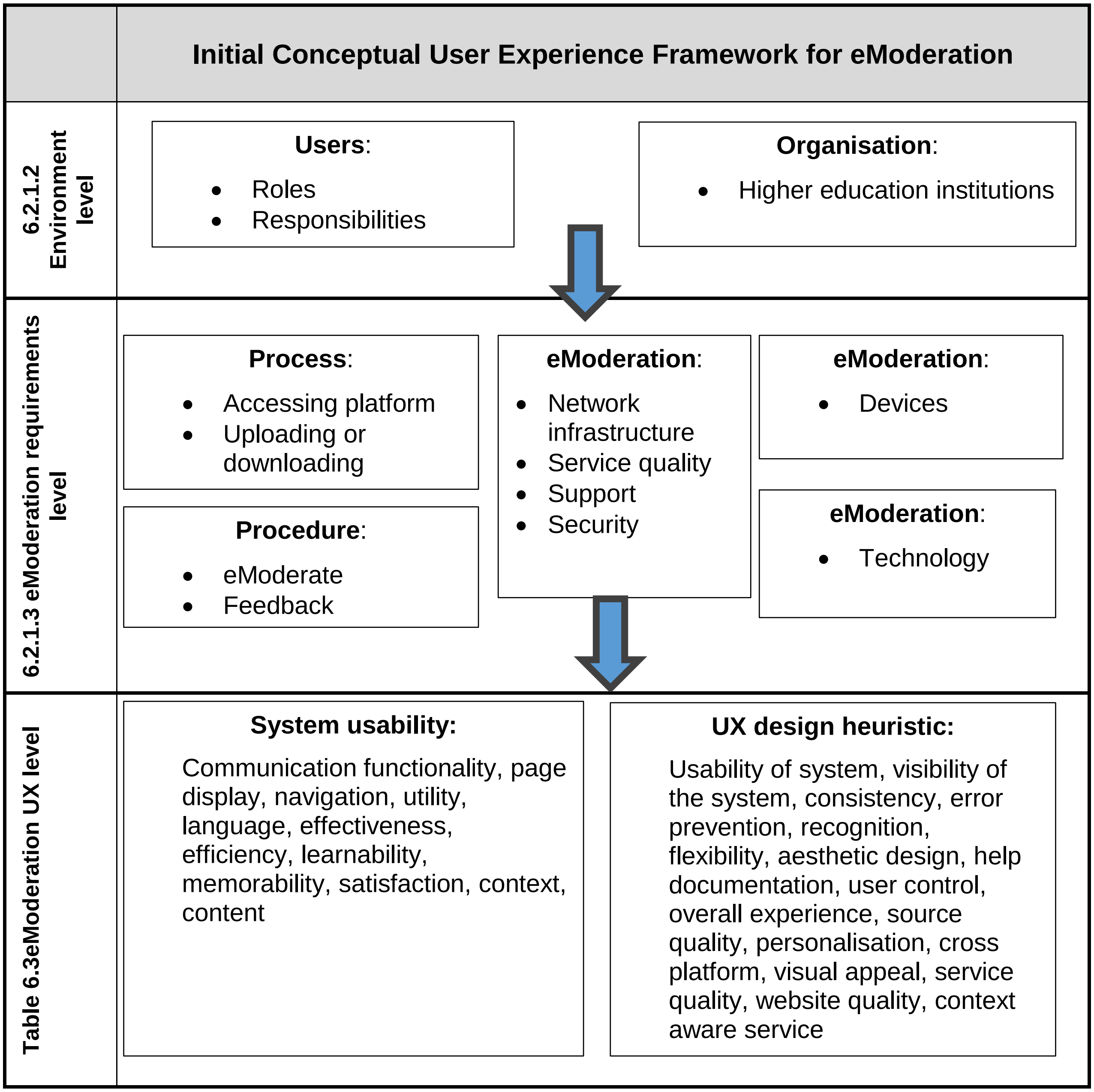


Figure 6.5 Initial Conceptual User Experience Evaluation Framework for eModeration

6.3 Case Study at MGI

MGI, a private higher education institution based in SA, was selected as a case study for iteration and evaluation two of this research. Section 4.8 discussed the research strategy that would be followed to gather data as well as the processes that would be followed in the research design. Data collection occurred during the design and development phase, and concepts identified in the previous stage during the literature review were used to create designs which in turn were used to create instantiations of the artifact as explained in Section 6.2.

During the second iteration of the design and development of the artifact, the User Experience Evaluation Framework for eModeration, a survey was conducted to determine which user experience constructs should form part of the artifact followed by interviews with the deans. During the second iteration data was generated and took the form of user experience and usability design considerations associated with eModeration, concept instantiations, proof of concept, choices and reasons related to the implemented technology (eModerate system), design choices and the overall design methodology and process, as illustrated in Figure 1.2. The next section elaborates on how the questionnaire and interviews were designed, with specific reference to:

- Participant selection
- Questionnaire design
- Interview design

6.3.1 Participants involved in evaluation and iteration two

The cases were selected using a purposive sampling method that would produce valuable data. The cases were made up of four faculty deans and the moderators of modules in those faculties. In total four of the six deans agreed to participate in the study. The dean of IT could not be interviewed because this person is the researcher, and the Faculty of Law did not wish to participate in this study. Table 6.4 illustrates the faculties, number of semesters and the highest level of offering in the faculty.

Table 6.4 Faculties used in the study

Faculty	Semester	Highest Level of offering
Commerce	1 and 2	Level 4
Social Science	1 and 2	Level 5

Faculty	Semester	Highest Level of offering
Science	1 and 2	Level 3
IT	1 and 2	Level 4
Creative Arts	1 and 2	Level 4

The modules used in the sampling were selected by the researcher from the faculties that were willing to participate using the inclusion criteria outlined below. A sample was selected from every level of study. The type of module also played a role in the selection process; some modules were theoretical, others were only practical and some were both theoretical and practical in nature. Large modules, having huge numbers to moderate, were also included, for example, Business Management I in Commerce and English I Social Science. The following criteria were considered in the selection of the modules to be used:

- Is the module offered only in semester 1?
- Is the module offered only in semester 2?
- Will the module be offered in both semesters — same content, same moderator, but taught in both semesters?
- Is the module a year module?
- Is the module offered on level 1, 2, 3 or 4?
- How many modules is the moderator moderating?
- What is the size of the module?

The deans were requested to submit a list of all of the modules and moderators to the researcher. All of the moderators for modules offered in semesters one and two at the private higher education institution were selected as the target population. As some moderators moderate more than one module, the number of moderators and number of modules did not correspond. In such cases the moderator was asked to complete the questionnaire based on a selected module. Table 6.5 illustrates the various participants involved in the case study, the number of modules in the relevant faculty, the number of modules selected in each year of study and the percentage of modules selected per level. Table 6.6 provides a summary of the number of faculty modules used in iteration one.

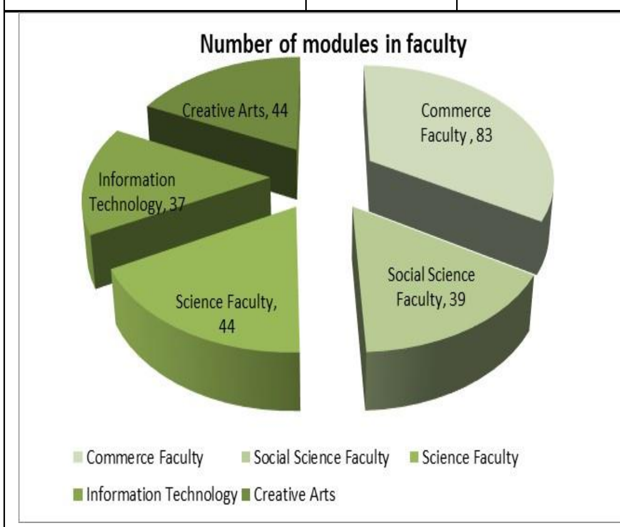
Table 6.5 Breakdown of faculties at Midrand Graduate Institute

Faculty	Semester	Level of study	Number of modules at this level	Number of modules selected for moderation	% of modules selected at this level
Commerce	1	1	10	3	30%
		2	12	2	17%
		3	13	4	31%
	2	1	14	4	29%
		2	16	3	19%
		3	15	4	27%
Totals for Faculty of Commerce			83	20 modules moderated. A total of 388 scripts.	24% of all modules in Commerce moderated.
Social Science	1	1	2	1	50%
		2	3	1	33%
		3	5	1	20%
		4	3	2	67%
		5	2		
	2	1	6	2	33%
		2	4	1	25%
		3	5	4	80%
		4	5	2	40%
		5	4	1	25%
Totals for Faculty of Social Science			39	15 modules moderated. A total of 111 scripts.	38% of all modules in Social Science moderated.
Science	1	1	5	2	40%
		2	6	3	50%
		3	5	4	80%
	2	1	8	2	25%
		2	10	6	60%
		3	5	4	80%
Totals for Faculty of Science			39	21 modules moderated. A total of 280 scripts.	54% of all modules in Science moderated.
Creative Arts	1	1	1	0	
		2	2	0	
		3	0	0	
	2	0	1	1	100%
		1	12	2	17%
		2	12	3	25%
		3	15	0	
Totals for Faculty of Creative Arts			44	6 modules moderated. A total of 150 scripts.	14% of all modules in Creative Arts moderated.

Faculty	Semester	Level of study	Number of modules at this level	Number of modules selected for moderation	% of modules selected at this level
Information Technology	1	1	7	4	57%
		2	5	1	20%
		3	2	1	50%
		4	2	2	100%
	2	1	8	2	25%
		2	4	1	25%
		3	5	1	20%
		4	4	2	50%
Totals for Faculty of Information Technology			37	14 modules moderated. A total of 220 scripts.	38% of all modules in Information Technology moderated.

Table 6.6 Summary of the number of faculty modules used in the study

Faculty	Number of modules	Number of modules moderated in total per faculty and total number of scripts.	Percentage of all modules in faculty used in the eModeration research.
Commerce	83	20 modules and a total of 388 scripts	24%
Social Science	39	15 modules and a total of 111 scripts	38%
Science	39	21 modules and a total of 280 scripts	54%
Creative Arts	44	6 modules and a total of 150 scripts	14%
Information Technology	37	14 modules and a total of 220 scripts	38%



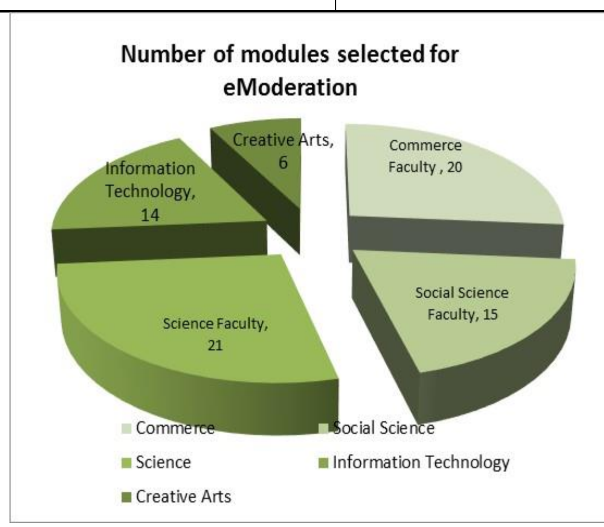


Table 6.6 also reflects the percentage of modules selected per level. The percentage was determined by using the number of modules selected in a level and dividing it by the total number of modules in a level. The percentage of modules selected per faculty was calculated using the total number of modules selected divided by the total number of modules in a faculty as reflected in both Tables 6.5 and 6.6 as a summary.

6.3.2 Questionnaire design

In the literature review (Chapter Three) reference was made to which user experience evaluation methods would be used to guide the design of the artifact. The objective of the survey was to gain an understanding and explore the phenomenon of user experience in eModeration, which includes the understanding of subjective and contextual aspects of user experience, as well as the interrelationships between the factors contributing to it. The research findings were then used to guide the design of the artifact. Väätäja and Roto (2010) agree that "user experience evaluations are conducted in many phases during the product development process and the goal of evaluation differs accordingly". During iteration one of the evaluation, user experience evaluation took place to determine which user experience constructs would be relevant to a user experience evaluation framework for eModeration. During the second iteration of the evaluation the goal was to determine whether the identified framework was complete, simple enough to use, general enough to elicit the required data, exact and clear before the artifact could be refined. The literature review guided the researcher in designing the questionnaire. The length of the questionnaire is a direct result of the lack of a pre-existing UX framework that could be used to assess eModeration. This necessitated that the researcher determined which UX constructs would be relevant in an eModerate environment. All of the questions presented in the questionnaire were considered relevant by at least five academics (two inside and three outside of the institution) who evaluated the questionnaire prior to distribution and administration.

It was important to understand the theoretical background to user experience and eModeration as well as what was actually being measured when designing the questionnaire. It was also important to identify the objectives underpinning the design and development of the artifact. In the design and development the limitations and advantages of the context in which the artifact would be used were also acknowledged. The design and development objectives originated from the identified problems indicated below:

- the lack of a standard definition of user experience;
- usability of the eModerate system;
- user experience of the eModerate system;
- issues concerning the understanding of which constructs of user experience were relevant to eModeration; and
- issues concerning the paper-based moderation system.

It was for these reasons that the questionnaire was designed and divided into five separate sections (see Appendix C):

- Section A: Biographical data — user profile information of participants
- Section B: Questions on moderation
- Section C: Questions on usability and design heuristics
- Section D: Questions on general interface design and heuristics criteria to determine user experience
- Section E: Questions on user experience design heuristics

6.3.2.1 Section A: Biographical data

The participants were required to have worked with an eModerate system before participating in the survey. The section of the questionnaire that dealt with biographical data was used to gather information about the participants in order to sketch the profiles of moderators and deans. The biographical section was divided into three parts:

- professional information (qualification, career and employer);
- the participant's level of computer literacy; and
- the user's internet use and accessibility.

The professional information was used to determine the demographics of the participants. It was also used to identify the faculty in which the moderator was doing moderation at the time of the study.

The computer literacy section evaluated four levels of competency: document management (word processing, spread sheets, presentations and emailing), general internet use (browsing, blogging, social media, banking, eCommerce), educational technologies (eLearning, mLearning and eModeration) and lastly programming technologies (IT professionals). The following Likert sale was used to measure the users' computer literacy experience: 1 None, 2 Beginner, 3 Indecisive, 4 Intermediate and 5 Advanced. The researcher wished to determine contrast between the users' level of computer literacy and their experience of the eModerate system in order to determine whether the users' computer literacy would play a role, or have an impact on, the users' user experience of eModeration systems.

Four questions focused on the participant's internet use: where does he or she access the internet from (work, home, on the move, etc.), size of the internet at the access points (limited, unlimited, do not know, not applicable), what medium (hardware) and type of mechanism (modem) the participant uses to access the internet, for example, cell phones, laptops, desktop PCs, tablets (iPad, Blackberry, Android, Nokia), Kindle or other. The last question focused on the speed of the users' internet connection: very slow, medium or fast. The researcher wanted to evaluate whether the internet would play a role, or have an impact, on the users' overall user experience when using eModeration systems.

Section A of the questionnaire also served as a means to gather information about the environment and context in which the study was conducted. Included in the environment were people and organisations as identified in Figure 5.1 (Chapter Five). Environment and context are two important components in both the user experience field and Design Science Research. Because user experience is subjective it cannot be evaluated with "stopwatches" and it is context dependent (Law et al., 2009; Obrist et al., 2009). The context in this study was the eModeration system that included internet infrastructure. In Section A of the questionnaire attention was paid to gathering information about the environment to ensure that it was adequately evaluated and to determine if the environment level should be represented as part of the artifact.

6.3.2.2 Section B: Questions on moderation

The purpose of Section B was to determine the moderators' impressions, perceptions and experience with paper-based moderation systems and eModeration systems, also to get their preference on paper-based moderation versus eModeration. Section B also asked the moderators to comment on the moderation process and procedures followed. The data gathered from Section B was used to identify the constructs associated with the environment and context components of user experience related to eModeration.

Only the moderators were asked to complete Section B. Section B was divided into three sections:

- traditional paper-based moderation process B1 - B5,
- electronic moderation process B6 - B13; and
- overall moderation experience B14.

The participants also needed to indicate whether they had been previously involved in moderation before this event or not. The data gathered was compared to answers from the eModeration section of the questionnaire.

The second part of Section B focused on the participant's experience of electronic examination script moderation. It was possible that a moderator might not have been involved in paper-based moderation before participating in the survey. Conversely, it was also possible for a moderator to have been involved in paper-based and/or eModeration. For the purpose of this study it was a requirement that a participant first had to complete the eModeration task before participating in the survey.

The last question in Section B focused on asking the participants to rate their overall experience of the changeover from traditional paper-based moderation to eModeration, whether they considered the process faster and easier, and if their internet infrastructure was able to handle the eModeration system. Results from these questions contributed to the eModeration Requirements level of the framework.

The deans did not complete Section B as the questions were only concerned with the act of moderation. However questions similar to the last section in Section B were given to the deans during their interview to determine their impressions about the changeover from manual paper-based moderation to eModeration. The two user groups fulfilled different roles and responsibilities during the moderation process. The moderator fulfilled the role of an end user using the system to complete the task of eModeration, while the dean fulfilled the role of a manager who needed to access the reports which were uploaded by the eModerator. It was possible for the different user groups to have differing opinions and views on the usability of the eModerate system as well as the user experience.

The questionnaire included open-ended questions. The open-ended questions where the moderators were asked to identify what they "liked" or "disliked" about the eModerate system were used to improve the design of the system and to improve the user experience. The answers provided to the open-ended questions provided a descriptive view of how the artifact was expected to support the solution.

The rating of the changeover from manual paper-based moderation to an electronic moderation system was done using a Likert scale ranging from 1 - 5:

- strongly disagree SD = 1;
- disagree D = 2;
- neither agree nor disagree N = 3;
- agree A = 4; and
- strongly agree SA = 5.

After the participants had completed Sections A and B of the questionnaire they were given a set of instructions. The participants were required to login to the MGI ePortal with the login and password provided by the eLearn developer. They then had to navigate and go to the module page where they found the information required to moderate. The participants were then expected to complete Sections C, D and E. These sections listed the main constructs that would contribute to the User Experience Evaluation Framework for eModeration. The participants were asked to indicate the significance of the constructs provided. The participants also had the opportunity to add constructs to the list of usability and user experience heuristics.

6.3.2.3 Section C: Questions on usability and design heuristics

Section C focused on the usability of the system and the design heuristics associated with usability as defined in Section 3.2.1. Nielsen (1994a) indicated that usability is measured against five attributes: learnability, efficiency, memorability, errors and satisfaction. Usability metrics differ from other metrics in that they measure something about people and their behaviour or attitudes. Usability metrics further help to reveal patterns that are difficult or impossible to see and can be used as a means to help the researcher reach an informed decision (Tullis and Albert, 2008). Bouvier et al. (2012) also used Preece et al.'s (2009) identified usability goals to evaluate user interface with novice people, which correlates with this study. None of the participants in this part of the study were expert usability or user experience evaluators.

No guidelines concerning how to measure websites such as eModeration systems could be found. It is for this reason that the researcher investigated the possibility of using or adopting previously existing procedures and guidelines for other types of websites such as eCommerce to find constructs that could also be used for eModeration system websites. Websites such as eCommerce websites and eModerate system websites are similar in that people need to find information. However, the two types of sites differ in that when someone wishes to purchase a product on an eCommerce website he or she normally does not need to login with a login and password. With the eModerate system users are required to login to a secure site with a unique user name and password. Information on eModerate websites is also context and content specific. Users would not search for the examination scripts as the login page would allow the user to navigate their way to the module pages where they would find the information required to complete the task.

Section C of the questionnaire was divided into two parts:

- usability goals; and
- usability evaluation.

In the first part of Section C, before the user was required to answer questions C1 - C12 which concerned usability goals, he or she was given two tasks to complete: first, to login to the eModerate system and secondly to navigate his or her way to the module pages. Seven questions (C1 - C7), using the Likert scale from strongly disagree to strongly agree, focused on the user's experience on the login page. The second task required the user to select the module needing to be moderated. Thereafter questions C8 - C12 needed to be completed.

According to Head (1999), the interface of a website should be easy to learn, easy to memorise, user friendly, and should support recovery from errors. Usability was defined in Section 3.2.1 and has the following characteristics: interactive products should be easy to learn, effective to use, and enjoyable from a user's perspective. Sharp et al. (2009) and Tullis and Albert (2008, 2013) agree with Nielsen's (1994a) usability attributes and identified usability goals, for example, effective to use ("being able to complete the task"), efficient to use ("the amount of effort required to complete the task"), safe to use, having a good utility, easy to learn, easy to remember and satisfaction ("the degree to which the user was happy with his or her experience while performing the task"). Usability goals were added to the questionnaire to determine if they were relevant to a user experience evaluation framework for eModeration. In testing a system for usability the usability goals are operationalised as questions which provide a way for the designers to assess various aspects of an interactive product and the user experience (Preece et al., 2009). Table 6.7 describes each usability goal and the questions that were associated with it (the question numbers are listed in brackets, for example, C1 and C2).

Table 6.7 Usability goals and associated questions (International Organization of Standards, 1998; Moczarny, 2011; Nielsen, 1994a; Preece et al., 2009; Rogers et al., 2011)

	Usability goal	Definition of goal	Question(s)
1	Effectiveness	Effectiveness refers to how well a product does what it is supposed to do.	Can the product provide the user with access to the information that he or she needs, and support the user in learning, and with conducting their work efficiently? (C1 and C2)
2	Efficiency	Efficiency refers to the way that the product supports the user	Once the user has learnt how to use the system or product, can

	Usability goal	Definition of goal	Question(s)
		with conducting the task with the least number of steps.	he or she sustain a high level of productivity and carry out the tasks? (C6 and C9)
3	Safety	The safety factor involves protection of the user from dangerous conditions and undesirable situations.	What are the possible errors that can occur while using the product and what measures and methods are in place to allow the user to recover easily from such errors? (C3 and C11)
4	Utility	Utility refers to the product's functionality to assist users with what they want to do.	Does the system or product allow the user a sufficient and appropriate set of functions that will enable the user to carry out his or her task as required? (C5, C7 and C12)
5	Learnability	Learnability refers to how easily a user can learn to use the system.	How easy is it for the user to learn how to use the product by exploring the interface and trying out certain actions? Will it be difficult for the user to learn the whole set of functions in this way? (C46-48)
6	Memorability	Memorability refers to how easy it is to remember how to use a product once learnt. This is very important for interactive products that are used infrequently.	What kind of support is built into the product to assist the user with remembering how to carry out the tasks, especially for products and operations being used infrequently? (C4 and C8)

The second part of Section C in the questionnaire focused on the usability evaluation criteria (see Appendix C questions C13 - C59). Usability design heuristics, as identified by the International Organization of Standards (1998), Nielsen (1994a), Preece et al. (2009), and Rogers et al. (2011) have been indicated in Table 6.7. The researcher used the eCommerce usability design heuristics in Section C of the questionnaire to determine which eCommerce usability constructs were applicable, relevant, or consistent with a user experience evaluation framework for eModeration (see Appendix C).

The user was expected to answer questions on usability criteria as set out in Table 6.8. In terms of the specific questions, the usability goals can be turned into usability criteria, objectives that enable the usability of a product to be assessed in terms of how it can (or cannot) improve the user's performance (Preece et al., 2009). The usability evaluation aims to assess the degree to which the system's performance meets the task for which it is designed (effectiveness) (Bastien, 2010). Although the usability criteria can provide quantitative indicators of the extent to which productivity has increased, these do not address the overall quality of the user experience. In this study, usability evaluation was used to determine the extent to which usability has an impact on the users' experience of the eModerate system and which usability goals were relevant to the User Experience Evaluation Framework for eModeration. A limitation of usability in this study as captured with the questionnaire was that the data does not reflect normal usability testing done in a laboratory. Users were expected to follow a few steps then answer questions C1 -C12, complete three steps and then complete questions C13 - C59.

Table 6.8 Usability evaluation criteria

Usability goals and criteria	Definitions and criteria	Questions related to criteria in Section C	References
Communicate the intended message — functionality	The intended message should be communicated in a way that leads to a positive user experience. Aspects such as tone, colour of font, navigation, visual load and information hierarchy are part of communication. The message to be communicated to the eModerate user will concern how to moderate electronically.	Is information being communicated clearly, is it easy to read, visible, at the top of the page, and does it communicate the intended message? Questions C13 – 15.	Porter and Bewer 2010; Rubinoff 2004; Zou 2007
Page display, layout, size and site structure: information architecture, search boxes, search results, site wide navigation, contextual navigation, and page structure.	A website should provide orderly screens, simple search paths, fast and readable presentation of information, and navigation that is simple and efficient. Relevant factors include: navigation, information architecture, language, aesthetics and visual appeal, page structure and layout. The usability of an eModerate site needs to be identified.	The question is whether the usability criteria of eCommerce websites is applicable to eModerate websites? Which aspects of the page display, user interface, visual elements, navigation, and information will have an impact on the user experience? Is a search box required in an eModerate site? How good is the contextual navigation with respect to links? The page layout was then divided into three categories: Information architecture questions C16 – 19. Site navigation questions C20 – 24. Context navigation questions C25 – 28.	Chang and Chen 2009; Gardner 2007; Hassenzahl et al. 2010; Hassenzahl and Tractinsky 2006; Martim, Herselman and van Greunen 2009; Paluch 2006; Moczarny et al. 2012; Rubinoff 2004
Value of information provided — presentation of	The users utilise eModerate websites as a platform through which to find the examination scripts. The content is	An eModerate system needs to communicate some information to its users, for example the process to follow when moderating	Camus and Evans 2009; Hassenzahl et al. 2010; Moczarny et al. 2012; Rubinoff

Usability goals and criteria	Definitions and criteria	Questions related to criteria in Section C	References
information — functionality	aimed at explaining how to perform the task of moderation.	electronically. The questions being asked should determine if it is a necessary criteria, what type of information will be needed, whether enough information has been provided and if information is related to the context. Questions C10, C29 – 32.	2004, 2009; Sung 2006
Utility	Additional guides and information will be supplied to the users regarding the eModeration process.	The questions need to determine the importance of utility in an eModerate system and need to determine if enough functionality is provided to users to carry out their task. These also need to determine the functionality of the up/download links. Questions C33 – 36.	Camus and Evans 2009; Sharp et al. 2009; Zou et al. 2007
Effectiveness	Effectiveness refers to how good a product is at doing what it is supposed to do. Does the system perform the tasks for which it was designed? Does the eModerate system perform the tasks for which it was designed?	Can the eModerate system support users (moderators/deans) in learning, in conducting their work efficiently, and accessing the information they need to complete the moderation task? Questions C37 – 40.	Bastien 2010; Paluch 2006; Rubinoff 2004; Sharp et al. 2009
Efficiency	The number of steps taken when conducting a task should be kept to a minimum. How much effort is required to use the system in order to achieve the tasks? How much time and effort is	In terms of eModeration how many tasks are involved in conducting eModeration and how much effort will be required to perform those tasks? Less time is spent moderating and transport is no longer required as a resource, however, the internet	Bastien 2010; Moczarny et al. 2012; Paluch 2006; Rubinoff 2004; Rogers et al. 2011; Sharp et al. 2009

Usability goals and criteria	Definitions and criteria	Questions related to criteria in Section C	References
	required to use the eModerate system in order to achieve the moderation tasks?	is a requirement. The efficiency of the eModeration process was also questioned. Questions C41 - 45.	
Learnability	Learnability deals with how easy it is to learn to use a system. Learnability requires a short learning curve.	How difficult will it be to remember how to use the eModerate system? The user need not learn anything before using the system. There is a quick progression to feeling comfortable with the system. Questions C46 – 48.	Paluch 2006; Rogers et al. 2011; Sharp et al. 2009
Memorability	Once learnability is in place how easy is it to remember how to use a product?	How much will the user remember from one semester to the next about how to use the eModerate system? Questions C49 – 50.	Rogers et al. 2011; Sharp et al. 2009
Security	Security is one of the factors that will influence the customer's perception of any system. It is necessary to provide relevant and accurate information on the websites. The security of the examination scripts on the eModerate website is important. The user will not buy any products on the eModerate website.	The questions regarding security were used to determine if it should be included in the framework. Is the security sufficient? Users were asked whether they were restricted to only their pages or if they could see other modules. Is it possible for a user to hack into the system? Questions C51 – 56.	Hoffman, Novak and Peralta 2004; Martim et al. 2009; Rogers et al. 2011
Safety	Users should be protected from dangerous conditions and undesirable situations. Various methods of recovery should be available should the users make a mistake. When the user logs in he or she only has access to his or her	What will happen if the files are not uploaded or downloaded successfully? Does the login and password work and is it safe to use?	Sharp et al. 2009; Väänänen-Vainio-Mattila and Wäljas 2009

Usability goals and criteria	Definitions and criteria	Questions related to criteria in Section C	References
	module(s). How will the users be protected when they make a mistake with the uploading or downloading of moderation documents?	Can users login to pages that they should not have access to? Questions C3 and C11.	
Satisfaction	Usability generally involves ensuring that interactive products are easy to learn, effective to use and enjoyable from a user's perspective. Will the system receive a response from the user? Will the user be satisfied with the eModerate system?	The satisfaction questionnaire is based on the experiences of users while using the eModerate system. How do the users rate their level of satisfaction regarding their use of the eModerate system? Question C57.	Bastien 2010; Hernández, Jiménez and Martín 2009; Martim et al. 2009; Paluch 2006; Sharp et al. 2009; Szymanski and Hise 2000
Content	Link density provides clarity and easy navigation. Content is structured in a way that facilitates the achievement of user goals. The content is up-to-date and accurate. The content is appropriate to customer needs and business goals.	Does the link density provide easy navigation? Is content structured in such a way that it will facilitate the achievement of user goals? Is the content provided for moderation accurate and up-to-date? Is the content provided appropriate to eModerate? Questions C58 – 59.	Rubinoff 2004; Väänänen-Vainio-Mattila and Wäljas 2009
Language and culture	Language and culture have an impact on the perception of website usability. The eModerate system will use English as a language to communicate to its users.	Is it necessary to include other languages? Will the company culture determine the design or will this be influenced by the culture of the country? No question was asked concerning language or culture, which is a limitation because it is normally tested for user experience.	Martim et al. 2009; Nante and Glaser 2008

In the design of the Usability Evaluation section of the questionnaire, attention was paid to work done by Ssemugabi and de Villiers (2007) who used a set of heuristics suitable for the evaluation of the usability of e-learning applications in a web based learning environment. Ssemugabi and de Villiers (2007) identified the following categories: general interface usability criteria and website specific criteria for educational websites. The questionnaire was designed by the researcher to ask users for structured comment regarding their experience of using the eModerate system. Heuristics guided the user to explore and check whether the system complied with usability principles.

6.3.2.4 Section D: Questions on general interface design heuristic criteria to determine user experience

User experience measures do not include objective measures such as task execution time and number of clicks, but they do include the need to know how the user feels about the system (Obrist et al., 2009). Law (2011) agrees with Tullis and Albert (2008) that user experience evaluation methods draw from usability evaluation methods. Law (2011) further asserts that a threshold level of usability is required for user experience. The design of the questionnaire was informed by conceptual frameworks as discussed in Section 6.2. The theories enabled the researcher to translate constructs into meaningful measures (Law, 2011). The most widely used heuristics for evaluation are Nielsen's (1994b) set of ten classic heuristic principles. Nielsen's (1994b) classic heuristic principles are used in specific "context-bound" or "context-related" evaluations. Heuristic evaluation is usually conducted during the development phase, but can also be very effective when used on real, operational systems (Nielsen 1992; Peng, Ramaiach and Foo 2004). It is for these reasons (i.e. that the criteria can be used in specific context-related real operational systems) that Nielsen's heuristic principles were taken into consideration during the design of the questionnaire. Other factors which were also considered and which could affect website usability included navigation, information architecture, language, aesthetics and visual appeal, and page structure and layout (Gardner 2007). Table 6.9 includes the user experience criteria along with the relevant questions.

Table 6.9 General interface design heuristics that determine user experience (Moczarny, 2011; Nielsen, 1994b; Powals, 1996)

User experience criteria	Definitions and criteria	Questions related to criteria	References
Visibility of system	The system should keep the users informed about where they are. The system should also provide appropriate feedback within reasonable time.	Do you know where you are on the page? Is it clear where you are supposed to go to upload or download examination scripts? Is the faculty branding on each page clear? Are the links visible? Questions D1 – 4.	Nielsen 1994b
User control and freedom	'Exits' should be clearly visible. If a user chooses to leave an unwanted state it should be clear where to go and the user must have the freedom to do so without going through an extended dialogue.	Is there a 'home' and 'cancel' link on every page? Is the navigation clear on pages? Is there a logout link on every page? Questions D5 – 8.	Nielsen 1994b
Consistency and standards	Words, situations and actions need to be consistent throughout the application. Data needs to be displayed in a clear, consistent and meaningful way to decrease search time. The eModerate system pages between faculties should adhere to the ePortal standards.	Page titles on the page are the same as the links that point to them. Information on the page is displayed clearly, consistently, and is grouped logically in the navigation headings. Are the templates consistently used across the modules? Questions D9 – 12.	Nielsen 1994b; Powals 1996
Error prevention	The design should be created in such a manner that it prevents errors from occurring.	Is the design of the page such that it can cause participants to make an error? The eModerate pages constructively suggest a solution (i.e. If anything were to go wrong with the download or upload of information, the system provides participants with a detailed error message or a link that will help solve the problem). Is there more than one method available to recover from the errors? Are there effective error diagnostics?	Nielsen 1994b

User experience criteria	Definitions and criteria	Questions related to criteria	References
		Questions D13 – 17.	
Recognition rather than recall	Actions, objects, options and instructions should be visible or easily retrievable whenever appropriate. Names that are conceptually related to the function should be used. In the eModerate system the upload or download objects should be visible and named accordingly.	Can the user identify where they are in the application by looking at the page? Labels and links are descriptive — paths are specified in the toolbar. Is the eModeration process easy enough to follow? Is the information clear after having read it once? Questions D18 – 21.	Moczarny 2011; Nielsen 1994b; Powals 1996
Flexibility and efficiency of use	The system will be used by both inexperienced and experienced users. The system needs to provide functionality in order to speed up interaction.	Are the instructions clear enough to get the task done? Do the instructions inform the user about what to do next? Questions D22 – 25.	Nielsen 1994b
Aesthetic and minimalist design	Dialogue should contain only relevant information, irrelevant information is rarely needed. Information needed by the user should be displayed at a given time. Appropriate use of colour and graphics.	Is there any irrelevant information displayed on the eModerate webpages? Is the more general information higher up in the information architecture? Is the content of the information written for eModerate? Is there any need for improvement on the design of the eModerate webpages? Questions D26 – 28.	Nielsen 1994b; Powals 1996
Help and documentation	Error messages should be clear and expressed in plain language, precisely indicate the problem, and constructively suggest a solution. Help should be easy to find. Help should indicate to the user the number of steps that need to be carried out to complete a task. It should not be too long.	Is there a help link available on every page? Does the help function provide enough information? Is the help function easy to use? Questions D29 – 33.	Nielsen 1994b

6.3.2.5 Section E: Questions on user experience design heuristics

Section E of the questionnaire was designed to determine the user's overall satisfaction with using an eModerate system. The user's emotional state plays a dynamic role in user experience (see Section 3.3.3) (Agarwal and Meyer, 2009; Law et al., 2009; Hassenzahl, 2008). In Section E of the questionnaire users were given the opportunity to indicate positive and negative aspects associated with using an eModerate system. As discussed in Section 3.3.3, the user's motivations and emotions may involve positive or negative expressions. The user's characteristics as discussed in Section 3.3.2 and Section 3.3.3, also influence the internal state of the user which will have an impact on the overall user experience. Section E of the questionnaire was designed to determine the user's perspective on the product's features (presentation, functionality, interaction), that were made up of pragmatic (manipulation) and hedonic (stimulation, identification, evocation) attributes (see Section 3.2.3). The consequences of user interaction with the eModerate system can affect appeal, pleasure and satisfaction. Users were also asked to indicate how the product's instrumental qualities (usability) contributed to the non-instrumental qualities (user experience). In the design of the questionnaire attention was paid to including constructs that had already been evaluated to confirm their inclusion in the framework.

The challenge lay in determining the deans' and moderators' user experience and the usability of the process as experienced by the users. Table 6.10 explains the user experience design heuristics that were used in Section E of the questionnaire.

Table 6.10 User experience design heuristics

User experience design heuristic	Definitions and heuristic	Questions related to criteria	References
General user experience related issues	Is the user interface usable and aesthetically pleasing? Does the user interface support the privacy of users?	It was difficult to compare the user experience to other eModerate websites because the purpose of each site is different. The only similarity that they share lies in how papers are peer-reviewed.	Väänänen-Vainio-Mattila and Wäljas 2009
Visual appeal	Aesthetic experience aspects concern a product's ability to enhance user sensory modalities such as: look and feel of the product, colours, font, graphics and sounds used. The visual impact of a user interface can have a significant influence on the user experience. When designed badly it can complicate the effective communication that the company intended to convey to the users.	The user needs to rate the colour, text size, text colour and whether it is easy to read. What feelings does the user experience elicit when using the eModerate system? Questions E1 - E4.	Hassenzahl and Tractinsky 2006; Hoffman and Krauss 2004; Porter and Bewer 2010
Website quality perception — overall experience of use. Context-aware services and contextually-enriched content	Covered under general interface user. It determines whether the product is able to support the achievement of behavioural (usability) goals, for example, usefulness and ease of use. Are the services adapted to the user's context of use? Does the webpage offer meaningful contextual information?	The user has to rate the eModerate webpage under overall experience: features, functionality, structure of information, content offered, navigation structure, login page, ease of use, security and module layout page. The user needs to rate if the content is structured in such a way that it facilitates the achievement of goals. The eModerate website fits into the context of a virtual learning environment, for example, in an eLearn system of a higher education institution. Information provided is comprehensive enough for the features of an eModerate website. Questions E5 - E13.	Hassenzahl et al. 2004; Hassenzahl 2005; Kuniavsky 2010; Sproll et al. 2010; Rubinoff 2004; Väänänen-Vainio-Mattila and Wäljas 2009

User experience design heuristic	Definitions and heuristic	Questions related to criteria	References
Personalisation	Personalisation occurs when the webpage stores information about the user. For a good user experience the more the system "knows" about the user, the better it can serve the user effectively.	What is the user's experience of his or her name that appears in the title bar? A report can be generated from the system reflecting what the moderator or dean did. The user has to rate whether they perceive it as a good or bad experience. Questions E14 - E15.	Abbattista et al. 2002
Service quality	Service quality can be categorised under two criteria: • Convenience — is the webpage easy to navigate, can the users get the information that they are looking for and is it user friendly? • Interactivity — does the webpage facilitate two way communication?	Is eModeration convenient? Do the eModerate webpages allow for two way communication? To what extent are the eModerate webpages customised? Questions E16 - E17.	Chang and Chen 2009; Petre, Minocha and Roberts 2006
Cross-platform service quality	Can users access the platform from personal computers, laptops and mobile phones?	Rate the access via desktop PC, laptop and mobile phone. Questions E18 - E20.	Väänänen-Vainio-Mattila and Wäljas 2009
Feelings evoked when using the website	How do users experience the product from their personal perspective? User experience involves all aspects of use of an interactive product: how well the users understand the way in which it works, how the users feel about it while using the system, how well does it serve the users' purpose. Feelings are evoked as a consequence of a user's internal state, expectations, needs, motivation and mood.	The user has to rate their user experience under two categories: • positive (E21); and • negative feelings (E22).	Hassenzahl and Tractinsky 2006; Sharp et al. 2009

Table 6.11 serves as a breakdown of the answers expected from the first two research subquestions:

- The first subquestion: What are the most important user experience attributes for electronic moderation systems?
- The second subquestion: What user experience frameworks already exist which are relevant to the evaluation of electronic moderation systems?

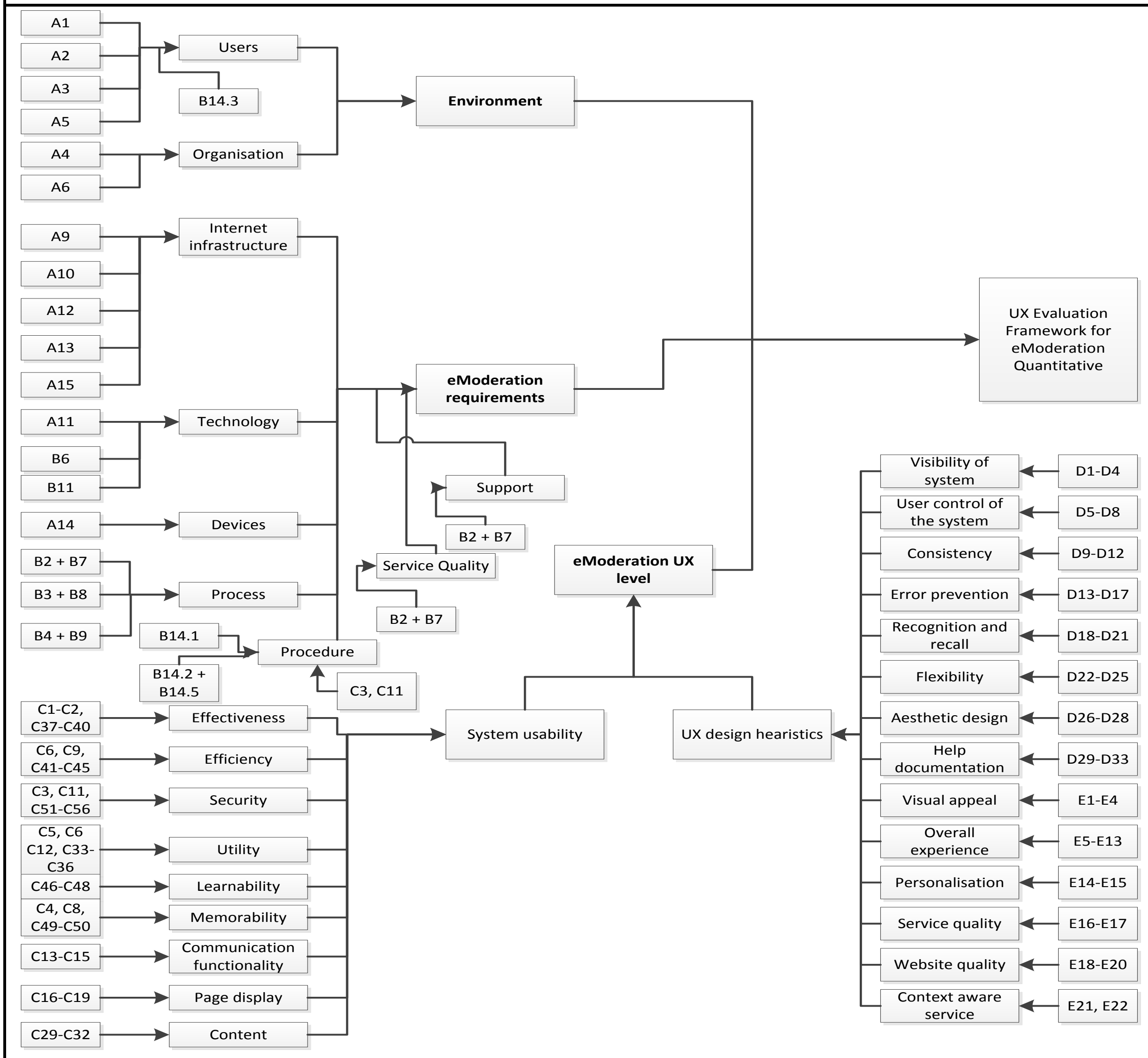
Table 6.11 summarises the overall design of the questionnaire handed out to participants during evaluation two, iteration two. Existing user experience frameworks created by Mahlke and Thüring (2007), Kort et al. (2007), Schulze and Krömker (2010), Ouma (2013) and Moczarny (2011) (see Section 3.4) were used during the design of the questionnaire to determine which user experience constructs were relevant to eModeration. The diagram in Table 6.11 also demonstrates the link between the questions in questionnaire and constructs in the framework.

Table 6.11 Summary of questionnaire design

Outcome and focus	Questions
Biographic details	First name/s, surname, maiden name, tel no., cell no., email address, physical address, race, nationality, place of birth, profession, company of employment and participants' role, dean or moderator, gender, language.
Computer literacy	Period of time that person has been an internet user. Indication of what the participant does on the internet.
Evaluation of manual paper-based moderation system	The participant needs to answer whether he or she has previously done moderation using the manual system. Indicate how often he or she has done manual moderation for the institution. Indicate the number of module(s) done using the manual system. Indicate the average number of scripts moderated. Indicate likes and dislikes of the manual system.
Experience of eModerate (novice versus expert)	Questions on moderator's experience of eModerate — is the user a novice or expert?
Frequency of eModerate use	Indicate how often he or she has done eModeration for the institution.

Outcome and focus	Questions
	Indicate the number of module(s) done using the eModerate system. Indicate the type of module, code, semester or year. Which features of the eModerate system does the participant use most often? Is there anything the user specifically likes or dislikes about eModerate websites?
Usability of eModerate measured against the following attributes • Effectiveness • Efficiency • Utility • Safety • Learnability • Memorability • User satisfaction	Points to be covered in the questionnaire. The participants will be asked to comment on: • How easy or difficult was it to find information on the system? • How satisfied was the user when using the system? • Structural layout of eModerate with respect to performance of the eModerate system. • Tone and terminology used. • Screen layout. • Visual appeal. • Usability design heuristics — eCommerce or eModerate — questionnaire rating.
User Experience of eModerate measured against: • Functionality • Attention • Pace • Interactivity • Conscious or unconscious control • Flow • Content • Usable • Useful • Desirable • Accessible • Findable • Credible	Interview with deans conducted after they had completed the moderation electronically: • Initial impression of the eModerate page's (graphic intensity, likes and dislikes) visual appeal. • Is there anything missing that you would like to see on the eModerate page (functionality or content)? • Is there anything that did not function properly on the eModerate page? • With regards to interactivity or flow, is there anything wrong with the process of eModerate? • With regards to usability, usefulness, and controllability, are there any changes that you would recommend concerning the process of eModerate that would improve the flow of information? • Are there other users who you would like to allow to access the eModerate page? • What do you think of moderation's move away from a manual paper-based system to an electronic moderation system? • How or where did you access the system from? • What was your experience of the process? • What emotions did you experience: positive or negative? • How available is the content? • How secure is the system? • Rate the eModerate website based on aesthetics.

Outcome and focus	Questions
	General interface design heuristics criteria — questionnaire and rating — will help identify criteria that can be used in a user experience evaluation framework for eModeration.
Linking questions in questionnaire to constructs:	



After the design and development of the questionnaire, a survey was conducted using the questionnaire as an instrument with data presented in Section 6.4. A reason why the questionnaire was lengthy was because no UX framework for eModeration could be found and the researcher had to determine which UX constructs would be relevant in an eModerate environment. All questions were also considered relevant by at least five academics (two inside and three outside the institution) that were used as to evaluate the questionnaire prior to distribution and use of the questionnaire. Furthermore Cronbach alpha tests for reliability were also conducted. The data and findings of the survey are discussed and presented in Sections 6.4 and 6.5. Deans also took part in the survey, and were interviewed in order to understand how they perceived the use of an eModerate system and what they thought should be included in a user experience evaluation framework for eModeration. The next section describes the design of the interview.

6.3.3 Interviews with the deans at MGI

In order to supplement the quantitative results (Müller et al., 2010), qualitative data was gathered via interviews with the deans. Law (2011) indicated that a qualitative approach appeared to be desirable in the arena of user experience research. The rationale behind interviewing the deans was to get management's perspective on the user experience of the eModerate system. The deans were required to also complete the designed questionnaire except for Section B, which was completed only by the moderators.

The interview was designed and developed to include the following sections:

- Section A: Biographical information
- Section B: Questions about the eModeration system and process
- Section C: Open-ended structured interview questions

The deans indicated the faculty which they managed as well as their age and gender. The questions asked during the interview and the interview schedule can be found in Appendix D. The deans were expected to rate how they experienced the changeover from a manual paper-based moderation system to an electronic moderation system (from strongly disagree to strongly agree). The views expressed by the deans were important as they represented the views of management.

Some of the questions which the deans answered were concerned with network infrastructure, the equipment being used to access the eModerate system and where they would access the system from.

The questions in Question 1.2 in Section A of the interview (see Appendix D) were also posed to eModerators in Section B of the questionnaire. Because managers were not required to complete Section B of the questionnaire, these questions were added to the interview because they would elicit a different response from managers as opposed to educators. Managers used the system to manage the process of eModeration while eModerators used it to eModerate examination scripts. It was important to understand and investigate how educators and management perceived the speed of the process and whether the process was easier than the manual paper-based moderation system. It was also important to investigate the users' interpretation of the change from manual to electronic, i.e. whether or not they viewed it as a positive development. Users also indicated if their internet infrastructure would be able to handle the eModerate system.

The deans indicated whether their faculty had used any eModerate system before and how many modules had been electronically moderated. The deans were asked which features of eModeration they preferred: the UNISA online marking tool, sticky notes in Adobe or a Word document that indicated where marks should be changed.

Under open-ended questions the researcher first explained some of the relevant terms and terminology used in user experience to the deans before asking questions related to:

- Graphical intensity, likes, dislikes, visual appeal and initial impression of the eModerate page(s).
- In their opinion, what had been omitted from the pages that should be there?
- What did not function properly on the eModerate pages and how would they change it?
- From their point of view, was the process of eModeration via an eModerate system acceptable and efficient?
- How would they like to access an eModerate system and, in their view, who else should be involved in the eModerate process?
- How did they view the changeover from manual paper-based moderation to an eModeration process?

The rationale behind asking these questions was to assist with identifying the Requirements and Environment requirements for the framework. Because the managers were using the system for different reasons to those of eModerators, it was possible that their views and opinions would differ.

Qualitative data was analysed in order to identify trends and patterns. After administering the survey and conducting the interviews with the deans, the researcher analysed the data. The conceptual framework, which had been designed after the literature review, was refined in the second iteration. The User Experience Evaluation Framework for eModeration was then presented to a few selected eModerators in iteration three.

6.4 Results from case study at MGI

The next section describes the results from the designed questionnaire during iteration and evaluation two, which is followed by a discussion of the adjusted framework:

- Section A: Biographical data — user profile information of participants
- Section B: Questions on moderation
- Section C: Questions on usability and design heuristics
- Section D: Questions on general interface design heuristics criteria to determine user experience
- Section E: Questions on user experience design heuristics

In Section 6.4 Tables were used to represent summaries of analised data while Appendixes provide completeness to data. Section 6.4.1 starts with reporting on the internal reliability or consistency of the measuring instrument as measured by Cronbach Alpha after which descriptive statistical analysis (Section 6.4.2 – 6.4.6) will be reported per section in the discussion of the questionnaire results.

6.4.1 Internal consistency or reliability of measuring instrument

Where possible items were also analysed in order to assess the reliability of the different constructs measured in the questionnaire to determine the internal consistency of scale by using Cronbach's Alpha.

The following criteria were used to select constructs. Cronbach's Alpha response values higher than 0,8 were accepted as good reliability, while values between 0,6 and 0,8 were accepted as reliable, which meant that the results could be used.

Table 6.12 reflects statistical values from the Cronbach's Alpha values for ranges. Cronbach's Alpha was the first screening test followed by the mean test, reports on items that formed part of the constructs, items left out, Mean, Standard deviation, Cronbach Alpha value (0.80) and interpretation of reliability (good). Estimates of internal consistency as measured by Cronbach's Alpha, not all exceeded 0,8 and are reported in Table 6.12 (see Appendix M for Cronbach's Alpha per construct and items).

Table 6.12 Cronbach's Alpha reliability estimates for the study's variables

Variables	**Items**	**Items left out**	**Mean**	**SD**	**Cronbach**	**Reliability**
Construct 1 : eModeration requirements	B14.1 - B14.5	None	3,99	0,878	0,879	Good
Construct 2 : Login page	C1 - C7	None	4,13	0,71	0,9431	Good
Construct 3 : Module page	C.8 - C.12	None	3,97	0,65	0,888	Good
Construct 4 : Communicate intended message	C.13 - C16	None	4,14	0,63	0,904	Good
Construct 5 : Page display and information architecture	C.17 - C.20	None	3,98	0,66	0,898	Good
Construct 6 : Site wide navigation	C.21 - C.24	None	4,01	0,73	0,931	Good
Construct 7 : Contextual navigation	C.25 - C.28	None	4,04	0,66	0,928	Good
Construct 8 : Value of information provided	C.29 - C.33	None	3,99	0,85	0,928	Good

Variables	Items	Items left out	Mean	SD	Cronbach	Reliability
Construct 9 : Utility	C.33 - C.36	None	3,99	0,85	0,682	Acceptable reliability
Construct 10 : Effectiveness	C.37 - C.40	None	4,05	0,73	0,861	Good
Construct 11 : Efficiency of resource usage	C.41 - C.45	None	4,15	0,64	0,780	Acceptable reliability
Construct 12 : Learnability	C.46 - C.50	None	3,81	0,81	0,723	Acceptable reliability
Construct 13 : Security	C.51 - C.53	None	3,66	0,65	0,309	Unacceptable reliability
Construct 14 : Satisfaction	C.54 - C.57	None	3,79	0,73	0,784	acceptable reliability
Construct 15 : Context	C.58 - C.59	None	4,09	0,68	0,853	Good
Construct 16 : Visibility of the system status	D.1 - D.4	D.2	4,01	0,62	0,790	Acceptable reliability
Construct 17 : User control and freedom	D.5 - D.8	None	4,01	0,65	0,898	Good
Construct 18 : Consistency and standards	D.9 - D.12	None	4,21	0,65	0,954	Good
Construct 19 : Error prevention	D.13 - D.17	None	3,64	0,9	0,921	Good
Construct 19 : Recognition	D.18 - D.21	None	3,98	0,68	0,899	Good
Construct 20 : Flexibility	D.22 - D.25	None	4,12	0,76	0,901	Good
Construct 21 : Aesthetics	D.26 - D.28	D.26	4,1	0,7	0,894	Good
Construct 22 : Help and documentation	D.29 - D.32	None	3,46	1,11	0,995	Good
Construct 23 :	E.1 - E.4	None	4	0,68	0,897	Good

Variables	Items	Items left out	Mean	SD	Cronbach	Reliability
Aesthetic visual appeal						
Construct 24 : Overall experience	E.5 - E.13	None	4,2	0,6	0,954	Good
Construct 25 : Personalisation	E.14 - E.15	None	4,14	0,98	0,8779	Good
Construct 26 : Service quality	E.16 - E.17	None	3,94	1,06	0,923	Good
Construct 27: Cross-platform	E.18 - E.20	E.18, E.19	4,43	0,65	0,536	Unacceptable reliability

Cronbach's Alpha was used on B14.1 - B14.5 to determine reliability (questions measuring the same construct). Table 6.12 reflects the reliability estimates for the responses to "*eModeration requirements*" which were 0,8795 α, and indicate good reliability. Because of the good reliability and significance (Figure 6.17) it can be concluded that eModeration requirements should form part of the design of the User Experience Evaluation Framework for eModeration. The mean of the construct "*eModeration requirements*" was 3,944 with a standard deviation of 0,878. This means that the eModeration requirements scores ranged around Agree (4). The reliability of the questions concerning positive development, faster process, fewer people involved, and whether the internet infrastructure would be able to handle eModeration were also determined as being acceptable with the entire set evaluated at 0,8795 α (values above 0.8). Individual Cronbach's Alpha values for B14.1 - B14.5 indicate good reliability for each because the values are greater than 0,8 (see Appendix M).

The reliability estimates were 0,8612 α for the responses to "*effectiveness*", which indicated good reliability. Because the measurement indicated good reliability it could be used in determining whether the construct should be included in the User Experience Evaluation Framework for eModeration. The mean of the construct "*effectiveness*" (C37 - C40) was 3,931 with a standard deviation of 0,803. This means that the effectiveness scores ranged from Neutral to Strongly Agree. The reliability of whether the constructs measured would enable participants to moderate the modules effectively, whether the eModerate system would use less time for moderation compared to manual moderation and whether the website allowed access to the documents needed to complete the moderation task was also acceptable (see Table 6.12).

The reliability estimates were 0,7081 α for the responses to "*efficiency*", which indicated acceptable reliability. Because the reliability was acceptable it was concluded that efficiency should be part of the User Experience Evaluation Framework for eModeration. The mean of the construct "*efficiency*" (C41 - C45) was 4,145 with a standard deviation of 0,637. This means that the efficiency scores ranged from Agree to Strongly Agree. The reliability of the construct concerning whether participants were able to be more productive, whether eModeration would require less time spent moderating, and use less resources was also found to be acceptable (see Table 6.12).

Reliability estimates were 0,7841 α for the responses to "*Satisfaction*", which indicated acceptable reliability. The mean of the construct "*Satisfaction*" (C54 - C57) was 3,794 with a standard deviation of 0,726. This means that the satisfaction scores ranged from Neutral to Agree. Furthermore the construct score for "*Satisfaction*" was also calculated by taking the average of the items, for example Satisfaction score = (C54+C55+C56+C57)/4 (3,794). The reliability of whether the system would shorten the time spent completing the entire moderation process compared to the time spent on manual paper-based moderation processes was also acceptable as was the reliability for whether the eModerate system's internet resource requirement was a consideration and both were added to the Requirements level. The reliability of the email generated by the eModerate system after assessments had been uploaded was regarded as sufficient notice for the process to continue and was also added to the process requirement. The reliability of the construct measuring the respondent's satisfaction level with the eModerate system process, security, as well as quick response time to uploading or downloading of documents was also tested (see Table 6.12).

The overall Cronbach's Alpha value for reliability was interpreted according to criteria in Section 4.10. Only four constructs evaluated as acceptable reliability, C.33 – C.36 Utility (0,682), C.41 –C.45 Efficiency of resource usage (0,78), C.46 – C50 Learnability (0,723) and D.1 – D.4 Visibility of system status (0,79). Only C.51- C.53 Security (0,309) and E.18 – E.20 Cross platform were interpreted with an unacceptable reliability. It does however not make sense to remove cross platform, because one can not predict which platform the eModerator or manager will be using and security are also very important in eModeration. The overall Cronbach Alpha value confirms that the individual items of a dimension measured the same dimension or concept/s consistently. Estimates of internal consistency exceeded 0,8 and have been reported in Table 6.12 also see Appendix M for a detailed Cronbach's Alpha value per construct and individual items indicating good reliability.

The next section explains the data analysis process and statistical analysis techniques that were used in the study after the constructs were found to be reliable. Single scores for each construct was determined by calculating the average of the individual items – Factor-based scores. If the mean score was towards one a low frequency and a score towards five indicated a high frequency. Variables were also tested for normality using ANOVA which require the distribution of the variable (scores) that will be analysed to be normal. The p-value from the Shapiro-Wilk test larger than 0.01 indicated normality at a 99% level of confidence (to test the deviations from normality a strict cut-off of 0.01 was used).

Assumptions for statistical techniques were tested and satisfied. In cases where it was not satisfied, the normality was lacking and non-parametric tests were employed.

6.4.2 Section A: Biographical data

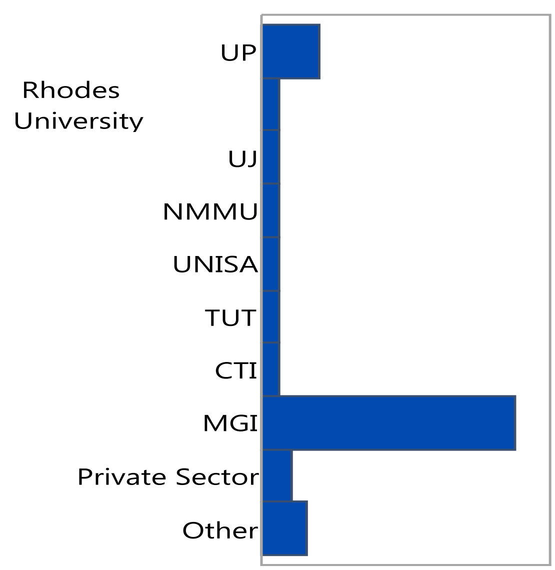
This section provides information on the response rate from all of the questionnaires with reference to the sample population of the study and biographical information of the users. As mentioned previously, the survey was distributed to 75 eModerators and five deans. A total of 30 eModerators out of the 75 (40%) responded and participated. Four deans completed the questionnaire. One of the deans did not participate. Refer to Appendix H that reflects the results of Section A of the questionnaire on biographical information in more detail to contribute to the reliability of data collection.

The participants were asked to indicate whether they had a related Information Technology qualification. A total of 10 (30%) out of the 34 participants had this qualification, while 24 (70%) of the 34 did not. The age of the participants ranged from 25

- 55+. Four ranges were used: 25 - 34, 35 - 44, 45 - 54 and 55+. The mean for the age distribution was 3,1764, standard deviation 1,0580 and standard error mean 0,181. The majority of participants were in the age range of 25 - 44. The majority of moderators were female. A total of 23,5% of the sample were male while 76,5% of the respondents who completed the questionnaire were female. It is important to mention that the participants were not expert evaluators in terms of user experience. The profile of eModerators and deans ranged from lecturers, senior lecturers, professors, full professors and industry experts, employed by either private or public higher education institutions with an age range between 25 – 44. Table 6.13 shows the respondents' institutions of employment.

Table 6.13 Institutions respondents were working for

Institution	**Count**
UP	4
Rhodes University	1
UJ	1
NMMU	1
UNISA	1
TUT	1
CTI	1
MGI	18
Private Sector	2
Other	3
Total	33
Not responding	1



Section A also asked the participants to indicate their perceived level of computer literacy in order to determine if computer literacy had an influence on the user's experience. Four levels of competency were identified:

- Document management: word processing, spread sheets, presentations, and emailing

- Internet usage: browsing, blogging, social media, banking, eCommerce
- Educational technologies: eLearn, mLearn and eModerate
- Programming technologies: IT professional

The participants had to rate their own level of competency against the following Likert scale: beginner, indecisive, intermediate or advanced. See Appendix H Table H.1 for more results from Section A of the questionnaire. The following results from level one (questions A10.1 to A10.4) focus on how the participants rated their competency in document management:

- Word processors — intermediate 38%, while 63% perceived themselves as advanced users;
- Spread sheets — intermediate 63%, while 32% perceived themselves as advanced users;
- Presentations (e.g. PowerPoint) — intermediate 38%, while 63% perceived themselves as advanced users;
- Emailing — intermediate 35%, while 63% perceived themselves as advanced email users.

Level two (A.10.5 - A.10.9) focused on the users' perception of their computer literacy regarding internet usage as well as the reasons that they were using the internet (see Table H.2 in Appendix H):

- Browsing — intermediate 47%, while 53% of participants perceived their browsing skills as advanced;
- Blogging — 20% of participants were not using blogs, 26% were beginning to blog, 23% considered themselves as intermediate and 6% advanced (3% did not answer);
- Social media — 8% were not using social media, 15% viewed themselves as beginners, 18% were indecisive, 38% intermediate and 21% were advanced users.

- Internet banking — 3% were not using internet banking, 3% were indecisive, 32% were intermediate and 62% perceived themselves as advanced internet banking users;
- eCommerce — 21% of users were not using the internet to purchase products, 16% perceived themselves as beginners in the area of eCommerce, 21% were indecisive, 24% were intermediate and 18% were advanced eCommerce users.

Level three focused on the participants' perception of educational technologies such as (see Table H.3 in Appendix H):

- eLearn — 3% were not using eLearn, 3% were beginners, 18% were indecisive, while 50% were intermediate users and 24% were advanced users of eLearn systems (3% did not respond). A large number of participants were working at institutions such as UNISA, UP and MGI which used eLearn systems. This may have contributed to the participants' familiarity with eLearn.
- mLearn — 29% of users were not using mLearn, 9% were beginners, 32% were indecisive, 18% were intermediate and only 6% were advanced mLearn users (6% did not respond).
- eModeration — 3% were not using eModeration.

Level four was included in order to determine how many users were IT professionals in programming. A total of 21 people indicated that they were not IT programming literate. Only 6% of the population were advanced IT professionals in programming (see Table H.4 in Appendix H). Based on this it can be concluded that users were not familiar with mLearn.

Questions about computer literacy formed part of the questionnaire and were used to identify possible contrast between the user's computer literacy and the use and or adoption of eModeration across different faculties. The findings revealed that the participants irrespective of faculty perceived themselves as advanced users in the area of document management, browsing of internet and eLearn educational technology, which can then also be associated with their adoption of eModeration. The profile of an eModeration user should include at least an intermediate level of competency in document management, internet and eLearn use.

In the design of the questionnaire attention was paid to asking questions regarding the participants' internet usage, access, size (limited, unlimited, etc.), mediums that they would use and the speed of their connection. These factors could play an important role in their user experience when working with an eModerate system. The outcomes of these questions would also determine the influence that the different areas of internet would have on the users' experience of eModeration systems and whether the internet factors should be included in an evaluation framework for eModeration.

Questions based on internet usage required participants to indicate what they use the internet for, such as, browsing for information, e.g. academic articles, online shopping, internet banking, forums, social media, eModeration, eLearn, search engines or other. Appendix H includes five Tables (H.5 to H.9) indicating the participants' responses to questions concerning internet use, after which more statistical analysis follows to determine the impact that the users' internet access has on their user experience of an eModerate system. It was observed that participants used the internet for forums (32%), social media (15%) and different search engines (34%). Only a total of 3 (9%) indicated that they used the internet for eModeration. This suggested that eModeration was an unfamiliar area for the participants. A total of 88% of the participants said that they were using the internet for other purposes that were not listed in the questionnaire, but did not indicate what they were using the internet for(see Table H.5 in Appendix H). No one responded to "other".

Question A12 asked participants where they usually accessed the internet from to complete the task of eModeration, for example: work, home, on the move, internet café, university or other. As indicated in Appendix H, Table H.6, 7 (21%) users accessed the internet from home, 9 (26%) on the move and 24 (71%) at university. The majority of participants were working at higher education institutions as shown in Table 6.9 and these participants preferred accessing the eModerate system while on campus. Based on the biographical information it can be said that the participants interpreted the question as "I am accessing internet from the University network not seen as work". It can also be concluded that some of the users preferred to complete the task of eModeration while on the move.

For this study, it was important to find out where the participants were accessing the internet from, as well as the size of the internet connection (see Table H.7 in Appendix H). The researcher wanted to determine if the internet size would have an impact on the users' user experience while involved in eModeration. The p-value from the Kruskall-Wallis test is more than 0.05 (*p=0.0805*) indicating no significant difference between the mean ranks of the size of internet use when considering satisfaction (at a 95% level of confidence see Table J2 in Appendix J for data). Of the participants, 20 users had unlimited access to internet at work, 18 users had limited access at home and 21 users had limited access on the move. The users were not always aware of the size of the internet at the institution at which they worked, which resulted in 23 users being unable to answer this question.

Part of the questions concerning the internet examined what technology the users used to access the internet, for example, devices such as cell phones, laptops, desktop PCs or tablets using 3G, ADSL, wireless broadband or other. Table H.8 in Appendix H reflects the relationship between hardware and the medium of internet access. When users were connecting via cell phones they were using 3G (19), when using laptops they used ADSL (13) or wireless (18) connections to the internet. The responses showed that the majority of participants preferred to use laptops. If they used desktops, ADSL connections were used. Users also indicated that they used 3G, ADSL and wireless connections when using their tablets. Kindles were not the preferred instrument on which to download the PDF examination scripts.

The participants were asked to rate the speed of their own internet connection as this could influence their user experience when using an eModeration system. Table H.8 in Appendix H indicates that if users used their mobile devices the internet speed was medium. Very few participants experienced their internet speed as being very fast. It can be concluded that in order to complete the eModeration task internet is indeed needed and should form part of the User Experience Evaluation Framework for eModeration in order to ensure user experience.

The findings of Section A of the questionnaire was used in identifying the scope of the application domain (environment) which included users and the organisation relevant to the design of the artifact (see Table 6.11). This in turn reflects the first of the three Design Science Research areas (Environment, IS Research and Knowledge Base, see Figure 4.8). Where the Environment includes: people. Organisation and technology. The users were either eModerators and or managers working at private or public higher education institutions with an odd eModerator(s) working in industry. The findings from Section A were used to contribute to the Environment and the eModeration Requirements levels of the designed artifact. The two identified constructs included under the Environment level were users (eModerators, managers or deans) and the organisation(s), which were higher education institutions. The identified constructs included in the eModeration Requirements level were related to internet infrastructure.

The participants' perceptions of the use, access, size of internet as well as how and where they accessed the internet from also contributed to the eModeration Requirements level from a technical side. As previously discussed in the guidelines (see Section 2.4) users needed the internet in order to perform eModeration. For example, eModerator should have appropriate secure internet access to eModerate system and ICT support when needed (Salmon, 2013). The findings from Section A indicated that the users had internet access with sufficient bandwidth using different devices. These findings partially contributed to the eModeration Requirements level constructs. Under the eModeration Requirements level network infrastructure, eModeration devices and eModeration technology were identified as constructs as a result of questions asked in Section A of the questionnaire.

6.4.3 Section B: Moderation

Section B covered more than the migration from manual paper-based moderation to eModeration but also the perceptions of the change. Section B was completed by moderators in order to determine their experience of the migration from manual paper-based moderation to eModeration. Questions that were relevant to managers and moderators were included in the managers' interviews to determine their perception regarding the use of electronic moderation systems rather than manual paper-based moderation. Section B was separated into two parts, the first part concentrated on the manual paper-based moderation and the second part on the eModeration. If the participant have not done manual paper-based moderation they did not complete the first part of Section B not influencing the data.

In Question B.1 moderators indicated whether they had done moderation in the past using the traditional method of moderating examination scripts (manual paper-based). A total of 27 (90%) of the 30 moderators indicated that they had been involved in the traditional way of moderating examination scripts compared to the 17 (57%) out of the 30 (B.6) moderators who had used eModeration in a virtual learning environment. For 13 moderators, eModeration was a new experience.

Table 6.14 reflects how many times moderators had used manual paper-based (B.2) and eModeration systems (B.7). A total of 13 (43%) moderators had previously been involved in manual paper-based moderation compared to 16 (53%) eModerators who had used eModeration for the first time during this study. This indicates that eModeration is still not widely used.

Table 6.14 Number of times moderators used manual paper-based or eModeration

Number of times moderators used manual paper-based or eModeration						
Item reflecting number of participants	**Zero**	**Once**	**Twice**	**Three**	**Four**	**Five or more**
B.2 Manual paper-based moderation	4	2	6	3	2	13
B.7 eModeration	2	16	4	1	2	5

Furthermore, moderators had to indicate how many modules they had moderated using the two different methods — manual paper-based moderation versus eModeration. The findings are shown in Table 6.15. The highest numbers can be found under the categories one-to-two and three-to-four modules per person using manual paper-based moderation compared to 16 users who had been using eModeration for one-to-two modules. Seven of the moderators indicated that they had not used eModeration before. Six of the moderators indicated that they had never moderated before.

Table 6.15 Number of modules moderated

	Number of modules being moderated					
Item	**0**	**1-2**	**3-4**	**5-6**	**7-8**	**9-10**
B.3 Manual paper-based moderation	6	9	9	3	1	2
B.8 eModeration	7	16	5			1

The moderators also had to indicate the number of scripts that they had moderated using either manual paper-based or eModeration systems. As explained in the sampling strategy, modules across levels one (first year) to four were selected, taking into consideration whether these were theoretical examinations or practical examinations or both, as well as the size (number of students) of the module. For example, Business Management 1 was chosen because of the size of the module in order to determine whether the number of scripts would have an impact on the user's experience of using eModeration. The majority of modules had 10 to 20 scripts on average that were selected for the moderation sample as indicated in Table 6.16. Only modules with large numbers of students such as Business English and Business Management had 50 or more scripts selected for moderation. In order to evaluate an eModeration system it is important to take into account the number of scripts that are to be moderated. The system should be able to handle more than 20 scripts and it should not take users too long to upload or download these scripts, otherwise this may have a negative impact on their user experience of such systems.

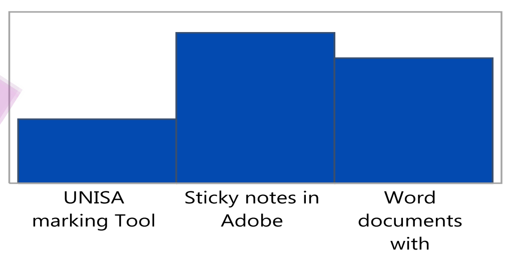
Table 6.16 Number of scripts moderated on average

	Number of scripts per module on average					
Item	**0-10**	**11-20**	**21-30**	**41-50**	**51-more**	**N missing**
B.4 Manual paper-based moderation	7	11	3	2	5	2
B.9 eModeration	7	16	5		1	1

Questions B.10.1 - B.10.3 asked the moderators to indicate whether they had been using the system during the June or November examinations for either semester or year modules. The survey was conducted during both the June and November examination sessions. Moderators who received scripts only during the November examinations were required to complete the survey after the November examination session.

In question B.11 participants had to indicate which instrument they used to electronically moderate the scripts. When the moderators' login details were provided to them, a user manual was distributed as well. The manual contained information regarding the process of eModeration and how they should navigate through the system. Moderators were given the choice of using either the UNISA online marking tool, Adobe sticky notes or a Word document to indicate changes and recommendations on examination scripts. Table 6.17 reflects which features moderators used to complete the task of moderation and provides an indication of how many moderators made use of each instrument.

Table 6.17 Features used to moderate electronically

Item	Number		Usage representation
UNISA online marking tool	5	19%	
Sticky notes in Adobe	12	44%	
Word documents with comments	10	37%	
Total		27	
Missing		3	

Most of the participants, 44%, used sticky notes in Adobe to comment on the electronic documents compared to the 37% who used a Word document to record comments and recommendations. Only 19% used the UNISA online marking tool. It is likely that the moderators who used this marking tool probably worked at UNISA or had the tool installed on their machine. A limitation of the free marking tool is that the user must have Adobe Professional which requires a license. Other marking tools were also available but were not tested as part of this study. It can be concluded that the 44% of users who used Sticky notes were likely to be users who were still new to the method of using online or electronic marking tools, but were quite comfortable with the use of sticky notes in Adobe.

Using a Likert scale, questions B.14.1 - B.14.5 asked participants to provide their opinion on the change over from manual paper-based to use of eModeration:

- Is it a positive development?
- Is the process faster?
- Do you agree that fewer people are needed in eModeration?
- Will your internet infrastructure be able to handle eModeration?
- Is the process easier?

These five questions were included in the interviews with the deans to determine how they perceived the use of eModeration from a managerial perspective. The responses from the deans (management) will be compared with the eModerators reponses in Section 6.4.7.

The rest of Section B was completed only by eModerators therefore N = 30. These five questions were also used to determine the constructs required under the Requirements level of the framework. The following descriptive statistics such as frequency, means and standard deviations using fitted normal parameter estimates and goodness of fit test (Shapiro-Wilk W test), and factor-based score; where methods used in the analysis to confirm the significance of constructs identified in questions B14.1 - B14.5 (see Section 4.10 for more detail on each test).

Based on the responses, the eModerators felt the following way about eModeration:

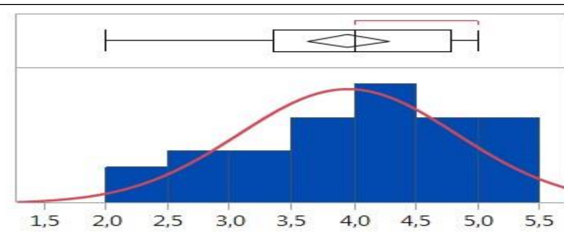
- Participants agreed that eModeration was a positive development: four (13%) neutral, 12 (40%) agreed, 13 (44%) strongly agreed and only one (3%) disagreed.
- Participants also agreed that the eModeration process was faster. Ten (33%) agreed and 11 (38%) strongly agreed. It is no longer necessary for moderators to wait for examination scripts to be delivered or collected, the moderator can download and upload examination scripts to the eModerate site at any time or place.

- Moderators were of the opinion that fewer people were required for eModeration than in the manual paper-based moderation system. A total of ten (33%) agreed and ten (33%) strongly agreed with the statement that fewer people would be needed in the eModeration process.
- Participants also indicated whether their internet infrastructure was able to handle eModeration, a total of 14 (47%) agreed and ten (33%) strongly agreed. The responses to the question concerning Internet infrastructure correlated with the participants' responses to questions about the internet in Section A of the questionnaire, which were also positive.
- Participants were asked to indicate if they perceived the process as being easier. Only one participant strongly disagreed while five (17%) were neutral, ten (34%) agreed and ten (34%) strongly agreed that the process was definitely easier.

Further descriptive statistical values that reflect the percentage scores for B14.1 - B14.5 elaborating on the change over from manual paper-based to eModeration as can be found in Appendix I (see Table I.1).

According to the responses to questions B14.1 - B14.5 results indicated that the eModerators perceived the use of eModeration systems as a positive development, that the process was faster and easier, fewer people were needed and that it was not as resource intensive with respect to internet use as was expected by the users. Therefore there was overall satisfaction with the user experience of the eModeration. The term "eModeration requirement" was used here to reflect B14.1 - B14.5: change over from manual paper-based to eModeration positive development, process faster and easier, fewer people needed and internet infrastructure can handle eModeration. Table 6.18 reflects the responses to the questions on change over from manual paper-based to eModeration descriptive statistical values for B14.1 - B14.5 factor-based score, standard deviations, fitted normal parameter estimates and goodness of fit test (Shapiro-Wilk W test). This means that moderation requirements scores ranged between Neutral to Strongly Agree, with a mean = 3,944 and p-value ($p=0,044$) which is statistically significant with a normal distribution.

Table 6.18 Change over from manual paper-based to eModeration descriptive statistics

Reliability B.14.1-B.14.5 eModeration requirement						
Construct	**Mean**	**SD**	**Std error mean**	**Upper 95% mean**	**Lower 95% mean**	**Reliability**
eModeration requirements	3,944	0,878	0,1603	4,723	3,616	N = 30 Good
Fitted normal						
Parameter estimates						
Type		**Parameter**	**Estimate**	**Lower 95%**		**Upper 95%**
Location		μ	3,944444	3,6165238		4,272365
Dispersion		σ	0,878187	0,6993946		1,1805608
-2log(Likelihood) = 76,3426026022063						
Goodness of fit test	W	Prob<W				
Shapiro-Wilk W Test	0,9283	0,0443*	Normal(3,94444,0,87819) distribution			
Note: Ho = The data is from the Normal distribution. Small p-values reject Ho						

Responses to Section B contributed to determining the constructs for the eModeration system's Requirements level of the artifact and the eModeration User Experience level of the framework (see 6.5.2).

As mentioned previously, moderators had to indicate which types of devices they used to complete the eModeration task. Moderators also had to indicate the advantages of eModeration, as well as the advantages of eModeration compared to the manual paper-based. The findings from the questions asked in Section B were then triangulated with those from the related interview question results from the deans to determine the application domain (eModeration) and eModeration requirements needed for a user experience evaluation framework for eModeration. The findings concerned with the eModeration process and procedures were used to identify the Requirements level constructs (see Table 6.11).

Section A of the questionnaire (see 6.5.1) and Section B of the questionnaire (see 6.5.2) were used as the basis for identification of relevant constructs to contribute to the first two levels of the User Experience Evaluation Framework for eModeration, namely Environment and eModeration Requirements levels as depicted in the User Experience Evaluation Framework for eModeration (see Table 6.11). Table 6.19 reflects a mapping between the constructs identified during the first evaluation where constructs were abstracted by the researcher from the literature (see initial conceptual framework Section 6.2) and the second evaluation, a survey conducted to determine which user experience constructs were applicable and/or relevant for the evaluation of eModeration systems.

Table 6.19 Mapping between the literature and the survey results

Level	Construct	Literature conceptual framework	Survey — Questionnaire Sections A-E	Included or removed from initial conceptual framework
Environment	**Users** roles, responsibilities	✓	✓ A and B	✓ Include
	Organisation Higher education institutions	✓	✓ A	✓ Include
Requirements	**Process** Access, uploading or downloading	✓	✓ A and B	✓ Include
	Procedure eModerate, feedback	✓	✓ B	✓ Include
	eModeration Internet infrastructure, service quality, support, security	✓	✓ A and B	✓ Include

Level	Construct	Literature conceptual framework	Survey — Questionnaire Sections A-E	Included or removed from initial conceptual framework
	eModeration Devices	✓	✓ A	✓ Include
	eModeration Technology	✓	✓ A	✓ Include

After completing Section B of the questionnaire, participants were given instructions to login to the eModerate system. After logging in they had to complete Section C.

6.4.4 Section C: Usability attributes and design heuristics

Participants completed Section C which focused on measuring usability attributes and design heuristics. Both eModerators and deans had to complete Sections C to E. Three steps needed to be completed before participants answered the first set of questions (C1 - C7):

- Go to the URL provided by the eLearn developer
- Login with unique login and password
- Navigate to module to be moderated

Questions 1 to 7 in Section C had to be completed before the participant could follow the next set of instructions and download the scripts. After downloading the scripts, users answered questions 8 to 12 after which they were asked to rate the usability of the system in questions 13 to 59. The results were then used to determine which usability constructs were relevant for eModeration (see Appendix J for results from Section C).

The first set of questions focused on users' responses to accessing the system, ease of access, security, process, functionality and satisfaction with the information provided to complete the task. A total of 19 (56%) agreed and 13 (38%) strongly agreed that accessing the eModerate page was easy. The participants also agreed that security was adequate: 15 (45%) agreed and 13 (33%) strongly agreed. Respondents were also in agreement that the content or information provided on the login page of the system was satisfactory: 8 (24%) neutral, 13 (38%) agreed and 10 (29%) strongly agreed. In general the respondents also had a favorable experience with the process of eModeration especially with the login into a secure environment: 18 (53%) agreed and 11 (32%) strongly agreed. It can be concluded from C1 - C7 that the following constructs should form part of the framework: navigation, security, process, content (satisfaction with information).

Analysis was done to confirm or reject the significance and reliability of constructs identified. The following statistical analysis methods were used in questions C.13 - C.58 (see Section 4.10 for more details on each test):

- descriptive statistics such as frequency, means and standard deviations using fitted normal parameter estimates and goodness of fit test (Shapiro-Wilk W test), factor-based score; where the means of each construct in sequence were added together and divided by the number of items (see Table 6.19 - Table 6.22) to determine significance of construct to confirm or reject inclusion,
- Non-parametric Wilcoxon rank sum test (Kruskall Wallis) where C37 - C40 effectiveness were ranked against E21.8 effective, C41 - C45 efficiency ranked against E21.8 effective, C54 - C57 ranked against A9 how long has the user been an internet user, A13.1 Work: size of internet connection, A13.2 Home: size of internet connection, A15.1 Work: speed of internet connection and A15.2 Home: speed of internet connection, etc., to confirm the user experience constructs and attributes. If the construct score was not normally distributed the non-parametric Wilcoxon rank sum test was used (see Table J.2 in Appendix J).

After eModerators logged into the system, they had to navigate their way to the module pages and download the scripts to be moderated. The eModerators then had to moderate the scripts before answering the second set of questions in Section C (C8 - C12). The second set of questions focused on the respondent’s experience of the eModeration system’s usability qualities such as page layout, ease of downloading and uploading of examination scripts, security of pages and functionality of completing eModeration using an eModeration system. Users experienced the page layout as satisfactory: 18 (56%)

agreed, while 7 (22%) strongly agreed. Users also found it easy to source information (navigation) about downloading or uploading examination scripts: 17 (53%) agreed and 7 (22%) strongly agreed. Users perceived the information provided to moderate the examination scripts as satisfactory: 19 (59%) agreed and 6 (19%) strongly agreed. The users were in agreement that the security was satisfactory on the login page but also on the module pages: 20 (63%) agreed and 9 (28%) strongly agreed. From questions C8 - 12 it was concluded that page layout and navigation, content (information provided) and security were constructs that should form part of a user experience evaluation framework for eModeration.

The third part of Section C focused on determining which usability goals were relevant to the User Experience Evaluation Framework for eModeration. For example, C.13 - C.16 focused on the communication of the intended message, C.17 - C.20 on page display information architecture, C.21 - C.24 on site wide navigation, C.25 - C.28 on contextual navigation, C.29 - C.32 on the value of the information provided, C.33 - C.36 utility, C.37 - C.40 effectiveness, C.41 - C.45 efficiency of resources, C.46 - C.50 learnability, C.51 - C.53 security, C.54 - C.57 satisfaction and C.55 - C.59 context. Responses to Section C contributed to the Requirements level and User Experience level of the framework. Appendix J (see Table J.1) reflects the individual data scores for questions C.1 - C.59 together with the reliability of the scale (consisting of constructs). Table 6.20 reflects the means and standard deviation of the usability constructs where N represents the number of participants: N = 34. Constructs with means higher than, or equal to, three were added to the framework.

Table 6.20 Usability constructs

Variables: usability constructs	**Mean**	**Std Dev**
C.1 - C.7 Login page	4,13	0,71
C.8 - C.12 Module page	3,97	0,65
C.13 - C16 Communicate intended message	4,14	0,63

Variables: usability constructs	Mean	Std Dev
C.17 - C.20 Page display and information architecture	3,98	0,66
C.21 - C.24 Site wide navigation	4,01	0,73
C.25 - C.28 Contextual navigation	4,04	0,66
C.29 - C.33 Value of information provided	3,99	0,85
C.33 - C.36 Utility	4,05	0,73
C.37 - C.40 Effectiveness	3,93	0,80
C.41 - C.45 Efficiency of resource usage	4,15	0,64
C.46 - C.50 Learnability	3,81	0,81
C.51 - C.53 Security	3,66	0,65
C.54 - C.57 Satisfaction	3,79	0,73
C.58 - C.59 Context	4,09	0,68

Learnability with respect to eModeration is not the same as learnability on eCommerce sites or mHealth websites (see Section 3.4.) which are used on a regular basis. According to the description of learnability in Section 3.2.1 learnability relates to how easily a user can accomplish a task the first time that he or she interacts with the design. Although the mean for learnability was above three, it was not included in the framework. It should not be a requirement for users to spend time learning how to use the system, especially if a manual on how to use the system is provided. The navigation of the eModerate system should be structured in such a way that it is easy enough to recognise what to do and where to go. Participants indicated that it was easy enough to recognise how to navigate through the pages: 17 (50%) agreed and 7 (21%) strongly agreed.

Figure 6.6 reflects the means of the usability constructs as identified in Table 6.20. All the user experience constructs that were added to the framework were expressed in terms of mean values above three. The only usability construct that was not added to the framework was learnability. Based on the findings indicated in Table J.1 (see Appendix

J) and Table 6.20, which were drawn from Section C of the questionnaire, the constructs of the "*overall experience, content, navigation, effectiveness, efficiency, satisfaction and context*" were added to the framework's User Experience level as instrumental qualities. The first three qualities: login page, module page and communication of intended message were added to the Requirements level indicated by the first oval in Figure 6.6. The user must have a positive user experience right from the initial steps in eModeration, for example, easy access to the eModerate pages with appropriate information communicated to the eModerator to complete the task. The next three qualities, page display information architecture, site wide navigation and contextual navigation were categorised under "*navigation*" in the framework (see second oval in Figure 6.6). The values for the information provided were grouped under the instrumental quality content (see third oval in Figure 6.6). Utility refers to the product's functionality to assist the user with what they want to do to carry out their tasks, for example, uploading and downloading examination scripts when using an eModerate system (see Table 6.7 and Table 6.8). Utility was categorised under the Requirements level "*process*" (to access the system and to upload and download examination scripts). Figure 6.6 demonstrates the distribution of the means of the usability constructs as assessed in Section C of the questionnaire, it does not reflect all of the usability constructs that were tested. The remaining constructs were added under the User Experience level's instrumental qualities.

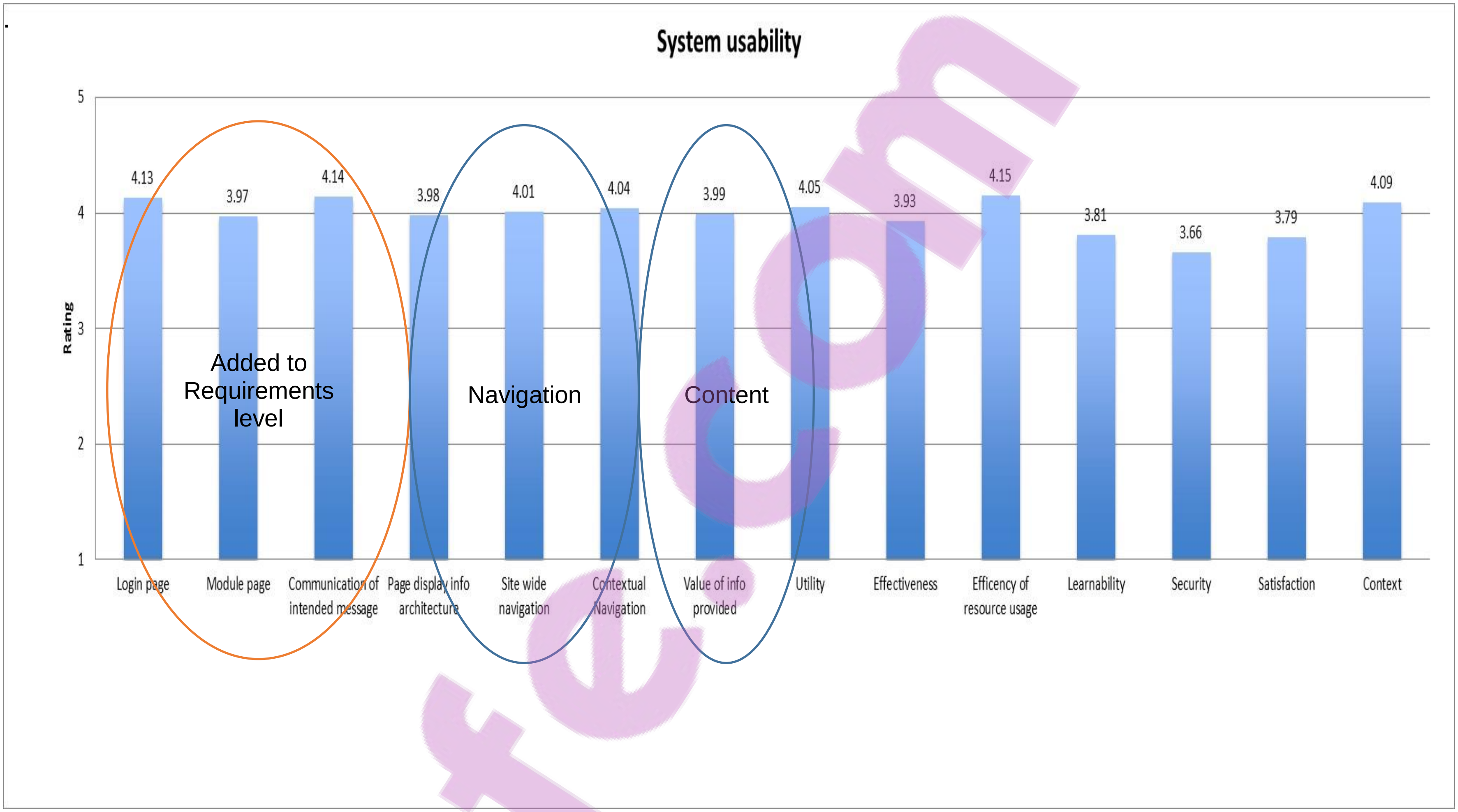


Figure 6.6 Usability constructs related to the evaluation of an eModeration system

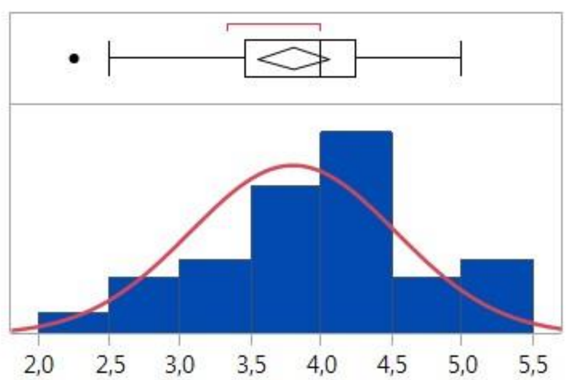
Table 6.21 reflects the descriptive statistical values for C37 - C40 "*effectiveness*", factor-based score, standard deviations, fitted normal parameter estimates and goodness of fit test (Shapiro-Wilk W test). The mean of construct "*effectiveness*" was 3,9313 with a standard deviation of 0,803. This means that effectiveness scores ranged between Neutral to Agree (4), with a p-value (*p=0,0101*) that was statistically significant with a normal distribution also the reason why effectiveness forms part of the framework.

Table 6.21 Fitted norm and goodness of test for effectiveness

C37 - C40 Effectiveness						
Construct	**Mean**	**Std Dev**	**Std error mean**	**Upper 95% mean**	**Lower 95% mean**	**Reliability**
Effectiveness	3,9313	0,8039	0,1379	4,2119	3,6509	N = 34 Good
Fitted normal						
Parameter estimates						

Type	**Parameter**	**Estimate**	**Lower 95%**	**Upper 95%**
Location	μ	3,9313725	3,6508815	4,2118636
Dispersion	σ	0,8038917	0,6484002	1,0581447
-2log(Likelihood) = 80,6440494175608				

Goodness of fit test	**W**	**Prob<W**
Shapiro-Wilk W Test	0,912642	0,0101*

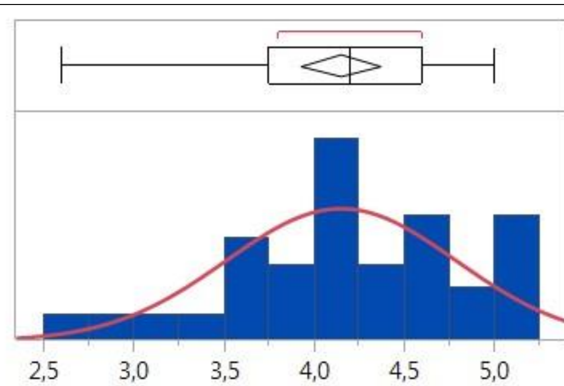


Normal(3,93137,0,80389) distribution

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho

The mean of the construct "*Efficiency of resource usage*" was 4,1455 with a standard deviation of 0,6372. This means that the efficiency of resource usage scores ranged around Agree (4), with a p-value (*p=0,079*) which indicated no statistical significance (see Table 6.22).

Table 6.22 Fitted norm and goodness of fit test for efficiency of resource usage

<table>
<tr><td colspan="7">C.41-C.45 Efficiency of resource usage</td></tr>
<tr><td>Construct</td><td>Mean</td><td>Std Dev</td><td>Std error mean</td><td>Upper 95% mean</td><td>Lower 95% mean</td><td>Reliability</td></tr>
<tr><td>Efficiency of resource usage</td><td>4,1455</td><td>0,6372</td><td>0,1093</td><td>4,3679</td><td>3,9232</td><td>N = 34
Acceptable</td></tr>
<tr><td colspan="7">Fitted normal</td></tr>
<tr><td colspan="7">Parameter estimates</td></tr>
<tr><td colspan="2">Type</td><td>Parameter</td><td>Estimate</td><td>Lower 95%</td><td colspan="2">Upper 95%</td></tr>
<tr><td colspan="2">Location</td><td>μ</td><td>4,1455882</td><td>3,9232333</td><td colspan="2">4,3679431</td></tr>
<tr><td colspan="2">Dispersion</td><td>σ</td><td>0,6372726</td><td>0,5140091</td><td colspan="2">0,8388277</td></tr>
<tr><td colspan="7">-2log(Likelihood) = 64,8498870638045</td></tr>
<tr><td>Goodness of fit test</td><td>W</td><td>Prob<W</td><td colspan="4" rowspan="2">
Normal(4,14559,0,63727)</td></tr>
<tr><td>Shapiro-Wilk W Test</td><td>0,943778</td><td>0,0799*</td></tr>
<tr><td colspan="7">Note: Ho = The data is from the Normal distribution. Small p-values reject Ho</td></tr>
</table>

The mean of the construct "*satisfaction*" was 3,794 with a standard deviation of 0,726. This means that the satisfaction ranged just below Agree (4), with a p-value (*p=0,1738*) which indicated no statistical significance (see Table 6.23).

Table 6.23 Fitted norm and goodness of test for satisfaction

C.54-C.57 Satisfaction

Construct	**Mean**	**Std Dev**	**Std error mean**	**Upper 95% mean**	**Lower 95% mean**	**Reliability**
Satisfaction	3,7941	0,7262	0,1246	4,0475	3,5407	N = 34 Acceptable

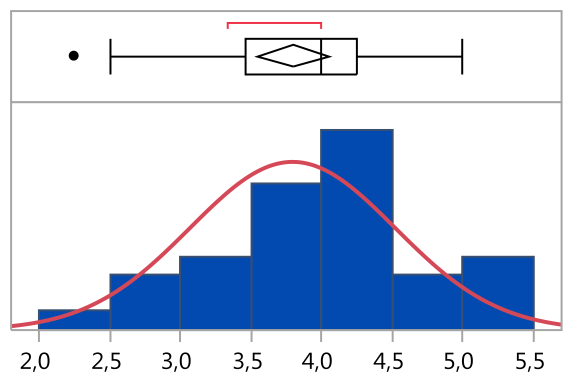
Fitted normal

Parameter estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	3,7941176	3,540713	4,0475223
Dispersion	σ	0,7262616	0,5857856	0,955962

-2log(Likelihood) = 73,7383616653566

Goodness of fit test	**W**	**Prob<W**
Shapiro-Wilk W Test	0,955048	0,1738*



Normal(3,79412,0,72626) distribution

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho

Section C of the questionnaire was used to confirm or reject the constructs, and to determine the role of usability in the design heuristics of the user experience of eModeration.

The participants in the research were required to answer a number of questions about their internet access in order to determine if any link existed between the users of the eModerate system (that were interdependent) and their user experience. Section A of the questionnaire reflected the results concerning the questions about participants' internet use. Further tests such as the non-parametric Wilcoxon rank sum were performed to determine one-way analysis between C.54 - C.57 “*Satisfaction*” and A.13.1 “*Work: What is the size of your internet connection?*” as reflected in Table J.2 in Appendix J. The non-parametric test was used when the construct score was not normally distributed. In this study the Wilcoxon rank-sum test was used as the data was not distributed normally in two groups or categories. The Kruskall-Wallis test was used in the other categories with more than two groups or categories. The p-value from the Kruskall-Wallis test was more than 0,05 (0,0805) which indicated no significant difference between the mean ranks of the size of the internet use when considering satisfaction (at a 95% level of confidence). Therefore it was concluded that there was no significant difference between the size of internet use and level of satisfaction.

Similar tests were conducted on user satisfaction with regards to internet, size of connection, speed of internet, speed of connection, etc.

6.4.5 Section D: Usability interface design

Section D of the questionnaire focused on the general interface design heuristics criteria in order to determine the user experience, which in turn contributed to the technical eModeration requirement level and Design Science Research environmental area. Table 6.24 indicates that the users perceived the freedom that they had while using the system as very important. See Appendix K, Table K.1 for more details on the results from Section D of the questionnaire.

Table 6.24 Usability interface design heuristics constructs

Variables: usability interface design heuristics constructs	**Mean**	**Std Dev**
D.1 - D.4 Visibility of system status	4,00	0,62
D.5 - D.8 User control and freedom	4,1	0,65
D.9 - D.12 Consistency and standards	4,21	0,65
D.13 - D.17 Error prevention	3,64	0,9
D.18 - D.21 Recognition	3,98	0,68

Variables: usability interface design heuristics constructs	Mean	Std Dev
D.22 - D.25 Flexibility	4,12	0,76
D.26 - D.28 Aesthetics	4,1	0,7
D.29 - D.32 Help and documentation	3,46	1,11

Participants identified user control and the freedom over the process of uploading and downloading, navigation and the logout button on each page as positive with a mean of 4,1. The flexibility that the system (mean of 4,12) includes such as clear instructions, logical flow of instructions, an upload process that is efficient, relevance of information provided, and the freedom to use the system at any time allowed user flexibility. The consistency and standards applied throughout the pages also contributed to a satisfactory user experience with a mean of 4,21. Participants also agreed that it was important that the system should adequately show a user's status within the eModeration process, users should know at all times where they are and the faculty, module and links should be clearly marked at all stages of the eModeration process (the mean was 4). The aesthetics of the system were rated as 4,1. Participants indicated that it was important to have error prevention as well as a "*help and documentation*" set up for good user experience.

Figure 6.7 reflects the means for the usability interface design constructs as identified in Table 6.24 with more detail provided in Table K.1 (see Appendix K). All of the usability interface design constructs provided in Table 6.24 had a mean above three. Based on the findings of Table 6.24 three constructs from the help and documentation, aesthetics, flexibility, recognition, error prevention, consistency, control of freedom, and visibility of system status were added to the framework's User Experience level as instrumental qualities. Figure 6.7 demonstrates the distribution of the means from the usability interface design constructs as assessed in Section D of the questionnaire.

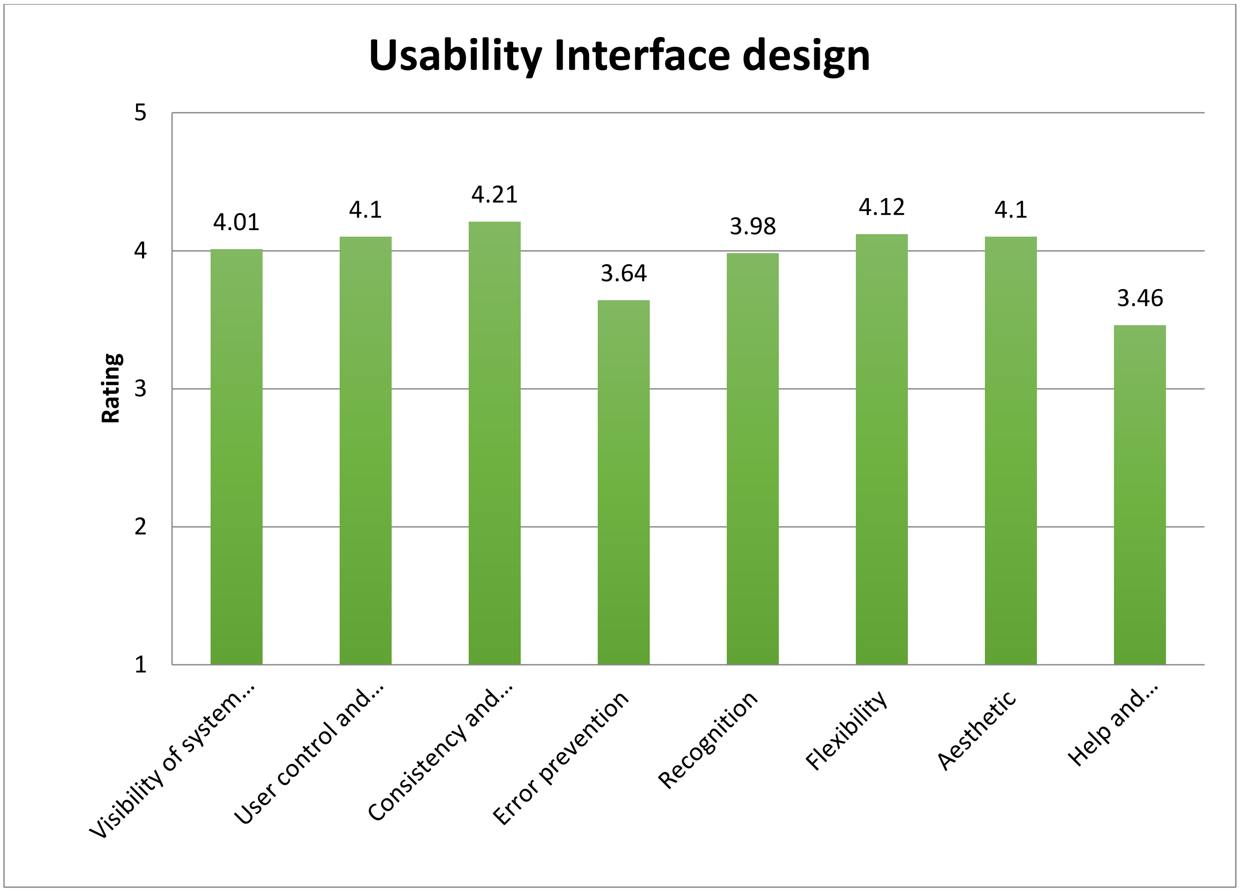


Figure 6.7 Usability interface design constructs

The findings confirmed that the eModerators also agreed that the system was flexible and efficient when in use. It was concluded that the Environment and Requirements levels contributed to the user experience. This was demonstrated in the findings which reflected the success of the User Experience level of the User Experience Evaluation Framework for eModeration and was also supported by literature from Roto (2006), and Hassenzahl and Tractinsky (2006).

6.4.6 Section E: User experience constructs

Section E was used to ask questions about the user experience constructs in order to determine which of these constructs would contribute towards ensuring a satisfactory user experience for users in the domain of eModeration. The users' perception of instrumental qualities (objective – usability) and the users' perception of the non-instrumental qualities (subjective – user experience constructs) would also have an impact on the user experience evaluation criteria. Table 6.25 reflects only the means and standard deviations of the user experience constructs, for more detailed data see Appendix L, Table L.1.

Table 6.25 User experience constructs

Variables: user experience constructs	Mean	Std Dev
E.1-E.4 Aesthetic visual appeal	4	0,68
E.5-E.13 Overall experience	4,12	0,6
E.14-E.15 Personalisation	4,14	0,99
E.16-E.17 Service quality	3,94	1,06
E.18-E.20 Cross-platform	4,43	0,65

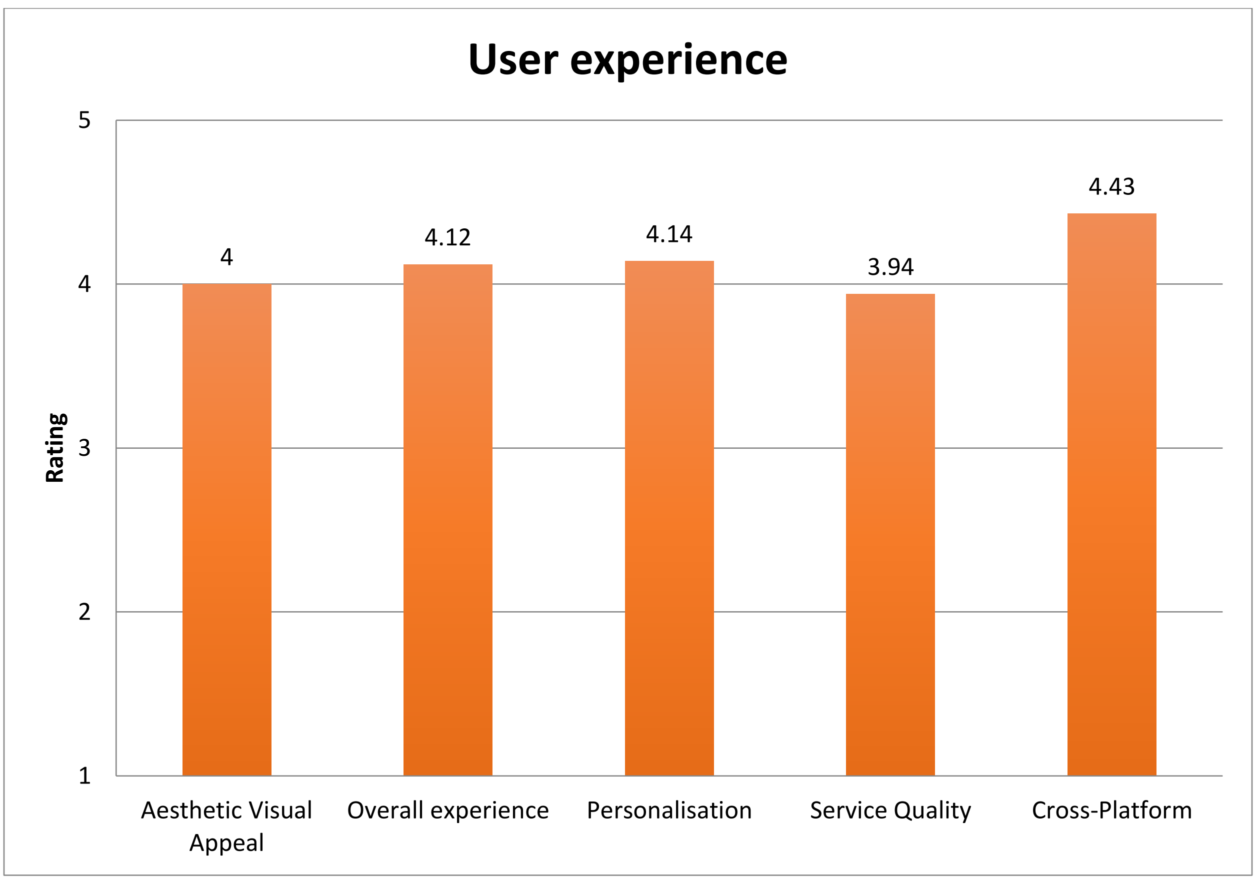


Figure 6.8 Identified User Experience Constructs

It is clear from the findings, as shown in Figure 6.8, that the means of the user experience constructs as identified in Table 6.25 were all above three. All of the constructs were added to the framework under the User Experience level. Based on the results presented in Table 6.25 and Table L.1 (see Appendix L), the constructs of cross-platform, service quality, personalisation, overall experience and aesthetic visual appeal were added to the framework's User Experience level. It is important to note that the system should allow users to access the content across platforms using different devices. It was also important to the users that service quality would be considered as a construct in the design of the artifact.

Another set of questions E21.1 - E21.11 required the participants to provide their overall perception of questions asked in B14.1 - B14.5. These items were included in the questionnaire as a verification measure to validate the responses of participants to the user experience constructs. Non-parametric Wilcoxon rank sum test (Kruskall Wallis) where B14.1 - B14.5 were ranked against E21.1 - E21.11 individually, for example, B14.1 - B14.5 to E21.1 easy to use, then B14.1 - B14.5 to E21.2 enjoyable, etc., to confirm the user experience constructs and attributes. If the construct score was not normally distributed the non-parametric Wilcoxon rank sum test was used (see Table 6.26).

Table 6.26 eModeration requirements non-parametric Kruskall-Wallis test scores

Items B14.1 - B14.5 compared to:	1-way Test	Chi-Square	Approximation p>ChiSq	Analysis: statistically significant or not
E21.1 Easy to use	5,1807	1	0,0228	Significant
E21.2 Enjoyable	2,8694	1	0,0903	No significance
E21.3 Appealing	1,5203	1	0,2176	No significance
E21.4 Useful	0,0468	1	0,8278	No significance
E21.5 Comprehensive	0,6954	1	0,4043	No significance
E21.6 Friendly	3,5562	1	0,0593	No significance
E21.7 Engaging	0,6615	1	0,4160	No significance
E21.8 Effective	11,6813	1	0,0006	Significant
E21.9 Pleasing	1,9318	1	0,164	No significance

Items B14.1 - B14.5 compared to:	1-way Test	Chi-Square	Approximation p>ChiSq	Analysis: statistically significant or not
E21.10 Sense of achievement	0,7396	1	0,389	No significance
E21.11 Functional	0,1997	1	0,6550	No significance

Questions B14.1 - B14.5 eModeration requirements were analysed utilising the non-parametric Kruskall-Wallis test together with questions E21.1 - E21.11 because data was not normally distributed. Data concerning the construct of eModeration was also captured in Section E where the deans and the eModerators were requested to select the relevant UX constructs related to eModeration. Table 6.26 reflects the items: B14.1 - B14.5 eModeration requirements and E21.1 - E21.11, one-way Anova Test, Chi-Square and Approximation scores. This was done in order to triangulate the data on eModeration requirements and to determine statistical significance. The p-values from the Kruskall-Wallis test, which were more than 0.05 indicate no significant difference between the mean ranks of B14.1 - B14.5 and respective constructs E21.1 - E21.11 (at a 95% level of confidence) as indicated in Table 6.26 with the exception of two cases. This analysis revealed a significant difference between eModeration requirements (B14.1 - B14.5) and easy to use (E21.1 *p=0,0228*) and effective (E21.8 *p=0,0006*), where the p-values were less than 5 percent the constructs were statistically significant. This analysis revealed no significant difference between eModeration requirements and the following constructs as the p-values were greater than five percent: enjoyable, appealing, useful, comprehensive, friendly, engaging, pleasing, sense of achievement and functionality. Table I.2 in Appendix I represents the data analysis from the One-way analysis, Tukey Kramer and Kruskall-Wallis test for B.14.1 - B.14.5 by E.21.1 Easy to use with significant values.

Table 6.27 reflects the distribution of positive user experience attributes identified by the participants. It can be concluded that participants found the use of eModeration easy, useful, effective and functional, but not enjoyable, appealing, comprehensive, friendly, engaging and pleasing. This is understandable since the system is designed for a work related task and not for entertainment.

Table 6.27 The distribution of positive user experience attributes identified by participants.

Variable	Items Construct	No	Yes	Mean	Std Dev	Std err mean	Upper 95% mean	Lower 95% mean	N
E 21.1	Easy to use	3 (10%)	27 (90%)	0,2059	0,4104	0,0704	0,3491	0,0626	30
E 21.2	Enjoyable	27 (79%)	7 (21%)	0,2059	0,4104	0,0704	0,3491	0,0626	34
E 21.3	Appealing	23 (68%)	11 (32%)	0,3235	0,4749	0,0815	0,4892	0,1578	34
E 21.4	Useful	12 (35%)	22 (65%)	0,6471	0,4851	0,0831	0,8163	0,4779	34
E 21.5	Comprehensive	28 (82%)	6 (18%)	0,1765	0,3869	0,0664	0,3115	0,0415	34
E 21.6	Friendly	25 (74%)	9 (26%)	0,2647	0,4478	0,0768	0,4209	0,1085	34
E 21.7	Engaging	27 (79%)	7 (21%)	0,2059	0,4104	0,0704	0,3491	0,0627	34
E 21.8	Effective	12 (35%)	22 (65%)	0,6471	0,4851	0,0832	0,8163	0,4778	34
E 21.9	Pleasing	31 (91%)	3 (9%)	0,0882	0,2879	0,0494	0,1887	0,0122	34
E 21.10	Sense of achievement	28 (82%)	6 (18%)	0,1765	0,3870	0,0664	0,3115	0,0415	34
E 21.11	Functional	12 (35%)	18 (65%)	0,6471	0,4851	0,0832	0,8163	0,4778	34

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Table 6.28 reflects some of the negative attributes of the user experience that were identified by the participants. Some of the participants perceived the process to be time consuming; they felt uncertain with respect to the new environment and how to complete the task, as well as overwhelmed by the eModerate system.

Table 6.28 Distribution of negative attributes of user experience

Variable	**Items** **Construct**	**No**	**Yes**	**N**
E 22.1	Uncertainty	28 (82%)	6 (18%)	34
E.22.2	Frustrating	28 (82%)	6 (18%)	34
E.22.3	Time consuming	22 (65%)	12 (35%)	34
E.22.4	Overwhelming	28 (82%)	6 (18%)	34
E.22.5	Irritating	32 (94%)	2 (6%)	34
E.22.6	Ineffective	33 (97%)	1 (3%)	34
E.22.7	Not functional	33 (97%)	1 (3%)	34

Figure 6.9 provides the overall rating of the eModeration user experience constructs.

Figure 6.9 Overall ratings of eModeration user experience constructs

In the literature review, the eModeration User Experience level was classified using three categories: usability goals, design heuristics to determine user experience and user experience heuristics. However, the researcher decided to use the following two categories — instrumental and non-instrumental qualities. Instrumental qualities included usability goals and design heuristics considerations and non-instrumental qualities included user experience constructs as discussed in Section 3.2.4. Hassenzahl and Tractinsky (2006), Mahlke and Thüring (2007) and Wimmer, Wöckl, Leitner and Tscheligi (2010) also recommended the use of instrumental and non-instrumental aspects or qualities when evaluating user experience. Table 6.29 depicts all of the user experience constructs that were included as well as the ones that were removed from the framework after participants had completed Sections C, D and E of the questionnaire (see column on the right hand side).

Table 6.29 Summary of constructs in artifact after evaluation and iteration two

Level	Construct	Literature conceptual framework	Survey — Questionnaire Sections A-E	Included or removed from initial conceptual framework
Environment	**Users** roles, responsibilities	✓	✓ A and B	✓ Include
	Organisation Higher Education Institutions	✓	✓ A	✓ Include
Requirements	**Process** Access, uploading or downloading	✓	✓ A and B	✓ Include
	Procedure eModerate, feedback	✓	✓ B	✓ Include
	eModeration Internet infrastructure, service quality, support, security	✓	✓ A, B and C	✓ Include
	eModeration Devices	✓	✓ A	✓ Include
	eModeration Technology	✓	✓ A	✓ Include

Level	Construct		Literature conceptual framework	Survey — Questionnaire Sections A-E	Included or removed from initial conceptual framework
eModeration user experience	Instrumental qualities	Navigation	✓	✓ A, C	✓ Include
		Effectiveness	✓	✓ C, E	✓ Include
		Efficiency	✓	✓ C	✓ Include
		Satisfaction	✓	✓ C	✓ Include
		Context	✓	✓ C	✓ Include
		Content	✓	✓ C	✓ Include
		Visibility of system	✓	✓ C, D	✓ Include
		Error prevention	✓	✓ D	✓ Include
		User control	✓	✓	✓ Include
		Page display	✓	✓ C, D	✓ Include
		Utility	✓	✓ C	✓ Include
		Language	✓	No	Removed
		Learnability	✓	✓ C	Removed
		Memorability	✓	No	Removed
		Consistency	✓	✓ C	✓ Include
		Recognition	✓	✓ D	✓ Include
		Flexibility	✓	✓ D	✓ Include
		Aesthetic design	✓	✓ D, E	✓ Include
		Help documentation	✓	✓ D	✓ Include
	Non-instrumental qualities	Overall experience	✓	✓ E	✓ Include
		Source quality	✓	✓ E	✓ Include
		Personalisation	✓	✓ E	✓ Include
		Cross-platform	✓	✓ E	✓ Include
		Context aware services	✓	✓ C	✓ Include

It is important to mention that the deans were not user experience professionals, therefore, the constructs abstracted from the interviews needed to be matched to the user experience constructs. For example, the constructs of usefulness mentioned by the deans related to effectiveness in user experience terms.

6.4.7 Interviews with deans

The next section reports on the interviews with the deans during iteration and evaluation two which were done in order to determine how they perceived the use of an eModerate system to complete the task of moderation instead of using a manual paper-based moderation system. As mentioned previously the deans were interviewed and had to complete the same survey as the one given to the eModerators. The only difference was that the deans did not complete Section B of the questionnaire.

The first section of the interview asked for some biographical information from the deans, for example which faculty they belonged to and their gender. All of the faculties, Commerce, Creative Arts and Social Science, with the exception of Science, had female deans.

Section B of the interview focused on the deans' use of the eModerate system. The deans were asked to indicate where they would access the eModerate system from, whether they had used eModeration before, and then to rate their changeover from manual paper-based moderation to eModeration.

The deans also had to indicate how many modules in the faculty made use of eModeration and which method the moderators used to moderate the papers, i.e. sticky notes, UNISA online marking tool or Word document.

Section C focused on open-ended questions.

The researcher explained the user experience constructs to the deans before asking them for their initial impression of the eModerate system, for example, likes, dislikes, graphical intensity, navigation, process flow, ease of use, usefulness.

The deans were then asked whether they felt that anything had been omitted on the eModerate pages. The purpose of this question was to determine what the requirements would be for proper navigation, and effective process flow and if the design of the eModerate page could be used as a standard guide for other eModerate systems.

The deans then had to respond to questions about the functionality of the system.

It was important that the process that was followed during eModeration was acceptable. The deans were asked if, from a managerial perspective, they agreed with the process being used in eModeration. The results indicated that the deans were of the opinion that an eModerate system could be used.

For any system to function optimally it is necessary to use people. The deans had to indicate, from a managerial point of view, if they agreed with the role players who were involved in eModeration and if they would add, change or remove people from the process followed in eModeration.

The last question asked the deans to voice their opinion on the changeover from manual paper-based moderation to eModeration. Table 6.30 indicates the constructs abstracted from the interviews with the deans.

Table 6.30 Constructs abstracted from the interviews with the deans

Faculty	**Constructs identified based on quotes and comments from the deans**
	Usefulness associated with design heuristics to determine user experience
Commerce	I think it is a very useful system.
Social Science	Concern however, on graphical intensity of the moderator’s green pen, it is difficult to see on screen, maybe a different colour pen should be used.
Science	Potential to be useful. Less chance to misplace examination scripts.
Creative Arts	It is a very useful system, especially the page layout that is clear, and it is quick to find what is needed.
	Usability of the system
Commerce	I think ePortal and the eModeration page colour is consistent with each other making it very usable.
Creative Arts	The fact that multiple documents can be up-/downloaded makes it a very usable system.
	Ease of use
Social Science	Moderation sending off is easier than manual courier system.
Science	Did not know anything about it and was initially afraid.
	Learnability
Commerce	Clear, easy to understand.
Creative Arts	Page layouts are clear and easy to understand.

Faculty	Constructs identified based on quotes and comments from the deans
	Flow of information
Commerce	Nice flow to process.
Creative Arts	Positive about the fact that you are in control of what is happening in the process and of where information is at what time.
	Efficiency
Social Science	Very impressed with the conduct and speed. Not time consuming.
Science	Should make the moderation process quicker.
Creative Arts	It saves time.
	Process control
Commerce	It made my life easier, it was easier to keep in contact with moderator. It was easier to see how far the moderator is with the moderation process, because I received an email telling me that the moderator uploaded. It is more controllable. A track of the process improved the whole moderation process.
Social Science	More control over bigger packs.
Science	Like to see what moderator is doing; both moderator and dean see the same view which makes it easier to assist with queries.
Creative Arts	The control over the moderation process and moderators empowered the dean with a feeling of being more in control of process. A challenge will, however, be for people to change the way they work — being more software savvy.

Table 6.31 reflects the deans' perceptions of their experience of the changeover from manual paper-based moderation to eModeration. The majority of the deans (three out of four) agreed that eModeration was a positive development and that the process was faster and easier. The deans also agreed that fewer people were needed in the process of eModeration (one out of four strongly agreed and two out of four agreed). Deans also agreed that the internet infrastructure was able to handle the eModerate system. In the qualitative section a positive comment was made about how advantageous it was that the actual examination script cannot get lost or stolen during transportation. The only problem identified by a dean when using eModerate systems is that users sometimes do not know what is required of them or they do not read the instructions carefully and therefore print the scripts and moderate these manually before uploading again.

Table 6.31 Deans' perception of changeover from manual paper-based moderation to eModeration

Statement	**Findings**
It is a positive development.	Three deans strongly agreed and one agreed.
The process is faster. The process is easier.	For both questions the deans responded as follows: Two deans strongly agreed and one agreed.
Fewer people will be involved.	One dean strongly agreed and two deans agreed. One dean was neutral.
My internet infrastructure is able to handle the eModerate system.	Two deans strongly agreed and one neither agreed nor disagreed.
Other, describe other positive comparisons.	One dean commented that the chance of scripts being lost was less likely.
Other, describe other negative comparisons.	One dean complained that the moderators had not followed instructions.

Table 6.32 compares the experiences of the deans and the eModerators during the changeover from manual paper-based moderation to eModeration. The majority of the deans (three out of four) and the eModerators (13 out of 30) agreed that eModeration was a positive development and that the process was faster and easier. Deans and eModerators also agreed that fewer people were needed in eModeration than in manual paper-based moderation. It can be concluded that both deans and eModerators agreed that the constructs identified in Sections B14.1 - B14.5 of the questionnaire should form part of the framework.

Table 6.32 Deans' perception of changeover from manual paper-based moderation to eModeration versus that of eModerators

Question	**Respondent**	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
14.1 It is a positive development	EModerators	1(13%)		4(13%)	12(40%)	13(44%)
	Deans				1(25%)	3(75%)
14.2 The process is faster	Emoderators		4(13%)	4(13%)	10(33%)	10(33%)
	Deans				2(50%)	2(50%)
14.3 Fewer people needed	Emoderators	2(7%)	1(3%)	7(23%)	10(33%)	10(33%)
	Deans			1(25%)	2(50%)	1(25%)
14.4 Internet can handle eModeration	Emoderators 29	1(3%)	2(7%)	2(7%)	14(48%)	10(34%)
	Deans			1(25%)	1(25%)	2(50%)
14.5 Process easier	Emoderators 29	1(3%)	3(10%)	5(17%)	10(34%)	10(34%)
	Deans				2(50%)	3(50%)

Table 6.30, Table 6.31 and Table 6.32 reflects the themes which emerged after the interviews with the deans had taken place such as the process being faster, the process being easier as well as the people involved in the process. Deans from the faculties were asked to comment on their initial impression of the eModerate page/(s) (graphic intensity, likes and dislikes). Management perceived the use of an eModerate system as a useful tool for completing the task of moderation. Two managers also commented on how it was easier to use an eModerate system than a manual paper-based system. Managers were of the opinion that it was easy to understand and use an eModerate system. Management also appreciated that they had more control over the flow of information because they could track where and when eModerators logged in and follow up. Managers also received notifications when the eModerator had uploaded the completed work. All of the managers agreed and commented on the process and control, for example "*It made my life easier, it was easier to keep in contact with moderator, it was easier to see how far the moderator is with the moderation process, because I received an email telling me that the moderator uploaded. It is more controllable. A track of the process improved the whole moderation process".* Less time was required to complete the process of moderation because when the eModerator had completed the moderation, files could be immediately uploaded onto the system instead of the eModerator waiting for a driver to collect the scripts. For example the following comments were made: "*Very impressed with the conduct and speed*", "*Should make the moderation process quicker*".

The deans from the Social Science and Commerce faculties did not experience any problems with either the usability or the user experience of the system. Three of the deans indicated that they accessed the eModerate system from their work stations with only one dean accessing the system from home. Therefore there was a need to determine how and from where respondents would want to access the system. An observation from the interviewees was that the bandwidth of the user machine might have a direct impact on the user's experience of eModeration.

None of the deans in this study had previously used an eModerate system. The data obtained from the interview with the deans indicated that the move from a manual paper-based approach to eModeration was perceived as a positive development; the process was faster and fewer people would be required and involved in the moderation process.

Interviews were recorded and transcribed afterwards. Themes were identified and abstracted from the responses. The deans were not user experience experts, therefore, the constructs were abstracted and then matched to user experience constructs. For example the construct "*usefulness*" as described by the deans relates to "*effectiveness*" in user experience terminology.

To conclude, the deans of the faculties were in agreement that a user experience evaluation framework was advantageous and that the process was acceptable, effective and efficient. The findings from the questionnaire corroborated the themes identified in the qualitative data, namely satisfaction, effective and efficient. However, a challenge faced by some of the deans was to convince moderators to adapt to eModeration. This meant that they should not print the examination scripts, but rather use technology such as electronic marking tools to moderate.

The quantitative results from eModerators (reflected in Section 6.4.2 to 6.4.7) were used to confirm the themes identified during the interviews with the deans. This process of triangulation contributed elements to the Environment and Requirements levels of the User Experience Evaluation Framework for eModeration such as users, organisation, process, procedure, devices and technology needed to ensure satisfactory user experience. In retrospect, these constructs correlated with the literature review where the system, context and user were discussed. With respect to the system, the deans agreed that the functionality, namely the workflow process was faster, which was then captured in the evaluation framework as part of the eModeration process and procedure.

The deans also agreed that the infrastructure, devices and technology used were important constructs in the Requirements level. The usability goals relevant to eModeration such as effectiveness, efficiency and freedom of control emerged from the interviews as user experience constructs. The usability goals relevant to eModeration were confirmed by findings from the analysis of quantitative data gathered from eModerators and added to the eModerate user experience level. This will be discussed in the next section.

6.5 Discussion of findings from case study at MGI

This study aims to determine what user experience evaluation framework can be used to evaluate the user experience of an eModerate system. In Chapter Two eModeration was defined and explained while Chapter Three investigated existing frameworks, defined user experience and mapped user experience to eModeration. For the purposes of this study, user experience was defined in Section 3.2.4 as a concept where the end user is placed at the focal point of design and development, instead of the system alone or its aesthetic value, and where user experience is made up of usability, context, system and the user's internal state. Evaluation criteria were extracted from the literature review, and used to guide the design and development of the initial theoretical conceptual framework in Section 6.2. The framework was used as a basis for the design and development of the evaluation instrument in Section 6.3.

According to Zimmerman (2008) and Mahlke (2008), the user experience evaluation approach should be based on non-instrumental qualities, emotion and effect. Findings based on studies done by Hassenzahl and Monk (2010), and Väänänen-Vainio-Mattila and Wäljas (2010) made use of the principles of user experience heuristics which were used in this research. Section 6.3 focused on the design of the survey and interview questions. Section 6.4 focused on the refinement of the initial conceptual framework after having conducted the survey and interviews.

Evaluations and iterations one and two set out to answer the main research question and sub-questions one and two:

What is an appropriate framework for measuring the user experience of an eModeration system?

1. What would be the most important user experience constructs for the electronic moderation system's framework?
2. What user experience frameworks already exist in literature which are relevant for evaluating electronic moderation systems?

Section 6.5 summarised the research findings from the survey and interviews with the deans. The results of the survey and interviews can be found in Section 6.4.

In total 30 eModerators (30/75 = 40%) and 4 deans (4/5 = 80%) participated. The participants had to complete the survey designed in Section 6.3 after completing an eModeration session. The eModeration session required users to login to the eModerate system with a secure login and password that were emailed to them. The users then had to navigate their way to their module(s); download the examination pack (examination scripts, examination paper, examination memorandum, moderator's reports and result sheets); electronically moderate the scripts and upload the results onto the eModerate system. Participants then emailed the survey back to the researcher with a signed consent form acknowledging that they agreed to participate in the study and that their names or affiliation would not be published or disclosed. The findings were summarised based on the identified levels in the initial conceptual framework and set criteria from Section 6.2.1:

- Environment level
- eModeration Requirements level
- User Experience level

6.5.1 Environment level

As mentioned in Section 6.2.1.2, Chapters Two, Three and Five assisted with the identification of the Environment level needed to support eModeration within higher education institutions. Two factors were identified under the heading *Environment level* based on user experience and the Design Science Research literature (see Figure 5.1):

- **Users**: roles and responsibilities.
- **Organisation**: higher education institutions

The findings confirmed that fewer users would need to be involved in the moderation process when using eModeration compared to the traditional manual paper-based process. As explained in the eModeration guidelines in Section 2.4 and in the Research in Context (Chapter Five), the users would include managers, eModerate system operators and eModerators. The eModerate system at MGI was used as a frame of reference to determine the users' roles (see Section 5.3.1.1), responsibilities (see Section 5.3.1.2) and characteristics (see Section 5.3.1.3) as explained in Section 5.3. The roles, responsibilities and characteristics of eModeration were also defined by Salmon (2013), Morgan (2008) and Vlachopoulos (2008).

The organisations in which the User Experience Evaluation Framework for eModeration would be useful were identified and tested. These constituted private higher education institutions (see Section 5.3.2.1). Therefore private higher education institutions were added under the category organisation.

Table 6.33 illustrates the extracted evaluation criteria from findings from the designed artifact under the Environment level of the User Experience Evaluation Framework for eModeration.

Table 6.33 Environment level of the framework

Environment level	
Users	**ROLES** **Manager:** • To manage the identification of eModerators for respective modules. • To manage the information needed for eModeration by the eModeration system operator. • To manage the eModeration process and the outcomes. **eModeration system operator:** • To manage the online process, access, security and navigation. **eModerator:** • To use the eModerate system. • To moderate examination scripts electronically.
	RESPONSIBILITIES **Manager:** • To communicate a list of all of the eModerators to the eModeration system operator. • To oversee the process of eModeration. • To provide feedback to lecturers after the eModeration process has been completed. **eModeration system operator:** • To create eModerate pages for each module and assign secure access rights to eModerators. • To upload information needed for eModeration. • To handle queries from eModerators. **eModerator:** • To download scripts. • To eModerate the examination scripts electronically. • To upload the electronic scripts onto the system after eModeration.

Organisations	HIGHER EDUCATION INSTITUTION • The application domain is higher education institutions.

Table 6.33 was then used as input for the third evaluation and iteration of the study.

6.5.2 eModeration Requirements level

As discussed in Section 6.2.1.3, Chapter Five assisted with the identification of the eModeration Requirements level's constructs. Sections A and B of the questionnaire also captured and analysed the identification of constructs that would contribute towards a good user experience. The following constructs and their associated attributes were extracted from the literature and from the results:

- Process: accessing the system and uploading or downloading
- Procedure: associated with eModeration and the way in which feedback would be provided
- eModeration: network infrastructure, service quality, support, security
- Devices: types
- Technology: software

In order for any eModeration system to function successfully, the above mentioned constructs should be taken into consideration.

Table 6.34 elaborates on and discusses the eModeration requirements' constructs extracted from the literature review and supported by findings from the survey and the interview with the deans. The findings indicated that participants were looking for processes, procedures, network infrastructure, types of devices and technology that could be used to do eModeration. All afore mentioned are required for a good user experience of eModeration system implementation. Table 6.34 reflects the evaluation criteria that would be used to evaluate the requirements of any eModerate system to ensure a good user experience.

Table 6.34 eModeration Requirements level

<table>
<tr><th colspan="2">eModeration Requirements Level</th></tr>
<tr><td rowspan="2">Process</td><td>ACCESSING THE PLATFORM
To create appropriate login pages.
To create eModerate pages per module.
To assign and award secure access to the relevant people to their respective eModerate pages per module.</td></tr>
<tr><td>UP-/DOWNLOADING
To put a process in place for the uploading of examination papers, memoranda, reports and examination scripts for moderation.
To put a process in place for eModerators to upload the eModerated scripts and feedback reports.
The manager to track the process of moderation.
After eModeration is complete the manager can download the eModerator reports and provide feedback to internal examiners in the process.</td></tr>
<tr><td rowspan="2">Procedure</td><td>eModerate
To use the eModerate procedure that explains in detail the specific tasks to be executed with eModeration, for example, by whom, when and how is the procedure to be performed?
The eModerate procedure uses different users who perform specific tasks:
Managers involved in eModeration provide information to the eModeration system operator to create module pages and assign eModerators to the pages.
The eModeration system operator receives information from the manager, creates pages and users (eModerators).
eModerators involved in eModeration follow the procedure by accessing the eModerate system, downloading examination scripts, electronically moderating scripts and finally uploading scripts and moderation reports.
Managers receive notification that the eModeration task is complete and then download scripts and reports.
Managers act upon reports and provide feedback to the internal examiner.
eModeration system operator ensures continuity between users and system.</td></tr>
<tr><td>FEEDBACK
A procedure must be in place for the eModerator to provide feedback on moderation to the manager using the eModerate system.
The procedure should make provision for feedback from the manager to the internal examiner.
The system should also make provision for feedback to users on the status of the processes, i.e. the scripts have been uploaded and are ready for download and to be moderated and vice versa.</td></tr>
</table>

eModeration	**NETWORK INFRASTRUCTURE** • Ensure appropriate network infrastructure for reliable and time efficient distribution of the eModeration documentation. • Ensure appropriate access connectivity to network infrastructure. • All role players should have internet access in order for eModeration to be successful.
	SERVICE QUALITY • Ensure that the level of service provided by the eModerate system is satisfactory. • Ensure that the quality provided by eModeration is satisfactory for a good user experience. • Ensure that the user does not experience frustration when interacting with the eModeration product. • Ensure that the eModerate system is easy to navigate, user-friendly and that users can get the information that they need to complete the task. • Ensure that the eModerate system provides a two-way communication between the users.
	SUPPORT • Provide adequate support from the eModerate system operator to managers and eModerators.
	SECURITY • Ensure that the eModerate system is secure and only accessible by legitimate users of the system. • Unique logins and passwords to be created for all users. • Levels of security to be built into the system, manager to have access to all modules, eModerators should only have access to the page(s) that they eModerate.
Devices	**TYPES** • Ensure that users can access the eModeration process using different types of devices, for example, tablets, desktops or laptops of their choice as long as these are cross-platform. • Ensure adequate (reliable, acceptable performance in terms of speed) hardware and software for the use of eModeration interaction.
Technology	**SOFTWARE** • Moodle can be used as a software package. • An alternative option is Google documents. • The software should be accessible to all role players.

The eModeration requirements were also presented during the third evaluation and iteration which included the testing of the framework. The processes, policies and procedures of the organisation were taken into account along with the framework in considering the implementation of an eModerate system. If the eModeration requirements were not met as set out by the identified criteria and findings, the users might not have had a positive experience with eModeration. It was imperative that the constructs in the Environment and eModeration Requirements levels were in place before the user experience level constructs could be considered.

6.5.3 User Experience level

General user experience constructs such as a user's state of mind, context and system (Hassenzahl and Tractinsky, 2006; Roto, 2006) were identified in the literature review discussed in Chapter Three. The researcher aligned the principles of user experience with Design Science Research and eModeration as presented in Figure 5.1. The users were identified as eModerators, managers and eModerate system operators, context was associated with the organisation (private higher education institution) and the system was the environment web application — eModerate system (see Section 6.2.1.1).

Findings from Sections C, D and E in the questionnaire as well as from the interviews with the deans contributed to the instrumental and non-instrumental user experience constructs as reflected in Table 6.35. The user experience constructs could be used to evaluate the user experience of the eModeration system that the institution planned to implement. For example, if the user answered "*yes"* to the question *"When investigating or considering the navigation of the eModerate pages, is it easy and quick to navigate through pages to accomplish the task*?" then it can be agreed that navigation should be a construct in any user experience evaluation framework for eModeration.

Table 6.35 User Experience construct level

eModeration User Experience construct level	
Instrumental qualities	**NAVIGATION** • Ensure quick and easy navigation through pages to accomplish the tasks. • Ensure that users know where they are and have options for where to go next. • Ensure a balance between navigational options so as not to overwhelm the user. • Ensure that related information is placed together. • Ensure that common browser standards are followed. • Ensure that each page has all of the required navigation buttons, such as *previous* or *next* and *home*. • Terminology used should be understandable.

	EFFECTIVENESS • Ensure that eModerators can effectively moderate papers electronically using the eModerate system. • Ensure that facilities and activities are available to encourage interaction with the eModerate system. • Ensure effective access to information to complete the task. • Ensure that the users achieve their goal when using the system.
	EFFICIENCY • To ensure that a high level of productivity is maintained by users when using the eModerate system. • To ensure that the user should be able to complete the task in a shorter time frame than when using the manual paper-based method. • To ensure that the number of steps required to complete the task should be kept to a minimum. • To ensure efficient uploading notifications to all users in control of the process. • To ensure that fewer resources are required to complete the task, i.e. no transportation of examination scripts. • To minimise the effort required to complete the task of eModeration.
	SATISFACTION • Be aware that the eModerate users' satisfaction levels when interacting with the product are influenced by the product's qualities: utility, usability and visual appeal. • The satisfaction levels are influenced by stimulation during product use and quality perception by users. • Ensure that the users are satisfied with what is available on the eModerate system.
	CONTEXT • Refers to the environment in which the user operates. • Ensure that users understand that in an eModeration environment the usage context includes the aim of the product, i.e. to electronically moderate examination scripts. • Ensure that the users perceive the eModeration activity as meaningful. • Ensure that the representation is understandable and meaningful, i.e. ensure that the symbols, icons and names used are intuitive within the context of eModeration tasks. • Ensure that the context of the organisational settings does not affect the eModeration activity. • Ensure that the infrastructure, services, users and technology to be used are adequate and contribute to the interaction in context.
	CONTENT • Information provided to the users should be clear and easy to navigate when they interact with the system. • Provide appropriate, comprehensive and accurate information. • Provide content that is relevant to moderation. • Ensure that the content is structured in a way that facilitates the achievement of the users' goals.

	VISIBILITY OF SYSTEM • Ensure that the visual appeal, or aesthetics of the system, is attractive to the users of the eModerate system. • Navigation and visibility of navigation links should be clear and unambiguous. • The eModerate site should not contain irrelevant information, which could distract users as they perform their tasks. • Ensure that the eModerate system keeps the users informed about the process through constructive and appropriate feedback as they interact with the system, e.g. a message explaining how long it will take to down-/upload files. • Ensure that each page is ‘branded’ so that there is an indication as to which section it belongs to.
	ERROR PREVENTION • Ensure that users are able to easily recover from errors. • Ensure that some error prevention help functions are made available to users. • Ensure that a link to the eModerate operator is available.
	USER CONTROL • Ensure that role players have control of information as it goes through eModeration. • Ensure that managers are in control of the process of eModeration. • eModerators can also control where and when they want to complete the task. • Clearly marked ‘exit’ needs to be visible.
Non-instrumental attributes	**OVERALL EXPERIENCE** • It is important that the users’ overall interaction with the system is positive in order to contribute towards a positive user experience. • Ensure that the users’ overall experience of the system is satisfactory.
	SOURCE QUALITY • Ensure that the quality of the information required to complete the task of eModeration is accurate and complete. • Ensure that the source quality is clear, relevant, appropriate and engages role players when using the eModerate system.
	PERSONALISATION • Ensure that all of the role players can see that they are logged in. • Ensure that all of the role players can see what they have access to. • Ensure some personalisation of their eModerate page(s).
	CROSS-PLATFORM • To ensure that managers and eModerators are able to access the eModerate system using different platforms and different devices.
	CONTEXT AWARE SERVICES • The users should be made aware of the services that the eModerate system offers. • Ensure that meaningful contextual information associated with the eModerate content is provided.

It was concluded from the extracted findings and the designed User Experience Evaluation Framework for eModeration that there were similarities in user experience frameworks that were utilised in the design of the evaluation instruments (see Section 6.2). Not all of the usability goals that were identified in the initial theoretical conceptual framework (see Section 6.2.2) were included in the second evaluation and iteration. Constructs that were not considered necessary for eModeration included *page display, language, learnability and memorability*. This also applied to the design heuristics as not all user experience design heuristics that were initially identified formed part of the final artifact. For example, *recognition*, *flexibility*, and *visual appeal* were not seen as constructs that could contribute to a good user experience of eModerate systems. Figure 6.10 demonstrates the outcome after evaluation and iteration two of the Design Science Research process — the constructed artifact.

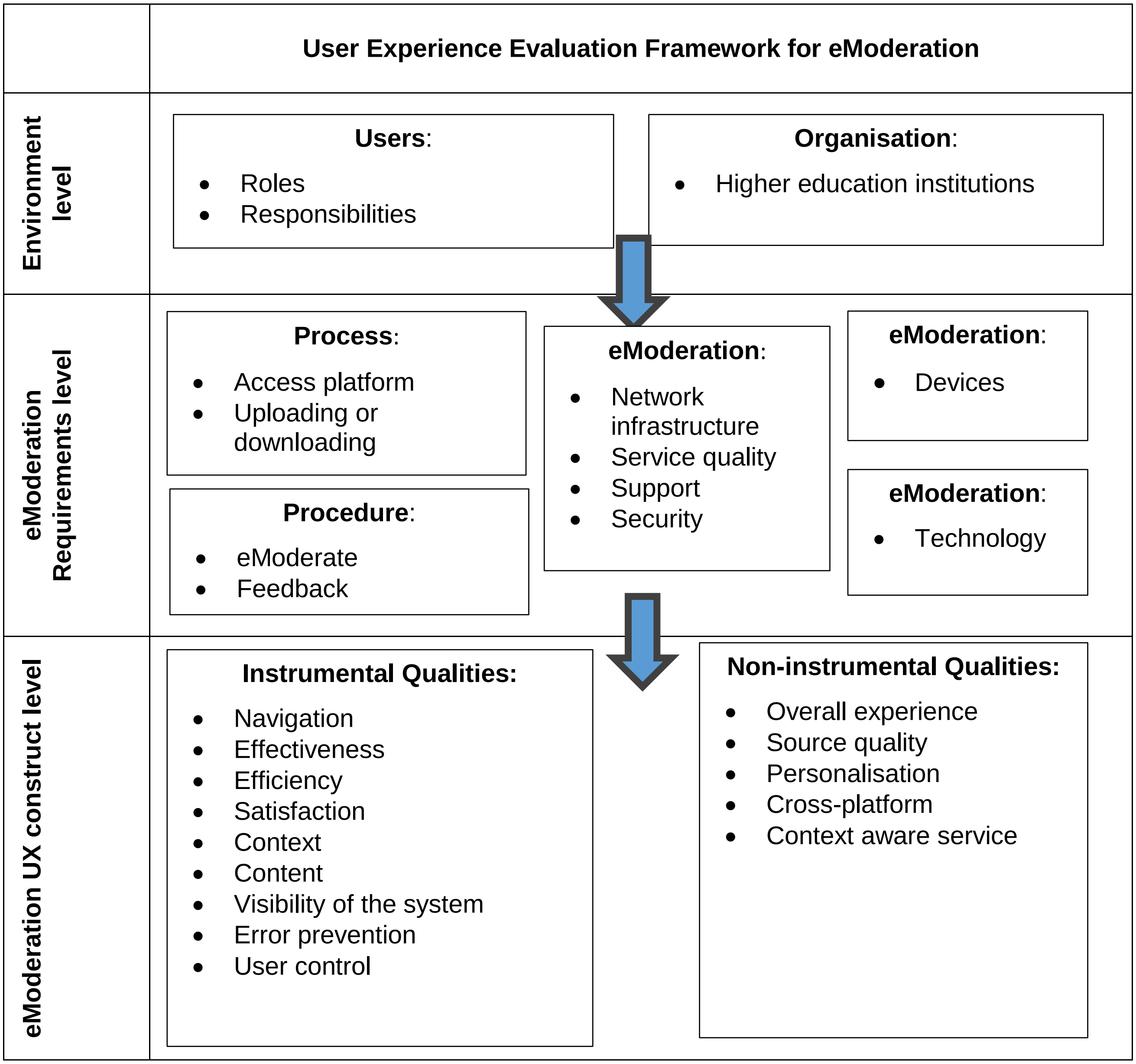


Figure 6.10 User Experience Evaluation Framework for eModeration after evaluation and iteration two

Table 6.36 summarises the constructs that formed part of the User Experience Evaluation Framework for eModeration after evaluation and iteration two. Table 6.36 includes confirmation of constructs after interviews with the deans.

Table 6.36 Summary of constructs in artifact after evaluation and iteration two

Level	Construct		Literature initial conceptual framework	Survey — Questionnaire Sections A-E	Interview deans	Included or removed from conceptual framework
Environment	**Users** roles, responsibilities		✓	✓ A and B	✓	✓ Include
	Organisation Higher Education Institutions		✓	✓ A	✓	✓ Include
Requirements	**Process** Access, uploading or downloading		✓	✓ A and B	✓	✓ Include
	Procedure eModerate, feedback		✓	✓ B	✓	✓ Include
	eModeration Internet infrastructure, service quality, support, security		✓	✓ A, B and C	✓	✓ Include
	eModeration Devices		✓	✓ A	✓	✓ Include
	eModeration Technology		✓	✓ A	✓	✓ Include
eModeration User Experience	Instrumental qualities	Navigation	✓	✓ A, C		✓ Include
		Effectiveness	✓	✓ C, E	✓	✓ Include
		Efficiency	✓	✓ C	✓	✓ Include
		Satisfaction	✓	✓ C	✓	✓ Include
		Context	✓	✓ C	✓	✓ Include
		Content	✓	✓ C	✓	✓ Include

Level	Construct		Literature initial conceptual framework	Survey — Questionnaire Sections A-E	Interview deans	Included or removed from conceptual framework
		Visibility of system	✓	✓ C, D		✓ Include
		Error prevention	✓	✓ D		✓ Include
		User control	✓	✓ D	✓	✓ Include
		Page display	✓	✓ C, D		No
		Utility	✓	✓ C		No
		Language	✓	No	No	No
		Learnability	✓	✓ C	No	No
		Memorability	✓	No	No	No
		Consistency	✓	✓ C		No
		Recognition	✓	✓ D		No
		Flexibility	✓	✓ D	√	✓ Include
		Aesthetic design	✓	✓ D, E		✓ Include
		Help documentation	✓	✓ D		✓ Include under support
	Non-instrumental qualities	Overall experience	✓	✓ E	✓	✓ Include
		Source quality	✓	✓ E	✓	✓ Include
		Personalisation	✓	✓ E		✓ Include
		Cross-platform	✓	✓ E	✓	✓ Include
		Context aware services	✓	✓ C	✓	✓ Include

A further outcome of iteration two was a refined user experience criteria tool that could be used in conjunction with the User Experience Evaluation Framework for eModeration to determine if an eModeration system would work for the organisation. See Appendix N for the refined user experience criteria tool.

After evaluation and iteration two the proposed artifact was then tested in the third evaluation and iteration of the research process. Results from the third evaluation were used to refine the framework, and evaluation criteria tool, before it was evaluated in iteration four at Monash University. The first and second evaluations and iterations of the Design Science Research process used *ex ante evaluation* to validate the design of the artifact, while iterations three and four made use of *ex post evaluations* to confirm whether or not the artifact in use was solving the problem. As mentioned in Section 4.8 *ex ante evaluations* are conducted prior to construction (Sonnenberg and Vom Brocke, 2012a).

The proposed framework contributed answers to the research question:

> *"What would the most important user experience constructs be for the electronic moderation system's framework?"*

The next section explains how the third evaluation and iteration were planned, conducted and executed in order to improve the artifact and to communicate the results.

6.6 Conclusion

Section 6.2 of Chapter Six, which forms part of Phase Two of the study (Information Systems Research: development of the Design Science Research stages) followed the design and development in Design Science Research as recommended in Section 4.7. Figure 6.11 illustrates, by means of red circles, where attention was focused during the process of developing the artifact using the survey to determine the relevance of user experience constructs in eModerate systems.

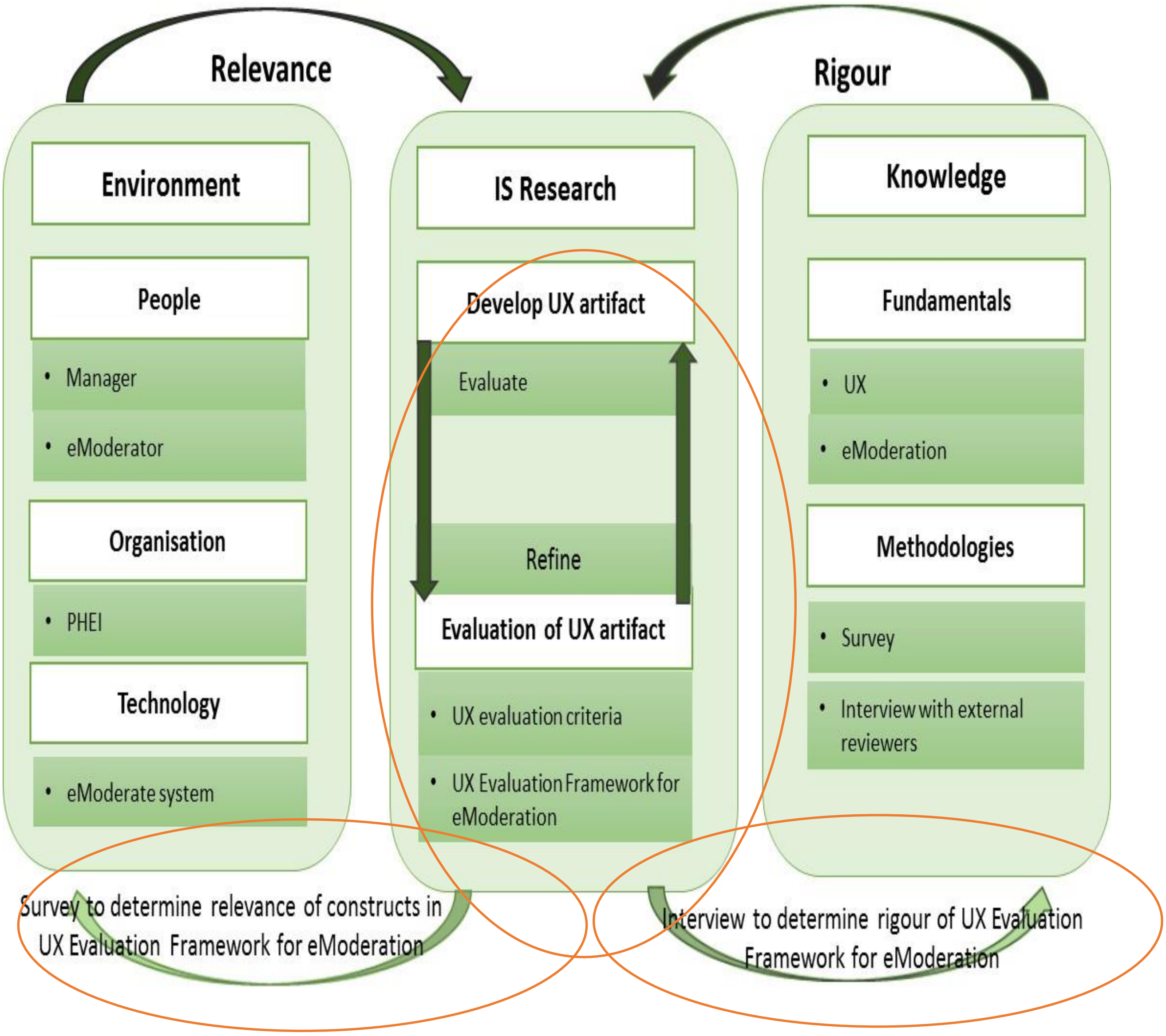


Figure 6.11 Information Systems Research artifact development

Figure 4.10 illustrated the evaluation strategies that were implemented in this study with *ex ante evaluation* forming part of Chapter Six. While Figure 4.11 was used to structure the chapters that reported on the *design and development* as well as *testing* and *evaluation* of the artifact after the identification of the problem. Chapter Six focused on the design and development of the instruments that were used to gather data (see Section 6.3) to refine the conceptual framework designed in evaluation and iteration one (see Section 6.2). The conceptual framework was designed by evaluating available knowledge (literature review). The conceptual framework guided the design and development of the questionnaire and the interviews as described in Section 6.3.

The survey and interviews were used to determine which user experience constructs, extracted from existing frameworks, would be relevant to the User Experience Evaluation Framework for eModeration (see Tables 6.33 – 6.35 and Figure 6.10). Chapter Six explained the processes that were followed to collect the data during evaluation and iteration two. The survey results and the interviews with the deans were used to determine how the User Experience Evaluation Framework for eModeration needed to be refined. The purpose of the survey and the interviews was to determine which user experience constructs found in the literature review were actually applicable and relevant to eModeration (see Section 6.4). User experience frameworks that could be found in the literature review were concerned with web applications such as eCommerce and information websites such as mHealth (see Section 3.4). Principles extracted from existing user experience frameworks were used together with the results from the survey and interviews to design and develop the User Experience Evaluation Framework for eModeration (see Figure 6.10). The collected data and findings were then used to refine the conceptual framework. The results from the second evaluation and iteration were presented in Section 6.4 followed by a discussion and the refinement of the conceptual framework into the User Experience Evaluation Framework for eModeration (see Section 6.5). The output of evaluation and iteration two was the second version of the framework together with an evaluation criteria tool (see Appendix N) that is to be used in conjunction with the framework when implemented (see Section 6.5). The construction of the framework was guided by the principles of Design Science Research which include knowledge base (user experience and eModeration literature), environment (people, organisation and technology) as well as IS research (develop and evaluate the artifact). The construction also involved applying three Design Science Research cycles: relevance, design and rigour in an iterative manner.

Chapter Seven: Testing

7.1 Introduction

The purpose of testing and evaluation is to demonstrate that the artifact — in this case the User Experience Evaluation Framework for eModeration — meets the functionalities and requirements that were established during the design and development phase (Ellis and Levy, 2010). Testing and evaluation of the developed artifact demonstrates the validity of the artifact within the context of the identified problem. Chapter Seven serves as Step Four in the Design Science Research process which tests the artifact for relevance and applicability.

7.2 Case study MGI eModerators testing of the artifact — interviews

In order to validate and confirm that the designed artifact solved the problem and met the set objectives, ten eModerators from MGI who had participated in evaluation and iteration two, were approached for interviews. A diagrammatical representation of the framework, together with a detailed explanation of each construct in a tabular format, was emailed to the eModerators with an information sheet (see Appendix E) before the interview. The interview questions were also emailed to the individuals prior to the interview. The evaluation criteria tool (see Appendix N) was created by the researcher as an instrument that could be used in conjunction with the framework when evaluating the user experience of eModerate systems.

Section 7.2.1 explains the rationale and the design of the interviews that were used to test the User Experience Evaluation Framework for eModeration. Section 7.2.2 provides feedback from the interviews done with the eModerators in evaluation three.

7.2.1 Design and development of the interview with eModerators

The rationale behind the third evaluation and iteration was to test and evaluate the designed and developed framework with the users who had been involved in the second iteration at MGI. The interview was designed in such a way that the researcher would gain a deeper understanding of the user experience issues which might influence the adoption of eModeration and how these insights could influence the design of the framework. The interview was designed to determine the following:

- whether the user experience constructs identified by the survey were satisfactory for the design of the User Experience Evaluation Framework for eModeration;
- whether the identified levels (Environment, eModeration Requirements and User Experience constructs) were adequate for measuring the user experience of eModeration;
- whether any of the User Experience constructs, that had been identified as issues by the participants, should be added or removed from the framework;
- if the designed artifact would be easy enough to use, and whether the framework made it possible to comprehend the essence of the modelled concept;
- whether the framework was general enough to address a variety of problems;
- whether the framework was applicable and solved the problem;
- whether the purpose of each construct was clearly explained, i.e. the operations or use of each facet and whether the interaction or flow between constructs was evident;
- whether the designed artifact was complete, by evaluating the satisfaction level of users with respect to completeness, effectiveness and whether it satisfied the requirements and constraints of the problem it was solving;
- to determine whether the designed artifact was relevant to the User Experience Evaluation Framework for eModeration.

Two eModerators were selected from each faculty to participate in the interviews. Interviews were conducted via email and followed up with telephonic interviews, which were recorded in case more information was required. The feedback, comments and responses from the eModerators were used to refine the first version of the framework before it was tested and evaluated at an external institution for reliability.

Participants were required to indicate whether or not they thought that the framework could be implemented at organisations other than private higher education institutions and if so, for what purpose. Participants also had to respond to a question concerning whether or not enough users had been identified and if sufficient detail had been provided about their roles and responsibilities.

The participants had to rate the Environment, eModeration Requirements and User Experience levels according to principles used for the evaluation of artifacts and the frameworks. The principles are simplicity, generality, exactness, clarity completeness and relevance as discussed in Section 4.8. The following Likert scale was used: "*good*", "*needs improvement*" or "*not adequate*". The researcher also supplied an area in which to add comments below the response. The designed interview can be found in Appendix E.

Participants were required to indicate if anything had been omitted from the three levels that would hinder successful implementation and if so, what would they add to each level. Participants also had to indicate whether they believed that the evaluation criteria for each construct were comprehensive and had been explained clearly.

Under the eModeration user experience constructs level, participants had to indicate whether they agreed with the identified instrumental and non-instrumental qualities and whether they wanted to add constructs to these.

Participants also commented on the type of services that an eModeration system should provide in the context of eModeration and what contextual information should be associated with eModeration.

7.2.2 Feedback after interviews with eModerators

A total of six eModerators across different faculties participated in evaluation and iteration three. For the purposes of anonymity, characters A – F were assigned to the participants. This section provides answers to questions three and four of the study, namely:

- Why do user experience issues influence eModeration adoption?
- How do the insights gained influence the design of the framework?

Qualitative data was used in evaluation three in order to gain a deeper understanding of the way in which eModerators perceived the framework and to identify themes and patterns that could assist with the identification of issues that these moderators might encounter with the framework. The insights gained during the interviews influenced the design of the framework.

Based on the first set of questions regarding the three identified levels all six of the eModerators agreed that the identified levels were adequate and appropriate for a user experience evaluation framework for eModeration. They did not see the need to add additional levels. Participant D responded: “making the model too complex might lead to confusion and slow down the process flow”. Participant F indicated: “Would not add another level as the three levels cover all aspects of eModeration”. Participant E was the only respondent who said: “My feeling is that a more context specific level in terms of the module ought to be included — for example, the type of assessment and format could be a level that provides for the unique characteristics of the specific module assessment”. An issue that emerged concerning one of the participants was the understanding of the term “context” and what it should include. The researcher explained to Participant E that the construct *“context”* is included under the User Experience level. As a result of this confusion the researcher decided to add more detail to the evaluation criteria related to context. This will allow the institutions to check if the system under investigation does provide the functionality required to accommodate the unique characteristics of specific module assessments.

Under the Environment level (see Section 6.5.1), users and organisations were identified as two different constructs in the User Experience Evaluation Framework for eModeration. Participants were requested to comment on these. For example, users were asked if they thought that the User Experience Evaluation Framework for eModeration could be used by any type of organisation other than higher education institutions. Participant A, an expert in eLearn systems, commented: “I think the criteria could be applied to any system as both a quality assurance and user experience evaluation framework”. Participant C voiced the opinion that: “No, I think it is customised for higher education institutions only”. Participant D identified more potential: “Public HEIs will definitely benefit as well. Colleges, school and any academic institutions having access to internet might also benefit, especially where external moderators are needed”. Participant E agreed with Participant D that the framework and criteria tool could be used by more than just private higher education institutions. Participant F commented: “It most probably can be used for any moderation purposes or where documents require quality assurance”. As a result, it was decided that “Higher education institution” would be included in the framework rather than just “Private” or “Public” with the possible inclusion of colleges, schools and other academic institutions that make use of moderation, especially external moderation.

There were two themes that emerged under the Environment level. This first was that the framework could be used in more than one type of institution and the second was that it could be used for other purposes, not only for the moderation of examination scripts.

Participant C who was an academic and also an industry expert expressed the following opinion regarding the Environment level: “Within the environment level, my opinion is that constitutional regulations and policies might also influence this level. I am not sure, however, if such regulations exist and are prescribed and enforced by the Department of Higher Education (for example)”. Every academic institution, especially higher education institutions in SA, is governed by the country’s Department of Higher Education. The department prescribes and requires institutions to externally moderate all of the exit level modules belonging to a qualification (SAQA, 2001). Higher education institutions are required to indicate in their policies and procedures how they implement government requirements. Policies and procedures are, however, covered under the eModeration Requirements level in the framework. A set of criteria was included in the evaluation framework to ensure that the system would cater to and take into consideration government regulations such as those regarding privacy and security.

Participants agreed that the number of users identified was adequate and that if too many users were added, it “might lead to confusion or slow down the process flow” (Participant D). Participant A, the eLearn developer expert, commented: “Yes, more than adequate. One thought that springs to mind is that IT Support plays a crucial role. Not sure if it is or could be relevant to the framework within the parameters of this study?” Accordingly, IT support was identified as an additional theme and was added as an element under the eModeration Requirements level.

All six of the participants agreed that the Environment level was good with respect to simplicity, generality, clarity and relevance. Five of the participants were of the opinion that the Environment level was exact and complete. One of the participants said that both exactness and completeness need improvement in terms of more specific detail — for example under technology. Participant D recommended that the process of communicating the login and password should be considered, as well as how the login and password should be communicated and by whom. The developer or system operator could email details to the users or, as the participant recommended, the system could automatically generate an email with the login details for the user. What was important for the framework was the inclusion of this in the evaluation of criteria which the institution could use to check if the system that they are investigating will cater for automatic notification functionality. The users should also check whether the creation of users and the communication of details are in line with the institution's policies and procedures. Associated with the user creation are the rights that will be assigned to each user.

Under the eModeration Requirements level participants also had to indicate whether they would wish to add a construct. Only Participant A was of the opinion that IT support should be added as a separate element: "IT support plays a crucial role in the job of the eModeration Systems Operator. Confirms my belief that IT Support should perhaps be considered as a requirement". During the refinement of the artifact IT support was added under the Requirements level. If the institution could afford an additional IT support person such an individual could be appointed to provide IT support at the Environment and Requirements levels. Otherwise these roles and responsibilities would have to be allocated to another dedicated individual within the institution. Participant C also indicated that it is necessary to add "system maintenance and upgrades" under the support element.

Participants also found that the evaluation criteria for each construct under the eModeration Requirements level were clear and comprehensive. One of the participants posed questions regarding the feedback construct, for example, "how will it be provided? Will the user get an sms or email notification?" The researcher then explained to the participant that there were two reasons for feedback in the criteria:

- Users of the system needed feedback regarding the *status of the eModeration process*, for example, "Please check files uploaded and ready to be reviewed". When the files were uploaded eModerators needed to be notified that files were ready to be moderated while managers needed to be notified when eModerators had uploaded files after they had completed the moderation process.

- eModerators provided feedback after the moderation process regarding the marking of examination scripts in the form of *moderator's reports*. These moderator's reports then need to be communicated to internal examiners. The evaluation criteria must ensure that the system supports the functionality to provide feedback regarding the moderator's report, for example, "How eModerators would provide feedback, or how would the manager communicate the moderator's report to the internal examiner?" Managers would typically download the moderator's report and share or discuss it with the internal examiner.

During the evaluation of the system, evaluators were expected to have an idea of how their institution handles the two types of feedback, for example, whether eModerators would expect to get a notification that files were ready. If a notification was sent to the manager about the status of documents, the managers would be more in control of the moderation process because they would have been made aware of what was happening. During evaluation and iteration two, managers and eModerators indicated that they were in favour of the control over the flow of information, the eModerate process and the feedback that the system provided. On this basis, it was important to ensure that the system would provide adequate feedback to users during the eModeration process.

All six of the participants considered the eModeration Requirements level to be more than adequate with respect to simplicity, exactness, comprehensiveness and relevance. One of the participants (the one who did not understand the feedback construct and what was meant by it) indicated that generality and clarity needed improvement. Under generality the participant commented: "In the technology software section, where Moodle and Google docs are mentioned, I would have referred to off the shelf products and not mention the products and maybe add 'bespoke' applications (not sure if these exist)". Moodle and Google documents were included under technology as examples of software that could be used because no existing off-the-shelf software application could be found that enabled an institution to perform the task of eModeration. Under clarity one participant commented that: "User interface is clear and understandable”. This suggests that it is important to ensure that the user interface is clear and understandable in order to maintain a good user experience for the eModerator. Under comprehensiveness Participant D commended the uploading process: “The upload process works smoothly; I was quite amazed by the effectiveness”. During the evaluation of eModerate systems it is important that users make sure that the system makes provision for the easy upload of documents and that the process is effective.

Lastly, the eModerators were asked to comment on the eModeration User Experience construct level, which was divided into two categories: instrumental and non-instrumental qualities. All of the participants agreed that the identified constructs under instrumental and non-instrumental qualities were relevant, clearly explained, comprehensive and complete. Only Participant C indicated that: “I would add an item such as system maintenance under the heading of error prevention. Timeous system maintenance can prevent errors in the first place”. With the refinement of the artifact system maintenance was added in accordance with the recommendation.

Overall all of the participants agreed that the User Experience level in the framework was good with respect to simplicity, generality, exactness, clarity, completeness and relevance. One of the participants commented on simplicity: “The entire process is simple and effective. The first solution to remote moderation I encountered that really works well and smoothly. Congratulations, this is a breakthrough for HEIs and other academic institutions in SA”. Under relevance one of the participants said: “Perfect for external moderation! Very useful for internal moderation as well to keep track and record of each semester’s examination results and moderation”.

In conclusion, positive feedback was received regarding the designed artifact. The following themes were identified as elements to be added to the User Experience Evaluation Framework for eModeration under the three respective levels. See the following tables:

- Table 7.1 for Environment level
- Table 7.2 for eModeration Requirements level
- Table 7.3 for eModeration User Experience level

Environment level

- Add an evaluation criterion under the eModerator systems operator heading regarding the role of IT support and its respective responsibilities.
- Add colleges, schools and academic institutions to the heading “organisation” as elements.

Additions were made in a larger font and underlined in the diagram. See Table 7.1.

Table 7.1 Refinement of Environment level of artifact evaluation and iteration three

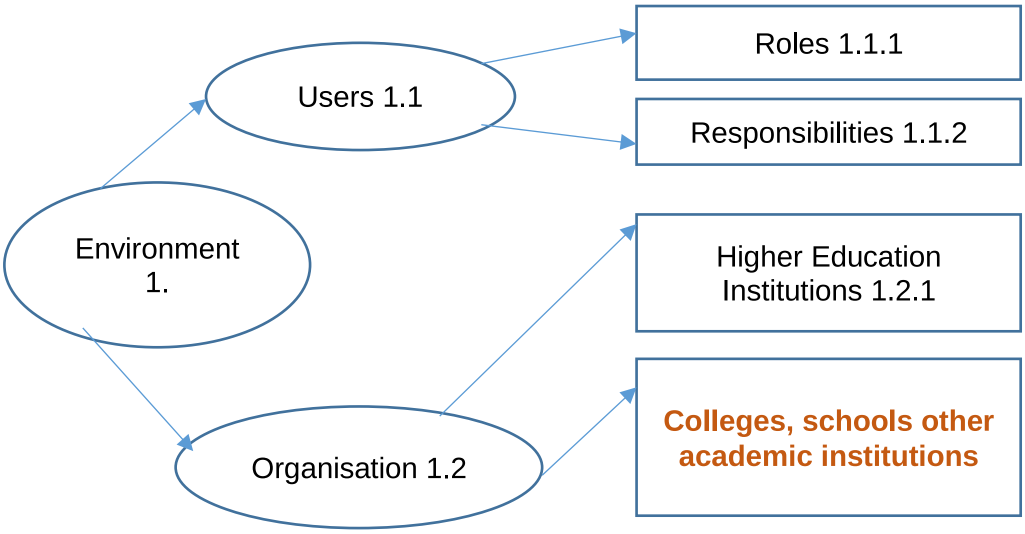
<table>
<tr><th colspan="2">Environment level (1.)</th></tr>
<tr><td rowspan="2">Users (1.1)</td><td>ROLES (1.1.1)

Managers:
• To manage the identification of eModerators for respective modules.
• To manage the information needed for eModeration by the eModeration system operator.
• To manage the eModeration process and the outcomes.
eModeration system operator:
• To manage the online process, access, security and navigation.
• To provide IT support for the eModeration system operator.
eModerator:
• To use the eModerate system.
• To moderate examination scripts electronically.</td></tr>
<tr><td>RESPONSIBILITIES (1.1.2)

Manager:
• To communicate to the eModeration system operator a list of all eModerators.
• To oversee the process of eModeration.
• To provide feedback to lecturers after the eModeration process has been completed.
eModeration system operator:
• To create eModerate pages for each module and assign secure access rights to eModerators.
• To upload information needed for eModeration.
• To handle queries from eModerators.
• To provide IT support in cases where eModerators cannot resolve the problems.
eModerator:
• To download scripts.
• To eModerate the examination scripts electronically.
• To upload the electronic scripts back onto the system after eModeration.</td></tr>
</table>

<table>
<tr>
<td>Organisation (1.2)</td>
<td>HIGHER EDUCATION INSTITUTION (1.2.1)

The application domains are higher education institutions.
The framework can also be used in colleges, schools and other academic institutions.

</td>
</tr>
<tr>
<td></td>
<td>

</td>
</tr>
</table>

eModeration Requirements level

- Add criteria to the process construct that will allow users to check if the eModerate system that they are investigating will ensure efficient uploading and downloading of documents (see 2.1.2 in Table 7.2).
- Add more detail to the procedure construct — specifically feedback — to ensure that users understand the two types of feedback being provided and how login details will be communicated (see 2.2.2 in Table 7.2).
- Add IT support as an evaluation criteria under eModeration support (see 2.3.3 in Table 7.2).
- Add evaluation criteria under security that will allow users to evaluate how the system will handle the creation of users and the communication of the login details, ensuring enough user privacy and security (see 2.3.4 in Table 7.2).
- Add evaluation criteria under security that will allow users to check if the system caters for different user rights and access (see 2.3.4 in Table 7.2).

- Add evaluation criteria for system maintenance and upgrades under support (see 2.3.3 in Table 7.2).

The changes that were made during the refinement of the eModeration Requirements level can be found in Table 7.2. These have been underlined and appear in a larger font.

Table 7.2 Refinement of the eModeration Requirements level after evaluation and iteration three

eModeration Requirements Level (2.)	
Process (2.1)	**ACCESSING THE PLATFORM (2.1.1)** • To create appropriate login pages. • To create eModerate pages per module. • To assign and award secure access to the relevant people to their respective eModerate pages per module.
	UPLOADING/DOWNLOADING (2.1.2) • To put a process in place for the uploading of examination papers, memoranda, reports and examination scripts for moderation. • To put a process in place for eModerators to upload the eModerated scripts and feedback reports, smoothly and efficiently. • The manager to track the process of moderation. • After eModeration is complete the manager can download eModerator reports and provide feedback to internal examiners during the process.
Procedure (2.2)	**eModerate (2.2.1)** • To use the eModerate procedure that explains in detail the specific tasks to be executed during eModeration, for example, by whom, when and how the procedure is performed? • The eModerate procedure uses different users who perform specific tasks: o Managers involved in eModeration provide information to the eModeration system operator to create module pages and assign eModerators to the pages. o eModeration system operator receives information from the manager, creates pages and users (eModerators). o eModerators involved in eModeration follow procedure by accessing eModerate system, downloading examination scripts, electronically moderating scripts and finally uploading scripts and moderation reports. o Managers receive notification that the eModeration task is complete and then download scripts and reports. o Managers act upon reports and provide feedback to internal examiner. o eModeration system operator to ensure continuity between the users and system.

	FEEDBACK (2.2.2) • A procedure must be in place for the eModerator to provide feedback on moderation to the manager using the eModerate system. • The procedure should make provision for feedback from the manager to the internal examiner. • The system should also make provision for feedback to users about the status of the processes, i.e. the scripts have been uploaded and are ready for download to be moderated and vice versa, through the automatic generation of an email to users from the system.
eModeration (2.3)	**NETWORK INFRASTRUCTURE (2.3.1)** • Ensure appropriate network infrastructure for reliable and time efficient distribution of the eModeration documentation. • Ensure appropriate access connectivity to network infrastructure. • All role players should have internet access for eModeration to be successful.
	SERVICE QUALITY (2.3.2) • Ensure that the level of service provided by the eModerate system is satisfactory. • Ensure that the quality provided by eModeration is satisfactory for a good user experience. • Ensure that the user does not experience frustration when interacting with the eModeration product. • Ensure that the eModerate system is easy to navigate, user friendly and that users can get information that they need to complete the task. • Ensure that the eModerate system provides two-way communication between the users.
	SUPPORT (2.3.3) • Provide adequate support from the eModerate system operator to managers and eModerators. • Provide IT support for the eModeration system operator. • Ensure that system maintenance and upgrades are available.
	SECURITY (2.3.4) • Ensure that the eModerate system is secure and only accessible to legitimate users of the system. • Create unique logins and passwords for all users. • Ensure that the login details are communicated effectively to users and explain how the framework will be communicated. • Build levels of security into the system, for example, the manager is to have access to all modules while eModerators should have access only to the page(s) that they eModerate.
Devices (2.4)	**TYPES (2.4.1)** • Ensure that users can access the eModeration process using different types of devices, i.e. tablets, desktops or laptops of their choice as long as these are cross-platform. • Ensure adequate (reliable, acceptable performance in terms of speed) hardware and software for the use of eModeration interaction.

Technology (2.5)	SOFTWARE (2.5.1) • Moodle can be used as a software package. • An alternative option is Google documents. • The software should be accessible to all role players.

eModeration User Experience level

- Add more detail to the evaluation criteria content (3.1.6), such as the system should allow users the functionality to add module assessments according to the unique characteristics of the module.
- Add evaluation criteria to the error prevention (3.1.8) element that will ensure that users have access to IT support when required.

Additions were made in a larger font and underlined in the diagram. See Table 7.3.

Table 7.3 Refinement of eModeration User Experience level after evaluation and iteration three

CONTENT (3.1.6)
• Information provided to the users should be clear and easy to navigate when they interact with the system. • Provide the appropriate, comprehensive and accurate information. • Provide content that is relevant to moderation. • Ensure that the content is structured in a way that facilitates the achievement of the users' goals. • <u>Ensure that the users are aware of the assessment format with its unique characteristics with respect to specific module assessment.</u>
ERROR PREVENTION (3.1.8)
• Users should be able to easily recover from errors. • Ensure that some error prevention help functions are made available to users. • Ensure that a link to the eModerate operator is available. • <u>Ensure that the users can access IT support if needed.</u> • <u>Ensure that regular system maintenance takes place and that a plan is available</u>.

After the interviews with the eModerators the information was used to refine the framework. A complete User Experience Evaluation Framework for eModeration, after evaluation and iteration three, can be found in Appendix O. The refined framework was then used in the *post ante evaluation* (evaluation and iteration four) conducted with participants from Monash University.

7.3 Conclusion

The purpose of iteration three was to test and evaluate the User Experience Evaluation Framework for eModeration with the eModerators who participated in the second iteration, and to identify any issues that they might have with the designed framework. Feedback from the interviews with eModerators was incorporated and used in the refinement of the artifact. The need for IT support and how this could be implemented in the framework were identified. The evaluation criteria for the roles and responsibilities of IT support were added to the Environment level and extended the application scope. An additional evaluation criterion for IT support was added under the support element. The eModerators were in agreement that the User Experience Evaluation Framework could be used at any academic institution using external moderation, which supports the generalisability of the framework. Additional evaluation criteria were added to the eModeration Requirements level under the elements feedback, support, security and process.

The eModerators were satisfied with the instrumental and non-instrumental qualities identified and did not see the need to change anything in the eModeration User Experience level. It can be concluded that the testing of the User Experience Evaluation Framework for eModeration provided useful feedback for the refinement of the framework before it was presented to Monash University. At the same time testing of the framework also contributed to answering question three and part of question four, by addressing the identified issues and refining the design of the framework.

Chapter Eight: Evaluation

8.1 Introduction

In Design Science Research it is important to evaluate the artifact. According to Peffers et al. (2008), evaluation of the artifact includes observing and measuring how well the artifact supports the proposed solution to the problem. The activity of evaluation includes comparing the objectives of a solution to the results achieved through the use of the artifact (Peffers et al., 2008).

The purpose of Chapter Eight is to evaluate the artifact, which in this case is the User Experience Evaluation Framework for eModeration, at a second private higher education institution in order to determine whether or not the artifact meets the functionalities and requirements established during the design and development phase. Testing and evaluation of the developed artifact also serves to demonstrate the validity of the artifact within the context of the identified problem and whether it is indeed applicable to the proposed context.

The evaluation of the User Experience Evaluation Framework for eModeration was conducted as follows.

- First, the eModerators and the deans from MGI used the institution's eModeration system. The users then needed to participate in a survey in order to identify the user experience constructs that would be relevant to the User Experience Evaluation Framework for eModeration (see Section 6.3).
- Secondly, the results from the survey and interviews with the deans (see Section 6.4) were used to provide feedback that would be used in the design and development of the artifact (see Section 6.5).
- Thirdly, the artifact was presented to the eModerators during an interview in order to evaluate its relevance, applicability and validity (see Section 7.2.1). The feedback from the eModerators was used to refine the artifact (see Section 7.2.2).
- Finally, the artifact was presented to participants from Monash University in order to evaluate the simplicity, comprehensiveness, generality, exactness and clarity of the artifact.

Chapter Eight describes how evaluations should be documented and how the artifact was evaluated during the four iterations based on identified evaluation criteria in Section 4.8.

8.2 Evaluation methods documentation

The documentation of prescriptive design knowledge can be done by means of design theory (Gregor and Jones, 2007) that supports Design Science Research evaluations. The two modes (interior and exterior) require design knowledge documentation, widening the perspective of how evaluations should be approached in Design Science Research (Sonnenberg and Vom Brocke, 2012a). *Ex post evaluation* is recommended in the exterior mode (i.e. analysing and creating descriptive knowledge) and *ex ante evaluation* during the interior mode (i.e. the building phase). *Ex ante evaluations* refer to design theories as well as to the progress achieved in the design of the IT artifact, which will be evaluated by means of evaluation criteria pertinent to aspects of the design theory.

Gregor and Jones (2007:322) refer to the documentation of prescriptive knowledge as information systems design theory (ISDT) that should show "the principles inherent in the design of an IS artifact that accomplish some end, based on knowledge of both IT and human behaviour. The ISDT allows the prescription of guidelines for further artifacts of the same type. Design theories can be about artifacts that are either products (for example, a database) or methods (for example, a prototype methodology or an IS management strategy)". Walls et al. (1992:37) define ISDT as a "prescriptive theory based on theoretical underpinnings, which explains how a design process can be carried out in a way which is both effective and feasible". Gregor and Jones (2007) identified eight components associated with design theory:

1. Purpose and scope
2. Constructs
3. Principles of form and function
4. Artifact mutability
5. Testable propositions
6. Justificatory knowledge
7. Principles of implementation

8. Expository instantiations

The eight components can be used to document the artifact's evaluation in terms of "what should be" and "how it would be able to shape the world". The descriptive knowledge will come from the exterior mode and components five, six and eight. Testable propositions will be investigated in *ex post evaluations* in order to create descriptive knowledge about the utility of the artifact, while justificatory knowledge will be used to explain why an artifact might work in a given context with the integration of truth from prior knowledge. Justificatory knowledge can be either descriptive (theories or observations) or predictive (other design theories that proved to be useful or that can provide principles concerning form and function that can be re-used). The last component refers to expository instantiations that assist with reasoning about an artifact's feasibility and applicability at build-time. It can also be used to reason about its usefulness when applied to some reality. Therefore, it is important to conduct evaluations on a continuous basis from the beginning of the Design Science Research process in order to assess the progress achieved as the artifact emerges (Pries-Heje et al., 2008). Design theories not only provide input that can be used in design activities (Gregor and Jones, 2007; Hevner et al., 2004; Iivari, 2007; Peffers et al., 2006), but can also be the result of the output of a Design Science Research project (Gregor and Jones, 2007; Pries-Heje and Baskerville, 2008). Gregor and Jones (2007) see the IT artifact as an instantiation of a design theory.

In terms of this study, the eight principles for documenting the artifact's evaluation in terms of "what should be" and "how it would be able to shape the world" are shown in Table 8.1. The theory that emerged from the study was evaluated using the eight components stipulated by Gregor and Jones (2007).

Table 8.1 Eight principles for documenting the artifact

Component	**Description**	**Section**
1. Purpose and scope	Defining and identifying the problem, and setting objectives. "What the system is for" (Gregor and Jones, 2007:38). For this study, the purpose and scope concerned the areas of user experience and eModeration which have been examined in order to develop a framework for the evaluation of user experience in eModeration.	Chapter One

Component	Description	Section
2. Construction	Representing entities related to the study in theory, developing evaluation metrics and the measurements of the artifact. The metrics define what the research is trying to accomplish and will in turn be used to assess the artifact's performance. Construction includes determining variables, parameters and constraints (Gregor and Jones, 2007). In this study the constructs associated with user experience and eModeration were defined in Sections 2.4, 3.6 and 6.2.	Chapters Two, Three and Six
3. Principles of form and function	Identification of utility functions. The identification of the abstract architecture that describes the artifact. The "*forms*" refer to the artifact's constructs and relationships, while "*function*" refers to how the forms are used to achieve the purpose of the artifact. See Sections 2.4, 3.6 and 6.2.	Chapters Two, Three, Five and Six
4. Artifact mutability	Artifact mutability refers to the changes that the artifact will undergo. According to Joubert (2012), it is necessary to specify the degree of mutability of the artifact as well as the expected level of adaptation or evolution in order to limit the effect of change on users. The artifact underwent four evaluations in order to refine and develop the final product See Section 4.8.	Chapters Six, Seven and Eight
5. Testable proposition	The testable proposition was investigated in *ex post evaluations* in order to create descriptive knowledge about the utility of the artifact. The evaluations determined how the artifact worked, whether or not it worked, and why it worked (theorise then justify theories about the artifact). Testable proposition relates to statements about the design theory. In this study, a set of evaluation criteria were used to evaluate the artifact (see Sections 6.2 and 7.3).	Chapter Six and Seven
6. Justification knowledge	The justification knowledge is used to explain why an artifact might work in a given context with truth being integrated from prior knowledge in the form of descriptive knowledge. This took place during evaluation and iteration two. Justification knowledge is based on theories from the natural or design sciences that are used to explain the design. This study made use of a case study in order to gather quantitative and qualitative data, as well	Chapter Seven

Component	Description	Section
	as theories relating to user experience and eModeration.	
7. Principles of implementation	Identification of the evaluation criteria and applying evaluation principles during the implementation. In this study, explanations of the process followed in order to implement the artifact within a specific context were provided in Chapters Four, Seven and Eight.	Chapters Four, Seven and Eight
8. Expository instantiation	Expository instantiations were used in reasoning about the artifact's feasibility and applicability at build-time and later to reason about the usefulness of the artifact when applied at a second private higher education institution. This took place during evaluation and iteration four, where the artifact was implemented to represent the theory as an expository device and for testing purposes.	Chapter Eight

The next section briefly explains the evaluation method adopted from Sonnenberg and Vom Brocke (2012a) in this study.

In Evaluation 1 the input in this study originated from a practical problem that was observed by the researcher in practice. A literature review was then conducted to determine the relevance of the problem and to assist with the formulation of the research problem (Chapters Two, Three and Five). Part of the literature review involved the investigation of existing artifacts (design theory) and determining whether these could be refined within the context of a user experience evaluation framework for eModeration (see Sections 2.3.3 and 3.4). The evaluation criteria used in Evaluation 1 were applicability, suitability of a design idea and finally the perceived importance of the problem. The purpose and concern of Evaluation 1 was to validate the purpose and scope as well as the constructs to be used in the designed User Experience Evaluation Framework for eModeration artifact. The appropriateness of the constructs was justified by referring to constructs that were used in similar domains and environments (justificatory prescriptive knowledge). The output of Evaluation 1 resulted in a conceptual framework that can be found in Section 6.2 and assisted with justifying the problem statement, research gap, and design objectives which in turn served as input for Evaluation 2. At this stage of the study testable propositions had been identified and were used in Evaluation 2.

The evaluation of the design activity also serves the purpose of showing the progression of the artifact design towards a solution for the stated problem. The inputs to Evaluation 2 were design specifications, the conceptual theoretical framework derived from the literature review, design objectives and inputs from users. At this stage the design specifications were evaluated against correctness and completeness with the focus being on whether the constructs used in the design specification and their relationships corresponded with the objective of the research design. The researcher used a survey (eModerators and deans) and interviews (deans) as evaluation tools to identify possible evaluation patterns pertinent to the validation of the design specification (see Section 6.3 and 6.4). The outcome of Evaluation 2 was to demonstrate that the artifact behaved as intended. Prescriptive justificatory knowledge in return constitutes formal proof that confirms consistency of assumptions about “what should be”. After Evaluation 2 the artifact emerged as the User Experience Evaluation Framework for eModeration.

After construction, the User Experience Evaluation Framework for eModeration artifact was introduced to six eModerators. Evaluation 3 served to demonstrate how well the User Experience Evaluation Framework for eModeration artifact performed while the users interacted with the organisation elements. During this evaluation some inferences about the utility of the artifact were made. Evaluation 3 linked *ex ante* and *ex post evaluations*, by reflecting on the artifact’s design and the subsequent iterations of the design activity’s feedback loop as advocated by Sonnenberg and Vom Brocke (2012a). Input to Evaluation 3 took the form of an instantiations of the refined User Experience Evaluation Framework for eModeration artifact, which was produced after Evaluation 2. The constructed User Experience Evaluation Framework for eModeration artifact was evaluated for applicability within the context of user experience evaluation for eModeration. Interviews with eModerators from each faculty were used as the evaluation tool in Evaluation 3 (see Appendix E). Evaluation 3 set out to measure the eModerators’ perceptions of the quality of the identified User Experience Evaluation Framework for eModeration. The output of Evaluation 3 (see Section 7.2) served as proof that the User Experience Evaluation Framework for eModeration artifact was consistent with its specifications in that it reinforced and integrated the principles of form and function validated in the preceding evaluation activities. The overall purpose of Evaluation 3 was to validate the component expository instantiation as well as the artifact's mutability as advocated by Sonnenberg and Vom Brocke (2012a). The evaluation activity at this stage also served to produce evidence regarding the ability of the artifact to behave according to its purpose and scope as defined in Evaluation 1. After Evaluation 3 had been conducted, the User Experience Evaluation Framework for eModeration artifact was refined and used at a second institution as part of Evaluation 4.

Evaluation 4 needed to demonstrate that the artifact was applicable and useful in practice (Sonnenberg and Vom Brocke, 2012a). The evaluation activity conducted during Evaluation 4 made use of three realities: real tasks, real systems and real users. The input for Evaluation 4 was taken from the third refinement of the User Experience Evaluation Framework for eModeration, a designed artifact instance that was fully embedded within the context of the organisational environment (private higher education institutions). Interviews were used as the evaluation tool during Evaluation 4 of this study. These had to determine: simplicity, applicability, comprehensiveness, exactness, clarity, efficiency with real world phenomena and generality (see Appendix F for interview questions). Finally the outcome of Evaluation 4 was to validate the artifact based on the testable propositions specified in the design theory and to ask if the solution really answered the original problem.

It was also necessary to take the considerations of Ellis and Levy (2010) into account with regards to the evaluation phase (as mentioned in Section 4.6.1.4). In order to identify the way in which the product does, or does not, meet the functionalities and requirements identified, evaluation must make use of processes supported by literature, and must ensure acceptance of the value of the artifact. Hevner et al. (2004) also mentioned that appropriate metrics and measurements should first be developed before the evaluation of the artifact (see Table 4.9 Section 4.8.3). Hevner et al. (2004) further assert that general measurements with which the researcher wishes to evaluate the artifact should include functionality, completeness, consistency, accuracy, performance, reliability, usability and comparability.

For the purpose of this study a case study evaluation method was chosen, where the artifact was applied to a real world situation, and its effect on that situation was evaluated. As Peffers et al. (2012) indicate, the choice of evaluation method is driven by the artifact. Case studies can provide evidence of efficacy but a potential weakness in using case studies is that these cannot be used to formulate generalisations about the evidence.

8.3 Case study Monash University South Africa

The rationale behind the fourth evaluation and iteration was to test and evaluate the designed and developed framework with external users at a second private higher education institution.

8.3.1 Design and development of the interview with academic staff from Monash University South Africa

The interview was designed in such a way that the researcher would gain a deeper understanding into whether the User Experience Evaluation Framework for eModeration could be used in higher education institutions. The designed interview and information leaflet can be found in Appendix F. The questions in the interview focused on the user experience issues that the external institution might have with the framework and how insights into these could influence its design. The following objectives were identified:

- To determine if the User Experience constructs identified in the survey and follow up interviews were satisfactory for the design of the User Experience Evaluation Framework for eModeration.
- To determine if the identified levels (Environment, eModeration Requirements and User Experience constructs) were simple and at the same time comprehensive enough.
- To determine if the identified levels (Environment, eModeration Requirements and User Experience constructs) were adequate for measuring the User Experience of eModeration.
- To determine if the User Experience Evaluation Framework for eModeration was general enough to be used at other organisations apart from higher education institutions.

- To determine if the framework was general enough to address various problems.
- To determine if other institutions would benefit from using the framework and to determine if there were other purposes for which the framework could be used.
- To determine the exactness of the evaluation criteria identified in the framework.
- To determine to what extent the framework fitted the problem, because if it addressed the problem, it was most likely to be accepted.
- To determine if the User Experience Evaluation Framework for eModeration would fit the organisation type.
- To determine if the User Experience Evaluation Framework for eModeration constructs were clear with respect to purpose and flow between levels.
- To determine if the purpose of each construct was clearly explained with the operations, and the interaction or flow between constructs being evident.
- To determine if the designed artifact was relevant to the User Experience Evaluation Framework for eModeration.

The following evaluation terms were used: completeness, simplicity, generality, exactness and clarity (March and Smith, 1995; Hevner and March, 2003; Hevner et al., 2004; Rosemann and Vessey, 2008; Hevner and Chatterjee, 2010; Aier and Fischer, 2011; Peffers et al., 2012, see Section 4.8.3). The feedback, comments and responses from the Monash participants were then used to refine the framework before it was presented as the final framework.

8.3.2 Feedback after evaluation and iteration four

For the purpose of anonymity participants were referred to as G, H, I, J and K. Based on the first set of questions regarding the three identified levels, all of the participants from Monash University agreed that the identified levels were adequate and appropriate for a user experience evaluation framework for eModeration. They did not see the need to add anymore levels. Participant G answered: “No, … if I look at the breakdown of what is underneath each one of them ... it looks quite comprehensive and it is covering everything”. Participant H answered: “it can work. I don’t think one would necessarily add to it”. Participants I, J and K found all of the levels in the framework to be in order and did not comment further. No problems were identified under the first question, which concerned whether or not the levels were considered to be comprehensive enough.

Participants had to indicate whether they considered the User Experience Evaluation Framework for eModeration simple enough for the user to easily comprehend the essence of the constructs in the framework. All of the participants agreed that the suggested framework would streamline the process of eModeration and that the constructs, elements and criteria identified in the framework were simple enough to easily comprehend. As participant G mentioned: “if too much detail is added to the framework, it would not be simple enough to understand and it could lead to confusion”. In response to the comprehensiveness of the User Experience Evaluation Framework for eModeration participant I said that: “the system is perfectly integrated [and] that guarantees usability”. Participant G also mentioned that comprehensiveness and simplicity contradict one another and further commented: “put in as much detail as possible because if people don’t have someone explaining it might look longer which complicates the framework ... since it must be comprehensive ... the simplicity might come in when you add more detail [such as examples] but practical examples”. It is important to include enough information in the evaluation criteria in order for the users to understand what is expected of them, but not to include too much which would make it difficult to comprehend and understand.

After asking the first two questions it was concluded that:

- The framework was simple enough for users to comprehend the essence of the constructs.
- The framework helped streamline the process of moderation.
- The framework did not need more information added to it as too much detail would make it difficult to understand.

8.3.2.1 Additions to the User Experience Evaluation Framework for eModeration after interviews with participants from Monash University

The next section reports on the recommended additions to the User Experience Evaluation Framework for eModeration from the perspective of the participants from Monash University (see Table 8.6). The feedback is provided as follows:

- additions to the Environment level;
- additions to the Requirements level; and
- additions to the User Experience level.

Environment level additions

In the third question (comprehensiveness) participants were required to indicate whether the elements identified under the Environment level such as “users” were comprehensive enough and whether they would like to add more users. The following pattern was extracted from the responses supplied by participants G and H and added to the User Experience Evaluation Framework for eModeration under the construct user: “*IT support*”.

Both participants G and H felt that it was necessary to have a separate IT support person added to the framework and not to only have the eModerator systems operator. Such a person, as mentioned by participant G, would be called if users had problems with, for example, the firewall, and the downloading and/or uploading of files. As stated by participant G: “who do they contact if they struggle doing this at 11 o’clock at night”. It would be necessary to add IT support to the Environment and Requirements levels to address identified issues.

Participant H said: “if IT support is not available to assist … it might be challenging to implement such an eModerate system successfully”. Participant H also recommended that IT support be added to the Requirements level: “it would also be necessary to add to the Requirements level IT support”, to assist with technical IT support. Participant H also asked if the current eModerate system operator would fulfill the role of an IT support person. Depending on the financial resources of the institution this role could be performed by the same person, but if the institution could afford an additional IT support person it would be beneficial to appoint such a person. An IT support person was added under the user construct as an additional element with its respective evaluation criteria.

Overall, the participants were satisfied with the user’s roles and responsibilities. Participant H said: “if I look at the role of the moderator to manager or person overseeing ... the role-players are clear so that is very useful”.

The evaluation criteria were adjusted in the framework to cater for IT support with specific roles and responsibilities. If there are sufficient resources, an IT support person needs to be appointed otherwise the roles and responsibilities should be integrated into the eModerate system operator’s portfolio.

“Organisation” is situated under the Environment level as an element with “higher education institution” being an identified organisation. Participants had to indicate whether they felt that the framework could be used in other environments. Participants G, H and I responded to the question indicating that the framework could be implemented in various locations. Participant I said that it, “can be used in *workplace training* as well as at *secondary school level*”. Participant H said that: “It can also be used by *public* institutions and it provides a nice handle on the quality control of [the] moderation process”. Participant K agreed with participant H that the framework could be used by private and public higher education institutions. Participant I indicated that the framework could also be used on a “micro level” when moderating assignments and tests on campus or at remote sites. Public and other academic institutions were added as evaluation criteria to the organisation construct under the Environment level.

After the interviews with Monash University, additional evaluation criteria were added to the framework in order to include other academic institutions that were using moderation, such as schools and colleges.

eModeration Requirements level additions

Participants were required to indicate what they would like to add to the framework. Participant H wanted to add a *“resource”* element. According to this participant resources would include costs and cost efficiency (budget), and the financial implications if the institution made use of an eModerate system. Participant H was not clear on where “resources” should be placed within the framework or whether this should be integrated under a different construct: “The only thing that I would probably change is my resources occasionally, so I don't know if that has a place or if it is integrated. … whether you are considering the resource implications for the institutions. I don't know if that is a separate level, … cost efficiency, ... [should] look at the implication for resources". Participant G wanted to add: "cost efficiency and infrastructure as constructs to be considered". Resource requirements for an eModerate system would typically include internet, bandwidth, scanners, eModeration technology, devices to access the system, and budget to support the physical devices and technology associated with eModeration. During the final revision, special attention was given to ensuring that there were sufficient resource requirements specified in the evaluation criteria, for example, how much bandwidth would be required to use the system optimally and to ensure a satisfactory user experience. The researcher added a resource element to the framework under the Requirements level and included evaluation criteria containing the aforementioned elements, such as budget, infrastructure, staff, etc.

Participant K recommended that all of the elements under eModerate constructs be merged together: "no need to have three eModerate headings under the eModerate requirements level".

Additions to the User Experience level

None of the participants thought it necessary to add more elements to the User Experience level. Participants perceived the User Experience level as comprehensive, simple, clear and exact enough for the framework. Participant J responded: "the user experience level is clear and simple". However, participant G wanted to add a checklist to "content", that would include information about what needed to be uploaded in order for eModeration to be completed successfully. This would include, for example, student marks, student scripts, examination papers, examination memoranda, moderators' reports, clear deadlines, assessment criteria, plagiarism report and requirements from the institution. Participants G, H and I emphasised the importance of communicating a specific deadline to the eModerator, something that could be added to the framework. The framework should include evaluation criteria that will ensure that the system will allow users to upload the previously mentioned content.

An issue raised by both participants G and H was whether moderation would take place on- or offline. Participant H indicated that he had moderated electronically using

Google documents and that this had not worked well. He said the following: “Google Docs is not necessarily the friendliest way of doing this, so I might mark the experience but I imagine in service quality one can have a few questions there probably to be investigated in more depth”.

In the last question, participants were asked to indicate why they thought users found it difficult to adapt to eModeration. Participant H answered: “it might be institutional objectives and values, practical realities, financial issues, possible requirements from the managing institution or a bigger decision not just a faculty and examinations service”.

8.3.2.2 Adjustments to the User Experience Evaluation Framework for eModeration after interviews with participants from Monash University

Patterns emerged under the Environment level (see Table 8.2). The participants wanted to adjust and add to the roles and responsibilities of users, for example, adding “*training*” to the role of the eModeration system operator. Under the Environment level users construct, the roles and responsibilities of the eModeration system operator needed to be adjusted. Participant H asked the following question: “will the IT support person fulfil the same role as an eModerate system operator or … should [there] be two different roles?” Participant H agreed with participant G that training was needed. Depending on the financial resources available to the company the IT support person could be different from the eModeration system operator. Participant G responded: “I was wondering if a framework like this would need resources. Training to ensure that people actually understand”. Participant G also commented and said that: “if it is too complex, then your framework would need too much training ... then it might not be a good system”. Participant G was also of the opinion that it would be better if there was a dedicated person to handle the training aspect: “it might need to be a specific role otherwise it just falls in the queue of other IT requests. There should be a different IT role”. Participant G felt that training criteria that would cover all of the roles and responsibilities for the different users should be added to the framework. Participant H was in agreement with participant G that some form of briefing on how to use the system should be included, for example, “[a] briefing document”. Participant K indicated that training would be a good idea and would ease people’s minds about retaining their jobs by demonstrating that the system would not replace people completely and could: “counteract political office resistance [towards implementing] new systems”. The researcher acknowledged that it is important to check that the eModerate system does provide some documentation related to the use of the system such as a training manual. As a result the researcher decided to add a “*training*” criterion under the eModeration system operator element as a role and responsibility and an evaluation criterion under “service quality” checking for the quality of the training manual.

Under the Environment level organisation element, the types of organisations that could use the User Experience Evaluation Framework for eModeration was adjusted to include “*other academic institutions (private and public) using moderation*” as recommended by participants G, H, J and K. The eModerators from MGI indicated that schools and colleges should also be added. The evaluation criteria for organisations was further adjusted to accommodate the recommendation.

Under the eModeration Requirements level participant G expected more detail under “service quality”. The participant wanted a: “a checklist, that you upload before you send it off or required documents to be uploaded” to be added as evaluation criteria. Participant G also mentioned that if examples were given, such as a “checklist”, the framework would be comprehensive and simple enough to understand. The checklist would include, for example, examination paper, examination memorandum, moderator’s report, student marks sheet, marking rubrics and the scanned examination scripts of students.

Under the eModeration Requirements level participant H saw a need to include an evaluation criterion for “*system maintenance*” under the support function. Participant H said: “if you look at [it] from a technical side to the eModeration requirement level ... the challenge here is the integration with IT. To get the logins ... having these platforms on the Cloud or maybe hosting it on the campus where the person is sitting or maybe having … a dedicated portal where you don’t get tied down by speed but you would need IT support”. IT support is not just a person who needs to do the job, it is also a technical function that needs to be fulfilled. IT support for the eModeration system operator and system maintenance was added as an additional evaluation criterion under the support element.

Participant H agreed with the eModerators from MGI that: “the managers should be made aware if the eModerator received [a] moderation pack, in turn the eModerator should receive communication that the moderation pack is ready for moderation”. As suggested by the eModerators, under the feedback element in the framework, an additional evaluation criterion was added concerning the automatic sending of emails to managers or eModerators during the process.

The only other adjustment recommended under the eModeration Requirements level, by the participants from Monash University, was software technology. Participants G and H had not had pleasant experiences with Google documents in the past and they both suggested that Google documents be removed from the list of suggested technologies. As mentioned by participant H: “Files tend to go corrupt, pages are not displayed or downloaded properly and sometimes the files are not accessible. It is also not clear when using Google docs if it (the document) should be downloaded first before editing can be done on the document”. Participants G and H preferred working with PDF files: “pdf documents work much better”. Participant H recommended that different software packages should be included: “there is enough flexibility in the framework to use several software packages”.

Under the User Experience level participant H also wanted to add system maintenance as an evaluation criterion to the error prevention element.

Participant H also recommended that the following be added to context: “the assessment format should be unique … [reflecting] the characteristics of specific module assessments”. The participant was referring to theoretical and practical assessments that might need different requirements.

Table 8.2 summarises the themes identified by eModerators from MGI and the participants from Monash University South Africa that were added to the evaluation criteria, as well as the adjustments that were made to these criteria.

Table 8.2 Themes identified after qualitative data collection

Level	Construct	Literature conceptual framework	Survey – Questionnaire Sections A-E	Interview deans	Included or removed from conceptual framework	Interview eModerators	Interview Monash University
Environment (1.)	**Users** (1.1) add IT support Roles (1.1.1) (addition to eModeration system operator – evaluation criteria – *training and IT support)*, Responsibilities (1.1.2) (addition IT support person with its respective evaluation criteria)	✓	✓ A and B	✓	✓ Include	✓ under eModeration system operator – add *IT support*	✓ add IT support person as an additional person if resources allow – with appropriate evaluation criteria. Add training to eModeration system operator.
	Organisation (1.2) Higher Education Institutions (1.2.1), Colleges, schools and other academic institutions (addition) (1.2.2).	✓	✓ A	✓	✓ Include	✓ addition colleges, schools	✓ other academic institutions
Requirements (2.)	**Process** (2.1) Access of platform (2.1.1), Uploading or downloading (2.1.2)	✓	✓ A and B	✓	✓ Include	✓ adjustment to uploading/downloading – smooth and effectively	✓ agree
	Procedure (2.2) eModerate (2.2.1), feedback (2.2.2)	✓	✓ B	✓	✓ Include	✓ adjustment to last evaluation criteria of feedback (2.2.2) – ensure automatic email generation.	✓ agree
	eModeration (2.3) internet infrastructure (2.3.1),	✓	✓ A, B and C	✓	✓ Include	✓ adjustment to 2.3.1 evaluation criteria.	✓ addition to 2.3.2 a checklist as evaluation

Level	Construct	Literature conceptual framework	Survey – Questionnaire Sections A-E	Interview deans	Included or removed from conceptual framework	Interview eModerators	Interview Monash University
	service quality (2.3.2), support (2.3.3), security (2.3.4), devices (2.3.5), technology (2.3.6), resources (2.3.7).					Addition to support 2.3.3 IT support for eModeration system operator. Addition of evaluation criteria to security 2.3.4, ensure login details are communicated to users.	criteria and training documentation. Addition to support 2.3.3 evaluation criteria, ensure system maintenance and upgrades are available. Ensure that resources for support are available. Include eModerate devices and technology under eModerate as 2.3.5 and 2.3.6. Add an additional evaluation criteria under technology software – check for off-the-shelf software. Addition of resources 2.3.7 with respective evaluation criteria.
	eModeration Devices	✓	✓ A	✓	✓ Include		Merge under eModeration.
	eModeration	✓	✓ A	✓	✓ Include		Merge under eModeration.

Level	Construct		Literature conceptual framework	Survey – Questionnaire Sections A-E	Interview deans	Included or removed from conceptual framework	Interview eModerators	Interview Monash University
	Technology							
eModeration User Experience (3.)	Instrumental qualities (3.1.)	Navigation (3.1.1)	✓	✓ A, C		✓ Include		
		Effectiveness (3.1.2)	✓	✓ C, E	✓	✓ Include		
		Efficiency (3.1.3)	✓	✓ C	✓	✓ Include		
		Satisfaction (3.1.4)	✓	✓ C	✓	✓ Include		
		Context (3.1.5)	✓	✓ C	✓	✓ Include		
		Content (3.1.6)	✓	✓ C	✓	✓ Include		Addition of assessment format. Addition of a checklist.
		Visibility of the system (3.1.7)	✓	✓ C, D		✓ Include		
		Error prevention (3.1.8)	✓	✓ D		✓ Include	✓ addition to evaluation criteria ensure that IT support is available.	✓ addition to evaluation criteria ensure that there is a system maintenance plan in place.
		User control (3.1.9)	✓	✓ D	✓	✓ Include		
		Page display	✓	✓ C, D		No		
		Utility	✓	✓ C		No		
		Language	✓	No	No	No		
		Learnability	✓	✓ C	No	No		
		Memorability	✓	No	No	No		
		Consistency	✓	✓ C		No		

Level	Construct		Literature conceptual framework	Survey – Questionnaire Sections A-E	Interview deans	Included or removed from conceptual framework	Interview eModerators	Interview Monash University
		Recognition	✓	✓ D		No		
		Flexibility (3.1.10)	✓	✓ D	√	✓ Include		
		Aesthetic design(3.1.11)	✓	✓ D, E		✓ Include		
		Help documentation (3.1.12)	✓	✓ D		✓ Include under support		
	Non-instrumental qualities (3.2)	Overall experience (3.2.1)	✓	✓ E	✓	✓ Include		
		Source quality (3.2.2)	✓	✓ E	✓	✓ Include		
		Personalisation (3.2.3)	✓	✓ E		✓ Include	✓ addition of evaluation criteria, no need for eye recognition technology.	
		Cross-platform (3.2.4)	✓	✓ E	✓	✓ Include		
		Context aware services (3.2.5)	✓	✓ C	✓	✓ Include		

Figure 8.1 illustrates the additions and adjustments to the eModeration Requirements level. Additions are indicated in bold, while italics are used to indicate where additional evaluation criteria were added and or adjusted under the identified elements.

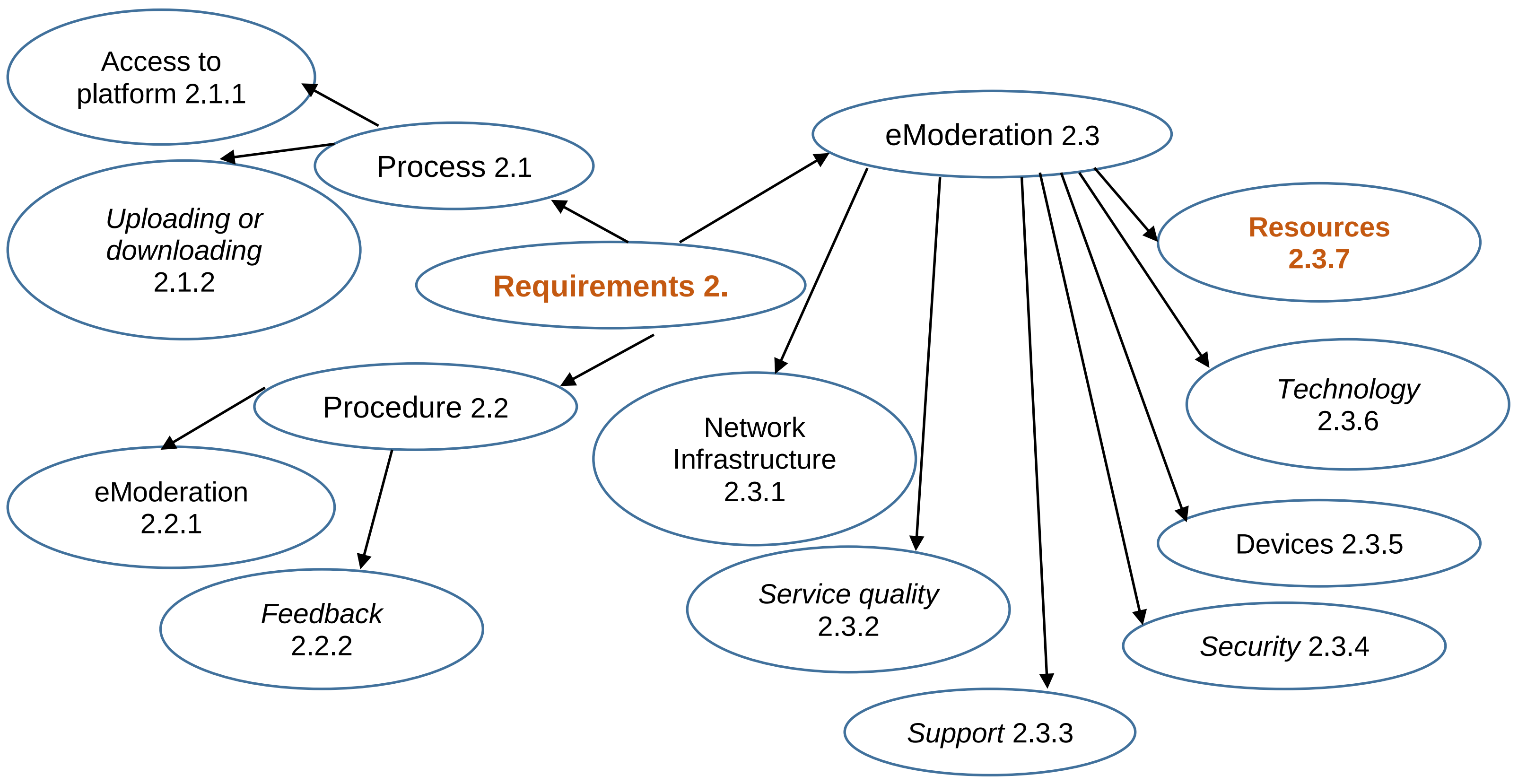


Figure 8.1 Additions and adjustments to the eModeration Requirements level

Table 8.3 represents the updated User Experience Evaluation Framework for eModeration. The larger font indicates the patterns identified by eModerators from MGI while the italicised sections indicate the patterns identified by the participants from Monash University.

Table 8.3 User Experience Evaluation Framework for eModeration

<table>
<tr><th colspan="2">Environment level</th></tr>
<tr><td rowspan="2">Users</td><td>
ROLES

Managers:

To manage the identification of eModerators for respective modules.
To manage the information needed for eModeration by the eModeration system operator.
To manage the eModeration process and the outcomes.

eModeration system operator:

To manage the online process, access, security and navigation.
To provide IT support for the eModerators and managers.
To provide training to eModerators.

IT Support

To manage the IT infrastructure needed for eModeration, for example, scanners, computers, network and internet.
To manage the internet availability, bandwidth and firewalls.
To manage the network infrastructure needed for archiving purposes.
To manage IT support for eModerate users.

eModerator:

To use the eModerate system.
To moderate examination scripts electronically.

</td></tr>
<tr><td>
RESPONSIBILITIES

Manager:

To communicate to the eModeration system operator a list of all eModerators.
To oversee the process of eModeration.
To provide feedback to lecturers after the eModeration process has been completed.

eModeration system operator:

To create eModerate pages for each module and assign secure access rights to eModerators.
To upload information needed for eModeration.
To handle queries from eModerators.

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</table>

<table>
<tr><td></td><td>

- To ask for IT support in cases where eModerators cannot resolve the problems.
- *To provide training to eModerators.*

IT Support

- *To ensure that IT infrastructure is adequate for eModeration, for example, scanners, computers, network and internet.*
- *To ensure that internet is available, enough bandwidth is provided, adequate firewalls.*
- *To ensure that adequate network infrastructure is available for archiving purposes.*
- *To ensure that they can support eModerate users when needed.*

eModerator:

- To download scripts.
- To moderate the examination scripts electronically.
- To upload the electronic scripts back onto the system after eModeration.

</td></tr>
<tr><td>Organisation</td><td>

HIGHER EDUCATION INSTITUTION

- The application domain is higher education institutions.
- It can also be used in colleges, schools *and other academic institutions.*

</td></tr>
<tr><td colspan="2">eModeration Requirements Level</td></tr>
<tr><td rowspan="2">Process</td><td>

ACCESSING THE PLATFORM

- To create appropriate login pages.
- To create eModerate pages per module.
- To assign and award secure access to the relevant people to their respective eModerate pages per module.

</td></tr>
<tr><td>

UP-/DOWNLOADING

- To put a process in place for the uploading of examination papers, memoranda, reports and examination scripts for moderation.
- To put a process in place for eModerators to upload the eModerated scripts and feedback reports, smoothly and effectively.
- The manager is to track the process of moderation.
- After eModeration is complete the manager can download eModerator reports and provide feedback to internal examiners on the process.

</td></tr>
<tr><td>Procedur</td><td>

eModerate

- To use the eModerate procedure that explains in detail the specific tasks to be executed with eModeration, for example, by whom, when and how is the procedure performed?
- The eModerate procedure uses different users who perform specific tasks:

</td></tr>
</table>

<table>
<tr><td></td><td>
<li style="list-style-type:circle">Managers involved in eModeration provide information to the eModeration system operator to create module pages and assign eModerators to the pages.
<li style="list-style-type:circle">The eModeration system operator receives information from the manager, creates pages and users (eModerators).
<li style="list-style-type:circle">The eModerators involved in eModeration follow procedure by accessing the eModerate system, downloading examination scripts, electronically moderating scripts and finally uploading scripts and moderation reports.
<li style="list-style-type:circle">Managers receive notification that the eModeration task is complete and then download scripts and reports.
<li style="list-style-type:circle">Managers act upon reports and provide feedback to the internal examiner.
<li style="list-style-type:circle">eModeration system operator to ensure continuity between users and system.
</td></tr>
<tr><td></td><td>
FEEDBACK
A procedure must be in place in order for the eModerator to provide feedback on moderation to the manager using the eModerate system.
The procedure should make provision for feedback from the manager to the internal examiner.
The system should also make provision for feedback to users on the status of the processes, i.e. the scripts have been uploaded and are ready for download to be moderated and vice versa, through email automatically generated from the system and sent to users.
</td></tr>
<tr><td rowspan="2">eModeration</td><td>
NETWORK INFRASTRUCTURE
Ensure appropriate network infrastructure for reliable and time effective distribution of the eModeration documentation.
Ensure appropriate access connectivity to network infrastructure.
All role players should have internet access for eModeration to be successful.
Ensure that network infrastructure is considered a resource and forms part of the cost involved in doing eModeration.
</td></tr>
<tr><td>
SERVICE QUALITY
Ensure that the level of service provided by the eModerate system is satisfactory.
Ensure that the quality provided by eModeration is satisfactory for a good user experience.
Ensure that the user does not experience frustration when interacting with the eModeration product.
Ensure that the eModerate system is easy to navigate, user friendly and that users can get the information they need to complete the task, by including a checklist of what should be available.
<li style="list-style-type:circle">Moderators’ reports
<li style="list-style-type:circle">Examination papers
<li style="list-style-type:circle">Examination memoranda
<li style="list-style-type:circle">Examination scripts
<li style="list-style-type:circle">Mark sheets, rubrics
<li style="list-style-type:circle">Students’ marks
</td></tr>
</table>

	• Ensure that the eModerate system provides two-way communication between the users. • *Ensure that the training manual provided to users is satisfactory.*
	SUPPORT • Provide adequate support from the eModerate system operator to managers and eModerators • Provide IT support for eModeration system operator. • *Ensure that system maintenance and upgrades are available.* • *Ensure that resources such as IT support, training support and staff resources are available to work with the eModerate system.*
	SECURITY • Ensure that the eModerate system is secure and only accessible to legitimate users of the system. • Create unique logins and passwords for all users. • Ensure that the login details are communicated effectively to users and explain how the details will be communicated. • Build levels of security into the system, for example, the manager is to have access to all of the modules while eModerators should have access only to the page(s) that they eModerate.
	DEVICES - TYPES • Ensure that users can access the eModeration process using different types of devices, i.e. tablets, desktops or laptops of their choice as long as these are cross-platform. • Ensure adequate (reliable, acceptable performance in terms of speed) hardware and software for the use of eModeration interaction.
	TECHNOLOGY - SOFTWARE • Moodle can be used as a software package. • An alternative option is Google documents. • The software should be accessible to all users. • *Check whether or not off-the-shelf software is available.*
	RESOURCES • *Ensure that enough budget is available, for example, for IT infrastructure, IT support, staff, etc.* • *Ensure that enough IT infrastructure is available to sustain eModeration, for example, scanners, desktop computers, internet and network.* • *Ensure that staff are available who can provide training to users.* • *Ensure that the system is cost effective for the institution.*
Devices	(Moved)

<table>
<tr><td>Technology</td><td>(Moved)</td></tr>
<tr><td colspan="2">eModeration User Experience construct level</td></tr>
<tr><td rowspan="5">Instrumental qualities</td><td>NAVIGATION
• Ensure quick and easy navigation through pages to accomplish the tasks.
• Ensure that users know where they are and have options for where to go next.
• Ensure a balance between navigational options so as not to overwhelm users.
• Ensure that related information is placed together.
• Ensure that common browser standards are followed.
• Ensure that each page has all the required navigation buttons, such as previous or next and home.
• Terminology used should be understandable.</td></tr>
<tr><td>EFFECTIVENESS
• Ensure that eModerators can effectively moderate papers electronically using the eModerate system.
• Ensure that facilities and activities are available to encourage interaction with the eModerate system.
• Ensure effective access to information to complete the task.
• Ensure that the users achieve their goal when using the system.</td></tr>
<tr><td>EFFICIENCY
• To ensure that a high level of productivity is maintained by users when using the eModerate system.
• To ensure that the user should be able to complete the task in a shorter time frame than when using the manual paper-based method.
• To ensure that the number of steps required to complete the task should be kept to a minimum.
• To ensure efficient uploading notification to all users in control of the process.
• To ensure that fewer resources are required to complete the task, i.e. no transportation of examination scripts.
• To minimise the effort required to complete the task of eModeration.</td></tr>
<tr><td>SATISFACTION
• Consider that the eModerate users’ satisfaction levels, when interacting with the product, are influenced by the product qualities: utility, usability and visual appeal.
• The satisfaction levels as influenced by stimulation during product use and quality perception by users.
• Ensure that the users are satisfied with what is available on the eModerate system.</td></tr>
<tr><td>CONTEXT
• Refers to the environment in which the user operates.</td></tr>
</table>

	• Ensure that users understand that in an eModeration environment the usage context includes the aim of the product, i.e. to electronically moderate examination scripts. • Ensure that the users perceive the eModeration activity as meaningful. • Ensure that the representation is understandable and meaningful, i.e. ensuring that the symbols, icons and names used are intuitive within the context of eModeration tasks. • Ensure that the context of the organisational setting does not affect the eModeration activity. • Ensure that the infrastructure, services, users and technology to be used are adequate and that these contribute to the interaction in context.
	CONTENT • Information provided to the users should be clear and easy to navigate when they interact with the system. • Provide appropriate, comprehensive and accurate information. • Provide content that is relevant to moderation. • Ensure that the content is structured in a way that facilitates the achievement of the users' goals. • *Ensure that the users are aware of the assessment format with unique characteristics specific to certain module assessments.* • *Provide a checklist that users can use to find out what should be uploaded, for example, examination papers, examination memoranda, examination scripts, moderators' reports, marking criteria, marks sheet, etc.*
	VISIBILITY OF THE SYSTEM • Ensure that the visual appeal or aesthetics of the system are appealing to the users of the eModerate system. • Navigation and visibility of navigation links should be clear and unambiguous. • The eModerate site should not contain irrelevant information, which could distract users as they perform their tasks. • Ensure that the eModerate system keeps the users informed about the process through constructive and appropriate feedback as they interact with the system, i.e. a message explaining how long it will take to download/upload files. • Ensure that each page is "branded" so that there is an indication as to which section it belongs to.
	ERROR PREVENTION • Users should be able to easily recover from errors. • Ensure that some error prevention help functions are made available to users. • Ensure that a link to the eModerate system operator is available. • Ensure that the users can get IT support if needed. • *Ensure that there is a system maintenance plan in place.*

	USER CONTROL • Ensure that role players have control of information as it goes through the eModeration system. • Ensure that managers are in control of the process of eModeration. • eModerators can also control where and when they want to complete the task. • Clearly marked *"exit"* button/icon needs to be visible.
Non-instrumental attributes	**OVERALL EXPERIENCE** • It is important that the users' overall interaction with the system is positive in order to contribute towards a positive user experience. • Ensure that the overall user experience of the system is enjoyable.
	SOURCE QUALITY • Ensure that the quality of the information required to complete the task of eModeration is accurate and complete. • Ensure that the source quality is clear, relevant, appropriate and engaging to role players when using the eModerate system.
	PERSONALISATION • Ensure that all the role players can see that they are logged in. • Ensure that all the role players can see what they have access to. • Ensure some personalisation of their eModerate page(s). • No need for eye recognition technology.
	CROSS-PLATFORM • To ensure that managers and eModerators are able to access the eModerate system using different platforms and different devices.
	CONTEXT AWARE SERVICES • The users should be made aware of the services that the eModerate system offers. • Ensure that meaningful contextual information associated with the eModerate content is provided.

The participants from Monash University not only recommended changes, alterations or additions to the framework, but also suggested where the framework could be applied elsewhere. This is discussed in the next section.

8.3.2.3 Commendations for the User Experience Evaluation Framework for eModeration after interviews with participants from Monash University

Participant G was very satisfied with the framework and commended the researcher: "the User Experience Evaluation Framework for eModeration would address the problem and it is a good option". Participant J also agreed that: "the problem[s] have been covered comprehensively". Participant G wanted the researcher to: "present the User Experience Evaluation Framework for eModeration to Monash University's examinations committee for implementation”. Participant H commented that: “the User Experience Evaluation Framework for eModeration provides a nice handle on the quality of [the] moderation process … a holistic approach to solve the problems institutions face with moderation”. Participant J said the biggest advantage and value in using eModeration is that it can be “done by anybody anywhere”.

Participant G indicated that the use of an eModerate system could be very valuable for future reference, and for archiving and quality assurance purposes. For example, if a student requests a remark it would be easy to retrieve. As mentioned by participant G: “for quality assurance and for due processes for document [approval] and for the twenty first century things are more online”. An eModeration system normally provides a footprint of actions, which could make quality assurance easier: “student tracking ... our head of school has administrator access so she can go to any unit, check one student or a class, so it is exactly that point. It makes it easier, you don’t have to phone someone, you don’t have to wait, e-mail”. Participant H identified the eModerate system’s ability to trace electronic documents within the institution as being very valuable. Participant H also mentioned that another advantage to using eModeration was that: “documents can be downloaded and the eModeration task can be completed offline. Before reports are uploaded again. The proposed framework thus streamlines the offline versus online requirements”. The process of finding an examinations script would also be easier especially in appeals processes.

Participant H identified some advantages associated with eModeration and how users of an eModerate system could benefit from using the User Experience Evaluation Framework for eModeration in order to implement an appropriate eModerate system. Participant H was also very excited about using an eModerate system similar to the one used in the study because of the advantages of using it at any time and place. Participant H mentioned: “[when] one is out of the office or abroad the job does not come to a standstill the whole time it is a real-time thing. That is definitely a benefit of it and that is what’s exciting me about the process”.

8.3.2.4 Future additions to the User Experience Evaluation Framework for eModeration after interviews with participants from Monash University

Participant G wanted to add the functionality to add plagiarism detection capabilities (such as "*Turn-it-in*" software), especially if the system would be used for Honours and Masters theses or dissertations: "it is difficult plagiarising exams because it is based on memory so that might not be necessary but we have a strong need to also moderate our Honours [projects]". Participant G also recommended that the framework be expanded so that it can also be used for the moderation of theses and dissertations. Participant I indicated that an eModerate system could also work well at a micro level where assignments need moderation during the semester. If the eModerate system is used at a micro level more users would be needed, as mentioned by Participant G: "everyone that runs the unit must be able to work with … a guideline list or a user manual, ... it should include the assessment criteria ... the plagiarism report ... it must have a clear deadline, … making sure that it is a usable online tool, ... even if it is a checklist*"*. At a macro level (examination script moderation) the number of users will remain as indicated by the framework, but as soon as it is implemented at a micro level (moderation of assignments and tests) during a semester more users might be required and need access to the system, for example, eTutors who assist in marking as well as lecturers and unit coordinators. For the purpose of this study the micro level has not been included, but should be considered in further research.

8.4 Conclusion

Chapter Eight started with an explanation of how evaluation should be conducted in Design Science Research and how evaluation was conducted in this study. Evaluation and iteration four of the Design Science Research process focused on the implementation of the User Experience Evaluation Framework for eModeration at a second private higher education institution (see Section 8.3). The designed conceptual framework, together with the evaluation criteria tool were presented to participants from Monash University to evaluate the framework for simplicity, comprehensiveness, generality, exactness and clarity. Participants were also required to identify possible issues that users might have with the adoption of eModeration systems. Participants were also required to indicate whether they thought the framework could be implemented in other areas besides higher education institutions.

In summary, participants agreed that the framework was simple enough to comprehend in order for it to be implemented. Participants also agreed that the information provided in the framework was comprehensive enough and warned that if too much detail was provided, the user might get lost in trying to understand the framework. Participants also agreed that the three levels identified were adequate, and that there was no need to add an extra level. Participants from Monash agreed with the eModerators from MGI that an IT support role needed to be added to the framework under the eModeration Requirements level.

Participants also identified the need to add more detail to resources such as using an example to explain what is needed. A checklist indicating what is required on each module page, for example, the moderator's report, examination papers and memoranda, etc., could assist managers of the system with knowing what typically needs to be uploaded.

Reasons as to why users might experience difficulty with adopting eModeration might include prior experience with on- and/or offline moderation, resource constraints and failure to adapt to new technology.

The participants from Monash University also agreed with the eModerators that the framework could be used at schools, colleges or any other training institution where moderation occurs. The participants from Monash University also identified a need to expand the framework so that it might be implemented at a micro level (during semester with assignments and tests) and not just at a macro level (examination scripts). They also valued the potential to have examination scripts and moderators' reports readily available for reference in, for example, an appeals process.

Chapter Nine: Communication and Conclusion

9.1 Introduction

eModeration has been shown to improve the efficiency and user satisfaction of assessment processes, yet its application in the South African context is limited. Note that none of the 27 public universities based in SA make use of eModeration and only one of the at least 94 private universities use eModeration partially, namely Monash University of South Africa (CHE, 2016). eModeration has not been used widely despite its known advantages in terms of effectiveness, security and user experience. Although one must acknowledge that there are a number of possible barriers to the adoption of eModeration the focus of this study was on the evaluation of the user experience of eModerators. Since no user experience evaluation framework for eModeration could be found this study sought to address this theoretical gap. This study aimed to develop a user experience evaluation framework for eModeration for the SA context. Such a framework could also be used to assist academic managers working at higher education institutions with the selection of eModeration systems that would meet their users' needs.

The preceding chapters covered the construction of the framework following a Design Science Research methodology. The Design Science Research methodology involved six steps and made use of a four step evaluation and iteration process which started with a state-of-the-art literature review, followed by an outline of the research within the context of higher education institutions and then identified the various users of eModeration. The literature review concluded with an initial conceptual framework, as well as an elaboration on the theoretical aspects associated with eModeration and user experience guidelines.

The evaluation and iteration phases aimed to improve and validate the authenticity of the framework by means of empirical evaluation. The outputs from the study include an artifact, namely the User Experience Evaluation Framework for eModeration, and an evaluation criteria tool.

This chapter briefly summarises the study and explains the contribution made by this research to the body of knowledge regarding user experience and eModeration. It also comments on the limitations of the research as well as the challenges experienced during the research process. Furthermore, it presents the final User Experience Evaluation Framework for eModeration. The chapter concludes by evaluating the study according to DSR guidelines and identifying future research opportunities. This chapter concludes the research by presenting the final conceptual framework, the User Experience Evaluation Framework for eModeration, which was developed during the course of the study and in doing so answers the main research question.

9.2 Research summary and contributions

The problem statement addressed in this research concerned the lack of an eModeration user experience framework that would address the evaluation of user experiences, a challenge that managers and eModerators using eModerate systems currently face. The main research question was: "*What constitutes an appropriate framework for evaluating the user experience of an eModeration system?*" The following provides a summary of the discussion presented in each chapter.

The literature review presented in Chapters Two and Three focused on defining the research areas and identifying frameworks in both eModeration and user experience that were relevant to the research problem. Theories related to user experience and eModeration were first introduced in Section 1.2 and later, in more detail, in Chapters Two and Three. The theories provided the theoretical underpinnings used to formulate the conceptual user experience evaluation framework for eModeration. Each of the user experience constructs is connected through a set of complex influences as shown in Figure 3.6, which represents the constructs that form part of user experience, namely "*user*", "*system*" and "*context*". eModerate systems in higher education institutions (context) were studied through the lens of user experience. The relationship between eModeration and user experience was further illustrated in Figure 5.1 where it can be seen that users have an internal state that is influenced by various factors and user experience elements. The system comprises certain characteristics and specific types. The context includes web applications such as eModerate systems, digital devices and specific organisations, such as higher education institutions. The mapping between eModeration and user experience was presented in Table 3.3, with guidelines set out in Table 6.2.

The existing user experience frameworks provided the descriptive knowledge as required in the theoretical bases for the design of a practical artifact (Gregor and Hevner, 2014). Chapter Three focused on contextualising user experience within eModeration. The investigation identified the fundamental constructs to be used for assessing the user experience of eModeration and guided the modelling of the framework. This was done using the relevance cycle in Design Science Research, which assisted with defining the objectives, the focus of the research, and a solution. Each of these activities was addressed in the literature review and the empirical study, and then used to design the initial conceptual User Experience Evaluation Framework for eModeration that was presented in Section 6.2. As a result an initial conceptual framework for the User Experience Evaluation Framework for eModeration was synthesised from the published literature. Evaluation criteria for the framework were also synthesised from the literature as part of evaluation and iteration one.

Chapter Four focused on the research process. The researcher adopted both an interpretive approach and a constructivist approach based on the main research objective, which was to perform an in-depth analysis of the user experience of eModerate systems in a specific higher education context. For this reason a case study research design strategy was deemed appropriate. A case study strategy supported additional data generation methods. First a survey was used and then semi-structured interviews were conducted during the course of four evaluations and iterations. A descriptive inferential numerical analysis was used for the quantitative data, while a descriptive and thematic textual analysis was used for the qualitative data.

Chapter Five described the research in context with attention being paid to the needs of managers and eModerators. After investigating the context, the eModerate solutions were then mapped to the identified needs.

Chapter Six analysed both the quantitative and qualitative data and reported on the findings from the perspectives of both the eModerators and management. Both groups of participants perceived the process and procedure of eModeration to be faster and more efficient than the paper-based process. From a managerial perspective, managers appreciated the feeling of being in control of the moderation process, while eModerators appreciated being able to moderate at a time and place convenient for them. The last section of the chapter mapped the findings back to the research questions identified in Chapter One.

Chapter Seven presented the artifact, the User Experience Evaluation Framework for eModeration, during evaluation and iteration three. A semi-structured interview was used to gather data from eModerators at MGI. The interview questions focused on testing the artifact for adequacy, simplicity, generality, exactness, clarity, completeness and relevance. The researcher ascertained that eModerate systems could assist different types of organisations (higher education institutions or any training institute that makes use of moderation) with executing the moderation task and providing a satisfactory user experience if the Environment level, eModeration Requirements level and eModeration User Experience level evaluation criteria were used by decision makers when evaluating the user experience of eModeration. In support of this strategy an evaluation criteria tool was designed and developed in conjunction with the User Experience Framework for eModeration. Furthermore, the research identified that user experience evaluation (criteria tool) should be taken into consideration when choosing an appropriate eModerate system in order to create the desired user experience for users. The research confirmed that if the eModeration requirements were not in place the user might have a negative user experience of eModeration and struggle to adopt the system. If the instrumental and non-instrumental qualities of user experience, as identified in the study, were not adequately addressed these could also have an influence on the user’s adoption of eModeration. The relationship between user and system is important and was explored together with the management thereof. Emphasis was placed on the management of eModeration requirements such as processes (access and uploading or downloading of files), procedures (eModeration and feedback), and eModeration itself (network infrastructure, service quality, support, security, devices, technologies and resources). The eModeration user experience is important in ensuring sustained use and adoption of eModerate systems. The findings of Chapter Seven assisted in answering the research questions.

Chapters Two, Three (literature review), Seven and Eight (empirical study) addressed the research question by focusing on the insights gained through evaluations and iterations three and four, wherein the framework was tested and evaluated. The identified insights guided the researcher with the design and refinement of the framework so that it would be simple, clear, exact, comprehensive and easily implemented by higher education institutions making use of moderation.

Various contributions were made to the body of knowledge during the course of the study including descriptive and prescriptive knowledge. Table 9.1 provides a summary of the research in terms of the research questions, which chapters provide answers to the questions, the outcomes and contributions.

Table 9.1 Research contribution

Sub research questions	**Chapters**	**Output items**	**Activity**	**Contribution**
What are the most important user experience constructs for the electronic moderation system's framework?	Two, Three and Five	The research question was answered in Section 2.4, which included eModeration guidelines that were extracted from the literature. Section 6.2 concluded with an initial conceptual framework for a user experience evaluation framework for eModeration, which was also derived from the literature. Section 6.5 answered the question after data gathering and analysis. This was followed by Sections 7.2.2 and 8.3.2 that confirmed the constructs.	Literature review, data collection and analysis using a Design Science Research methodology that involved six steps and four evaluations and iterations.	Identified user experience constructs for eModeration – theoretical.
Which existing user experience frameworks are relevant to the evaluation of	Two and Three	The research question was answered in Sections 3.4, 3.6 and 6.2. The question was then further	Literature review and the design and development step in the	Designed and developed Initial Conceptual User

Sub research questions	Chapters	Output items	Activity	Contribution
electronic moderation systems?		addressed in Section 6.5 after testing and refinement of the conceptual framework based on the literature.	Design Science Research process.	Experience Evaluation Framework for eModeration – theoretical.
Why do user experience issues influence the adoption of eModeration?	Seven and Eight	Identified evaluation criteria for each construct and element in the framework.	Iteration and evaluation three where the framework was refined before it was presented to Monash.	Refined Conceptual User Experience Evaluation Framework for eModeration – theoretical and practical evaluation tool.
How do the insights gained influence the design of the framework?	Eight	Verified, tested, refined and evaluated the User Experience Evaluation Framework for eModeration and an evaluation criteria tool.	Iteration and evaluation four, refinement of the framework before presentation of the final artifact.	Refined and validated the User Experience Evaluation Framework for eModeration – theoretical and practical

The research outputs included the user experience constructs for eModeration and eModeration guidelines, which emerged from the literature review process (literature review focusing on eModeration and user experience descriptive knowledge providing a theoretical basis for the design of a practical and useful artifact), and a contribution towards the broader body of knowledge on a theoretical level (prescriptive knowledge) as suggested by Gregor and Hevner (2014). The output items were based on academic literature. The research artifact, i.e. the User Experience Evaluation Framework for eModeration, along with its evaluation criteria tool constitute contributions towards the existing body of knowledge on a theoretical and practical level.

On a theoretical level, the study answers the need for research on user experience (Hassenzahl and Tractinsky, 2006) by presenting a User Experience Evaluation Framework for eModeration. In this framework environmental constructs' constitute different users and the organisation construct is in reached, with system requirements such as procedures, processes, and the concept of eModeration (network infrastructure, service quality, support, security, types of devices, technology software and resources) and eModeration user experience. This expands Hassenzahl and Tractinsky’s (2006) existing theoretical framework by extending the framework to include eModeration in the field of higher education. The User Experience Evaluation Framework for eModeration contributes towards the body of knowledge concerned with user experience and eModeration since there had been no previous theoretical consideration given to user experience frameworks in the context of eModeration. The evaluation criteria tool that emerged from the study makes an additional contribution to this body of knowledge. The User Experience Evaluation Framework for eModeration also contributes towards the “exaptation” quadrant of Gregor and Hevner’s (2014) Design Science Research Knowledge Contribution Framework in the form of an artifact and at a more abstract level, design theory about user experience evaluation of eModeration.

On a practical level, academic managers can evaluate other user experience frameworks by using the proposed User Experience Evaluation Framework for eModeration. The User Experience Evaluation Framework for eModeration should also be useful to user experience researchers when evaluating platforms (such as EasyChair) that are used to submit academic articles. In such cases, the User Experience Evaluation Framework could be used to determine the user experience of such systems when deciding which platform academics should use for the submission of articles as well as their subsequent allocation to reviewers. Here, the reviewers of academic articles would fulfill the same role as an eModerator. Furthermore, the User Experience Evaluation Framework for eModeration and the evaluation criteria tool provide the user with a toolset that can be used by the management of higher education institutions, or other academic institutions using moderation, to investigate the possibility of implementing new eModerate systems or to evaluate existing systems.

The researcher’s interpretation and amendment of Saunders et al.’s “research onion”, for Design Science Research (see Figure 1.1), user experience and eModeration (see Figure 5.1) should be considered an additional research contribution in terms of research methodology.

The following papers were presented and published on the research in order to ensure that the material was peer-reviewed and that the methodology and findings were validated:

- "*User experience evaluation of an electronic moderation system: a case study at a private tertiary education institution".* PhD proposal at a UNISA symposium 14 October 2011.
- "*Best practices towards eModeration.*" Computer Science Engineering and Technology Open Distance Learning conference, 5-6 September 2013, Magaliesberg.
- "*Adopting eModeration: Understanding the user experience in this organizational change*". 8th European Conference on Information Systems Management, 11-12 September 2014, Ghent University, Belgium.
- "*eModeration: Towards a User Experience Evaluation Framework*". Doctoral symposium at the mLearn 2015, 14th World Conference on Mobile and Contextual Learning, 17-24 October 2015, Venice, Italy.
- "*eModeration: Towards a User Experience Evaluation Framework*". SAICSIT '15: The Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists, 28-30 September 2015, Stellenbosch, South Africa.
- "Using a User Experience Evaluation Framework for eModeration". ICTAS' 2017 Conference on Information Communication Technology and Society (ICTAS), 9-10 March 2017, Durban, South Africa.

9.3 Research limitations

As discussed in Section 1.6.3, for the purposes of this study the researcher understood the term "*eModerating"* as referring to the process being followed to quality assure summative examination scripts using an electronic moderation system called eModerate. The study did not make provision for the moderation of assignments and tests because these fell outside the scope of the study. However, the researcher did identify this as an area for possible future research.

Data could only be collected from the moderators and deans after an examination session and fewer participants agreed to participate than expected. As indicated in Section 1.6.3, the potential target size could be perceived as a limitation of this study. Not all of the moderators chosen agreed to be involved in the study. A further limitation to the study concerned participation from eModerators in the third evaluation and iteration where out of the ten eModerators who had been identified only six participated. However, the use of four evaluation and iteration cycles and a mixed methods approach mitigated the challenge to some extent.

In the fourth evaluation and iteration, which was performed at Monash University, the researcher wanted to conduct a focus group session, but was unable to arrange for the participants to meet at the same time. While this disallowed group interaction it did allow for in-depth feedback with the interviewees being asked to respond to insights gained from previous interviews.

9.4 Research challenges

Not having an available user experience evaluation framework for eModeration against which to compare the outcomes of the research was a challenge.

For verification purposes it was decided to test the framework at a second HEI in SA. The challenge was to find a second HEI in SA that also used eModeration or an institution that would be interested in implementing eModeration in their moderation process. Monash University of South Africa agreed to participate because they were investigating the possibility of implementing an eModerate system.

Another challenge faced by the researcher concerned how to gather data from eModerators during specific times of the year. The questionnaire used in the survey was considered lengthy and eModerators were hesitant to complete it, rather opting not to participate in the study. In hindsight it may have been better to design a shorter questionnaire.

9.5 Research findings: The User Experience Evaluation Framework for eModeration

The following section presents the conceptual framework for the User Experience Evaluation Framework for eModeration. The framework is presented in Figure 9.4 and was constructed after having followed four evaluation and iteration phases (see Figure 9.1):

- Evaluation and iteration one — literature review (see Section 6.2).
- Evaluation and iteration two — case study at MGI Sections 6.3, 6.4 and 6.5.
- Evaluation and iteration three — case study at MGI where the User Experience Evaluation Framework for eModeration was tested with eModerators after the presentation of the first version of the artifact (see Section 7.2).
- Evaluation and iteration four — case study at Monash University where the User Experience Evaluation Framework for eModeration was evaluated with participants (see Section 8.3).

The Design Science Research design cycle was used to determine how the insights gained would influence the design of the evaluation framework for user experience and assist with creating the artifact, i.e. the User Experience Evaluation Framework, which would be used to evaluate the user experience of eModeration. Figure 9.1 serves as a summary of the research verification path that was followed during the study, which includes the evaluation and iteration phases.

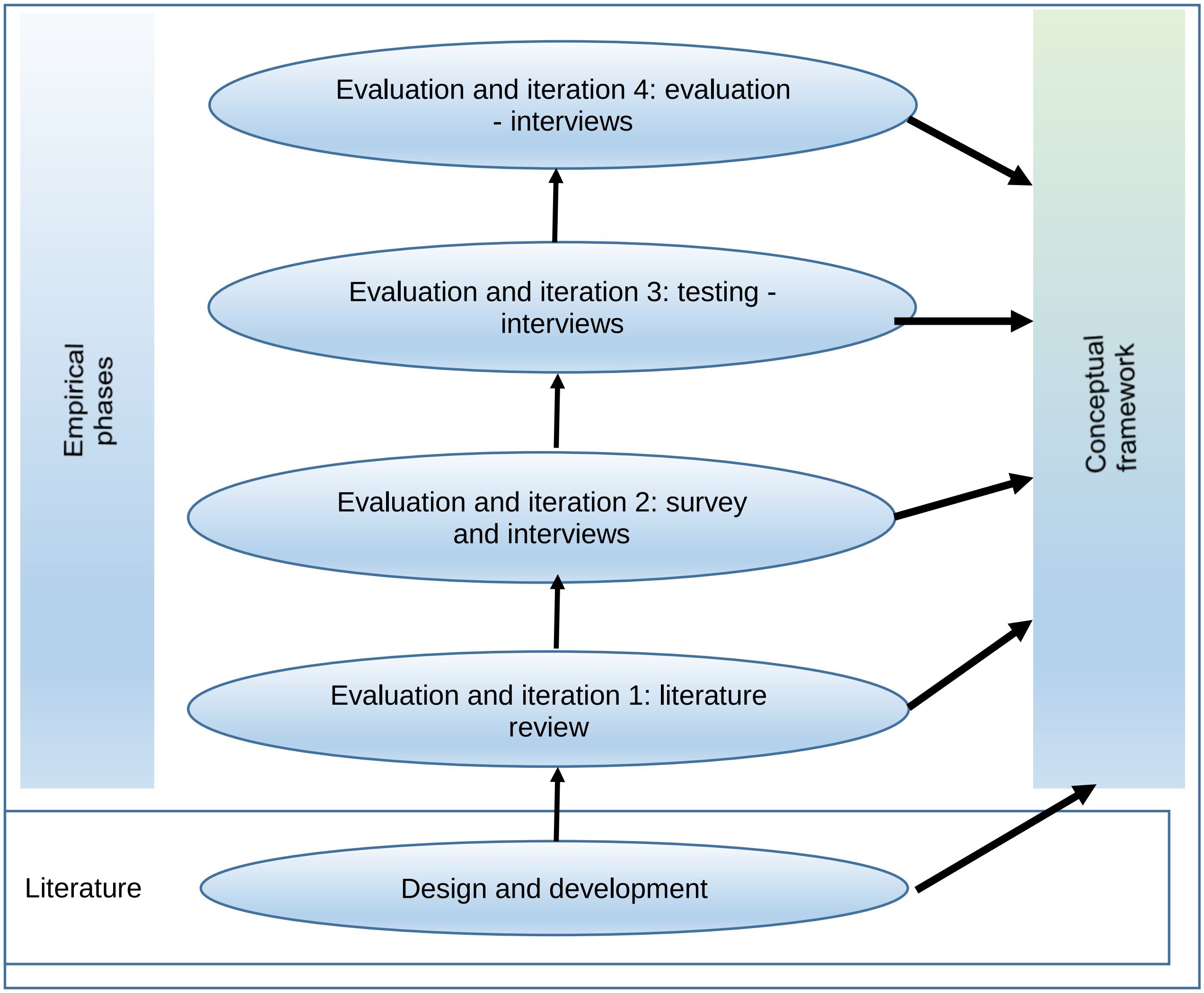

Figure 9.1 Research verification path

The iterative process of Design Science Research allowed the researcher to refine the framework and to evaluate the artifact at a different institution with a similar context. This led to a better understanding of the user experience constructs that would form part of the proposed framework. The testing and evaluation contributed to the finalisation of the framework.

Refinements and adjustments were made to the framework in the final validation phase, presented in Chapter Eight, when the framework was implemented and evaluated at Monash University South Africa. The three levels (Environment, eModeration Requirements and User Experience) used in the User Experience Evaluation Framework for eModeration as well as their corresponding constructs are briefly discussed below with reference being made to the respective chapters that explore each construct in greater detail.

9.5.1 Environment level

The Environment level constructs were identified as "*users*" and "*organisations*". In Section 8.3.2 feedback from the evaluation with respect to environment was discussed. Section 6.2.1.2, Section 6.5.1 and Section 7.2.2 discussed the constructs related to the Environment level of the framework. After evaluation it was decided to add "*IT support*" as a role and responsibility that would be covered by either the eModeration system operator or an additional IT support person depending on the resources available at the institution. With respect to the organisation, both managers and eModerators indicated that any training institution that makes use of moderation could benefit from using the framework. If the institution plans to implement the framework at micro (assessments during a semester such as tests and assignments) and macro (summative assessment such as examination scripts) levels as indicated by participants from Monash University, users such as lecturers, eTutors and unit coordinators would also need access to the system and have defined roles and responsibilities (areas to be considered for future research). Managers and user experience experts from Monash University agreed that the User Experience Evaluation Framework for eModeration could be used in academic institutions for both micro and macro level assessments.

9.5.2 eModeration Requirements level

The eModeration Requirements level constructs included "*process*", "*procedure*", and "*eModeration*" (network infrastructure, service quality, support, security, devices and technologies). Section 6.2.1.3, Section 6.5.2, Section 7.2.2 and Section 8.3.2 discussed the constructs associated with the Requirements level. After the evaluation of the framework, the researcher refined the framework using the recommendations put forward by the eModerators from MGI and the participants from Monash University. Both the eModerators and the managers agreed that the constructs associated with the eModeration Requirements level were adequate. Section 8.3.2 provides a complete summary, in Table 8.3, of where constructs or evaluation criteria were added.

The eModeration Requirements level should be understood as having been aligned with the organisation's processes and procedures. Decision makers would need to ensure that the eModerate system that they are evaluating will fit with their processes or procedures and make provision for these.

The construct "*resources*" was added with associated evaluation criteria. For example, with reference to devices, it is important to find out if the institution has a scanner. With respect to technology, it is important to find out if the institution has a platform for eModeration. The institution would need to investigate which resources would be needed in order to use such an eModerate system. Resources range from staff and technology to financial resources (see Section 8.3.2).

Training was also identified as a resource requirement. Training was added as a role and responsibility for the eModeration system operator who would be responsible for distributing a training manual or providing training when needed. An evaluation criterion for training was added to the service quality construct.

In order for the framework to be implemented successfully with satisfactory user experience, the Environment and eModerate Requirements levels need to be in place before attention can be paid to the eModeration User Experience construct level. Users in an organisation need certain eModeration requirements to be implemented in order to ensure a good user experience for the user.

9.5.3 eModeration User Experience construct level

The User Experience construct level was initially identified in evaluation and iteration one (see Section 6.2.1.1) and made use of user experience constructs from different areas, such as eCommerce and mHealth. After further investigation and empirical study (see

Section 3.4.1 (Mahlke and Thüring, 2007) and Section 6.5.3), two areas affecting user experience were identified: instrumental (usability) and non-instrumental qualities (user experience) associated with user experience. These qualities work jointly with the Environment and eModeration Requirements levels to ensure a satisfactory user experience. Section 6.5.3 explained the constructs under the User Experience level in more detail after evaluation and iteration two, while Section 7.2.2 only showed adjustments to the constructs in the framework after evaluation and iteration three. No additional qualities were identified in the validation and evaluation of the framework in evaluation and iteration four (see Section 8.3).

Under the "*content*" construct an evaluation criterion was added to ensure that all those involved in eModeration are aware of what should be uploaded to an eModerate system. This took the form of a checklist.

Table 9.2 summarises the User Experience Evaluation Framework for eModeration's evaluation criteria that are to be used in conjunction with Figure 9.2, which outlines the final User Experience Evaluation Framework for eModeration after following the *ex ante* and *ex post* evaluation strategy to evaluate the artifact.

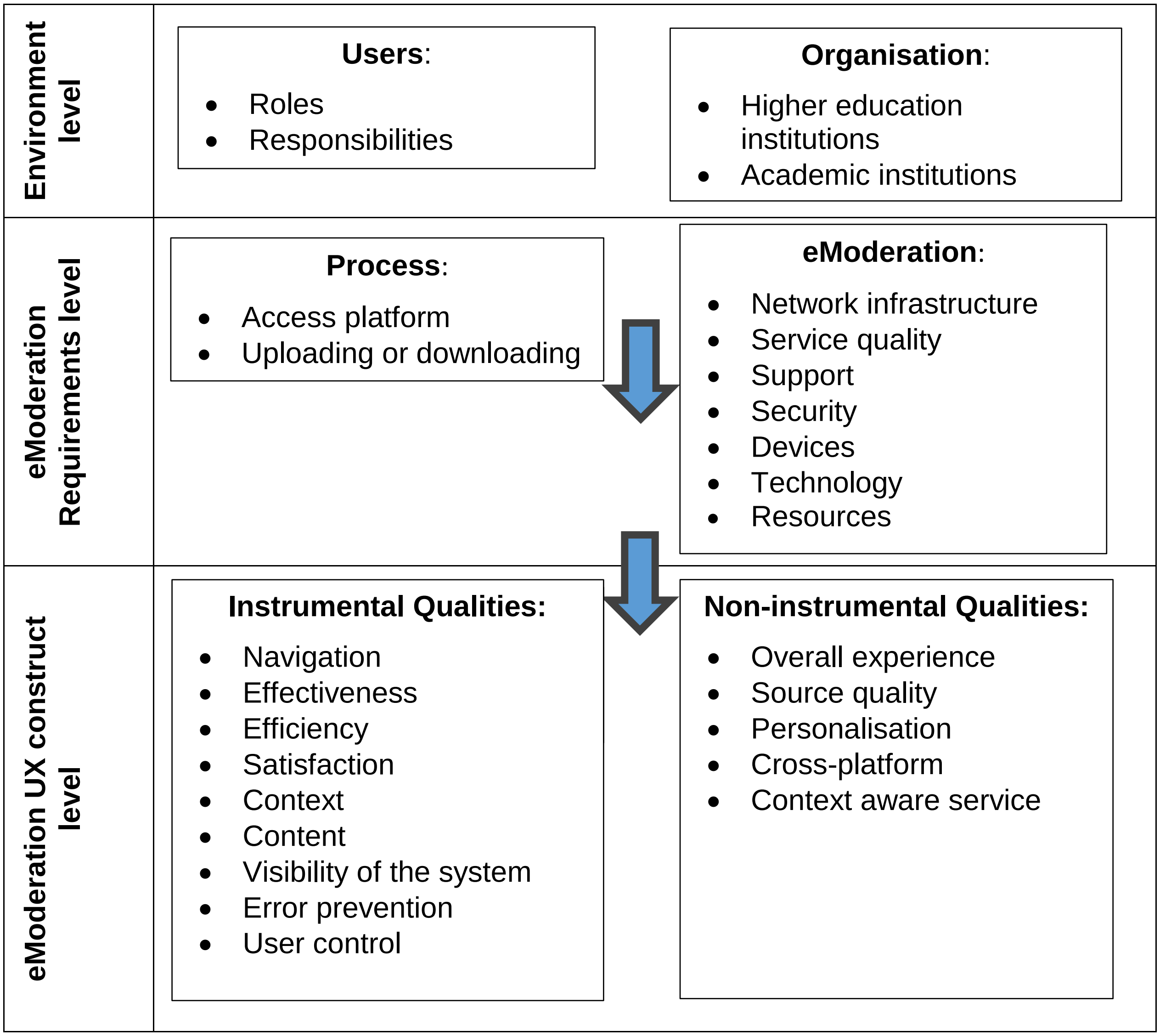

Figure 9.2 Final User Experience Evaluation Framework for eModeration

Table 9.2 User Experience Evaluation Framework for eModeration evaluation criteria

<table>
<tr><td colspan="2">User Experience Evaluation Framework for eModeration</td></tr>
<tr><td colspan="2">EVALUATION CRITERIA FORM

The purpose of this evaluation criteria form is to serve as a tool to evaluate eModerate systems with eModeration user experience constructs associated with three levels, namely Environment, Requirements and User Experience.

The procedure to follow:
Read through the three levels presented below, that describe the identified evaluation criteria and constructs associated with eModeration.
Observe the structure of the proposed framework: the User Experience Evaluation Framework for eModeration.
Evaluate the eModeration system using the proposed evaluation criteria as stipulated according to the three required levels, to determine the user experience of the proposed eModerate system.
Use the evaluation criteria tool with the framework to evaluate the eModerate system.</td></tr>
<tr><td colspan="2">Environment Level</td></tr>
<tr><td rowspan="2">Users</td><td>ROLES

Managers:
To manage the identification of eModerators for respective modules.
To manage the information needed for eModeration by the eModeration system operator.
To manage the eModeration process and the outcomes.
eModeration system operator:
To manage the online process, access, security and navigation.
To provide IT support for the eModerators and managers.
To provide training to eModerators.
IT Support:
To manage the IT infrastructure needed for eModeration, for example, scanners, computers, network and internet.
To manage the internet availability, bandwidth and firewalls.
To manage the network infrastructure needed for archiving purposes.
To manage IT support for eModerate users.
eModerator:
To use the eModerate system.
To moderate examination scripts electronically.</td></tr>
<tr><td>RESPONSIBILITIES

Manager:
To communicate to the eModeration system operator a list of all eModerators.
To oversee the process of eModeration.
To provide feedback to lecturers after the eModeration process has been completed.</td></tr>
</table>

<table>
<tr><td></td><td>eModeration system operator:
To create eModerate pages for each module and assign secure access rights to eModerators.
To upload information needed for eModeration.
To handle queries from eModerators.
To ask for IT support in cases where eModerators cannot resolve the problems.
To provide training to eModerators.
IT Support:
To ensure that IT infrastructure is adequate for eModeration, for example, scanners, computers, network and internet.
To ensure that internet is available, enough bandwidth is provided, and that there are adequate firewalls.
To ensure that adequate network infrastructure is available for archiving purposes.
To ensure that they can support eModerate users when needed.
eModerator:
To download scripts.
To moderate the examination scripts electronically.
To upload the electronic scripts back onto the system after eModeration.</td></tr>
<tr><td>Organisation</td><td>HIGHER EDUCATION INSTITUTION
The application domains are higher education institutions.
The framework can also be used in colleges, schools and other academic institutions.</td></tr>
<tr><td colspan="2">eModeration Requirements Level</td></tr>
<tr><td rowspan="2">Process</td><td>ACCESSING THE PLATFORM
To create appropriate login pages.
To create eModerate pages per module.
To assign and award secure access to the relevant people for their respective eModerate pages per module.</td></tr>
<tr><td>UPLOADING/DOWNLOADING
To put a process in place for the uploading of examination papers, memoranda, reports and examination scripts for moderation.
To put a process in place for eModerators to upload the eModerated scripts and feedback reports smoothly and efficiently.
The manager to track the process of moderation.
After eModeration is complete the manager can download eModerator reports and provide feedback to internal examiners during the process.</td></tr>
<tr><td>Proce</td><td>eModerate
To use the eModerate procedure that explains in detail the specific tasks to be executed during eModeration, for example, by whom, when and how is the procedure performed?</td></tr>
</table>

	• The eModerate procedure uses different users who perform specific tasks:
	    o Managers involved in eModeration provide information to the eModeration system operator to create module pages and assign eModerators to the pages.
	    o eModeration system operator receives information from manager, creates pages and users (eModerators).
	    o eModerators involved in eModeration follow procedure by accessing the eModerate system, downloading examination scripts, electronically moderating scripts and finally uploading scripts and moderation reports.
	    o Managers receive notification that the eModeration task is complete and then download scripts and reports.
	    o Managers act upon reports and provide feedback to internal examiner.
	    o eModeration system operator to ensure continuity between the users and system.

	FEEDBACK • A procedure must be in place in order for the eModerator to provide feedback on moderation to the manager using the eModerate system. • The procedure should make provision for feedback from the manager to the internal examiner. • The system should also make provision for feedback to users about the status of the processes, i.e. the scripts have been uploaded and are ready to be downloaded for moderation and vice versa, through emails automatically generated by the system and sent to users.

eModeration	**NETWORK INFRASTRUCTURE**
	• Ensure appropriate network infrastructure for reliable and time effective distribution of the eModeration documentation.
	• Ensure appropriate access connectivity to network infrastructure.
	• All role players should have internet access for eModeration to be successful.
	• Ensure that network infrastructure is considered a resource and forms part of the cost involved in doing eModeration.
	SERVICE QUALITY
	• Ensure that the level of service provided by the eModerate system is satisfactory.
	• Ensure that the quality provided by eModeration is satisfactory for a good user experience.
	• Ensure that the user does not experience frustration when interacting with the eModeration product.
	• Ensure that the eModerate system is easy to navigate, user friendly and that users can get the information they need to complete the task by including a checklist of what should be available.
	    o Moderator's reports
	    o Examination papers
	    o Examination memoranda
	    o Examination scripts
	    o Mark sheets, rubrics
	    o Students' marks
	• Ensure that the eModerate system provides two-way communication between the users.
	• Ensure that the training manual provided to users is satisfactory.

SUPPORT

- Provide adequate support from the eModeration system operator to managers and eModerators.
- Provide IT support to the eModeration system operator.
- Ensure that system maintenance and upgrades are available.
- Ensure that resources such as IT support, training support and staff resources are available to work with the eModerate system.

SECURITY

- Ensure that the eModerate system is secure and only accessible to legitimate users of the system.
- Create unique logins and passwords for all users.
- Ensure that the login details are communicated effectively to users and explain how the details will be communicated.
- Build levels of security into the system, for example, the manager is to have access to all of the modules while eModerators should have access only to the page(s) that they eModerate.

DEVICE – TYPES

- Ensure that users can access the eModeration process using different types of devices, i.e. tablets, desktops or laptops of their choice as long as these are cross-platform.
- Ensure adequate (reliable, acceptable performance in terms of speed) hardware and software for the use of eModeration interaction.

TECHNOLOGY – SOFTWARE

- Moodle can be used as a software package.
- An alternative option is Google documents.
- The software should be accessible to all users.
- Check whether or not off-the-shelf software is available.

RESOURCES

- Ensure that enough budget is available, for example, for IT infrastructure, IT support, staff, etc.
- Ensure that enough IT infrastructure is available to sustain eModeration, for example, scanners, desktop computers, internet and network.
- Ensure that staff are available who can provide training to users.
- Ensure that the system is cost effective for the institution.

eModeration User Experience Construct Level

Instrumental qualities

NAVIGATION

- Ensure quick and easy navigation through pages to accomplish the tasks.
- Ensure that users know where they are and have options for where to go next.
- Ensure a balance between navigational options so as not to overwhelm users.
- Ensure that related information is placed together.
- Ensure that common browser standards are followed.
- Ensure that each page has all the required navigation buttons, such as *previous* or *next* and *home*.
- Terminology used should be understandable.

	EFFECTIVENESS • Ensure that eModerators can effectively moderate papers electronically using the eModerate system. • Ensure that facilities and activities are available to encourage interaction with the eModerate system. • Ensure effective access to information to complete the task. • Ensure that the users achieve their goal when using the system.
	EFFICIENCY • To ensure that a high level of productivity is maintained by users when using the eModerate system. • To ensure that the user should be able to complete the task in a shorter time frame than when using the manual paper-based method. • To ensure that the number of steps required to complete the task should be kept to a minimum. • To ensure efficient uploading notification to all users in control of the process. • To ensure that fewer resources are required to complete the task, i.e. no transportation of examination scripts. • To minimise the effort required to complete the task of eModeration.
	SATISFACTION • Consider that the eModerate users' satisfaction levels, when interacting with the product, are influenced by the product qualities: utility, usability and visual appeal. • The satisfaction levels as influenced by stimulation during product use and quality perception by users. • Ensure that the users are satisfied with what is available on the eModerate system.
	CONTEXT • Refers to the environment in which the user operates. • Ensure that users understand that in an eModeration environment the usage context includes the aim of the product, i.e. to electronically moderate examination scripts. • Ensure that the users perceive the eModeration activity as meaningful. • Ensure that the representation is understandable and meaningful, i.e. ensuring that the symbols, icons and names used are intuitive within the context of eModeration tasks. • Ensure that the context of the organisational setting does not affect the eModeration activity. • Ensure that the infrastructure, services, users and technology to be used are adequate and that these contribute to the interaction in context.
	CONTENT • Information provided to the users should be clear and easy to navigate when they interact with the system. • Provide appropriate, comprehensive and accurate information. • Provide content that is relevant to moderation. • Ensure that the content is structured in a way that facilitates the achievement of the users' goals. • Ensure that the users are aware of the assessment format with unique characteristics specific to certain module assessments. • Provide a checklist that users can use to find out what should be uploaded, for example, examination papers, examination memoranda, examination scripts, moderators' reports, marking criteria, marks sheet, etc.

	VISIBILITY OF THE SYSTEM • Ensure that the visual appeal or aesthetics of the system are appealing to the users of the eModerate system. • Navigation and visibility of navigation links should be clear and unambiguous. • The eModerate site should not contain irrelevant information, which could distract users as they perform their tasks. • Ensure that the eModerate system keeps the users informed about the process through constructive and appropriate feedback as they interact with the system, i.e. a message explaining how long it will take to download/upload files. • Ensure that each page is “branded” so that there is an indication as to which section it belongs to.
	ERROR PREVENTION • Users should be able to easily recover from errors. • Ensure that some error prevention help functions are made available to users. • Ensure that a link to the eModeration system operator is available. • Ensure that the users can obtain IT support if needed. • Ensure that there is a system maintenance plan in place.
	USER CONTROL • Ensure that role players have control of information as it goes through the eModeration system. • Ensure that managers are in control of the process of eModeration. • eModerators can also control where and when they want to complete the task. • Clearly marked *“exit”* button/icon needs to be visible.
Non-instrumental attributes	**OVERALL EXPERIENCE** • It is important that the users’ overall interaction with the system is positive in order to contribute towards a positive user experience. • Ensure that the overall user experience of the system is enjoyable.
	SOURCE QUALITY • Ensure that the quality of the information required to complete the task of eModeration is accurate and complete. • Ensure that the source quality is clear, relevant, appropriate and engaging for role players when using the eModerate system.
	PERSONALISATION • Ensure that all the role players can see that they are logged in. • Ensure that all the role players can see what they have access to. • Ensure some personalisation of their eModerate page(s). • No need for eye recognition technology.
	CROSS-PLATFORM • To ensure that managers and eModerators are able to access the eModerate system using different platforms and different devices.
	CONTEXT AWARE SERVICES • The users should be made aware of the services that the eModerate system offers. • Ensure that meaningful contextual information associated with the eModerate content is provided.

9.6 Seven guidelines used to evaluate the Design Science Research methodology followed in this study

Hevner et al. (2004) suggested seven guidelines for conducting Design Science Research (see Section 4.6.1.6), which have been used to answer the main and subquestions posed in this thesis. The next section summarises and answers the questions posed by the guidelines.

Guideline 1: Design an artifact

The research managed to produce a purposeful innovative artifact, i.e. the User Experience Evaluation Framework for eModeration.

Guideline 2: Relevant problem

The objective of Design Science Research is to develop a relevant solution to a problem for a specific domain using technology-based solutions. The researcher managed to create a relevant solution to a practical problem in a specific domain called electronic moderation, which is also referred to as eModeration.

Guideline 3: Design evaluation

Thorough evaluation techniques were used to evaluate the artifact (see Section 8.2). The researcher used an evaluation technique recommended by Sonnenberg and Vom Brocke (2012a), see Figure 4.9. The implementation plan for evaluation of the artifact was described in detail in Section 4.8. Figure 4.10 demonstrated how Sonnenberg and Vom Brocke's (2012a) evaluation pattern was implemented and integrated into this study.

The research used an iterative evaluation process consisting of four stages:

- Stage one was an evaluation of the literature;
- Stage two was an evaluation of the conceptual framework at MGI that was used to determine which of the current user experience constructs used for eCommerce and mLearn web pages were relevant to eModeration;

- Stage three was an evaluation where the refined conceptual framework was evaluated with the eModerators; and
- Stage four consisted of an external evaluation with a second higher education institution.

The researcher used a well-executed evaluation method that incorporated utility, quality, efficacy and rigour to ensure that the artifact was indeed applicable and relevant.

Guideline 4: Research contribution

The researcher produced an innovative artifact that solved a problem using technology. Considering Gregor and Hevner's (2014) Application Domain Maturity matrix for placing DSR knowledge contributions this eModeration evaluation framework bears some similarity to inventions. Gregor and Hevner (2014:345-346) describe an invention as an "artifact that can be applied and evaluated in a real-world context and when new knowledge is contributed to the Ω and/or ʌ knowledge bases Design Science Research projects in this quadrant will entail research in new and interesting applications where little current understanding of the problem context exists and where no effective artifacts are available as solutions". However, claiming that the eModerate evaluation framework is a clear departure from accepted ways of thinking and doing is problematic and therefore, the researcher considered classifying the artifact in the exaptation quadrant where known solutions are extended to new problems. Exaptation is described as "the adaptation of a trait for a different purpose from its original purpose where new technology advances often require new application and a consequent need to test or refine prior ideas … new advances open opportunities for the exaptation of theories and artifacts to new fields" (Gregor and Hevner, 2014:347). This is relevant since user experience frameworks associated with other fields such as eCommerce and mHealth exist. However, at the inception of this study no User Experience Evaluation Framework for eModeration existed and the researcher applied knowledge from the existing frameworks to a different purpose in the user experience field to guide the design and development of the new artifact. The contribution to the field of knowledge is the User Experience Evaluation Framework for eModeration, and an evaluation criteria tool. The researcher also published several peer-reviewed academic papers based on the research as indicated in Section 9.6.

Guideline 5: Research rigour

As discussed by Hevner et al. (2004), if these guidelines for Design Science Research are followed rigorously they will differentiate the research from normal design. The artifact was defined in Section 6.5, refined and redefined again in Section 7.3, and finally presented in Section 8.2. It was then illustrated in Table 9.2 and Figure 9.2. The artifact was also formally presented to the academic community through publications. Rigorous methods were implemented during the construction and evaluation of the designed artifact.

Guideline 6: Design a search process

Part of the design and development of the artifact involved a search process. The problem space was constructed and mechanisms employed to find an effective solution. The search process incorporated a literature review and an empirical study that guided the researcher in finding effective solutions to the problem.

Guideline 7: Communication of research

The final objective of Design Science Research, as recommended by Hevner et al. (2004), is to communicate the results effectively. The results of the study were communicated to specific target audiences including academics at national and international conferences, technology-orientated industry specialists who attended the conferences as well as management-oriented groups (management at MGI and Monash University of South Africa).

9.7 Discussion and future research directions for The User Experience Evaluation Framework for eModeration

Perspectives on eModeration were presented in Section 2.3 and those regarding user experience in Section 3.3. User experience in the context of eModeration was presented in Section 3.6, while Section 6.2 discussed perspectives on how the user experience of eModerate systems should be evaluated. Included in this discussion were three levels, namely the Environment level, the eModeration Requirements level and the User Experience construct level. Each level focused on the identification of constructs, to be used in that level, that correlated with user experience evaluation. As discussed in Section 3.4 the perspectives were based on pre-existing user experience frameworks, which also included the constructs system, user and context with context correlating to the Environment level, system to the eModeration Requirements level and user to the User Experience level. This research further confirmed the position taken by mapping (see Table 3.3 in Chapter Three) the user experience constructs, as indicated by Rubinoff (2004, 2009), Paluch (2006), Hassenzahl and Tractinsky (2006) and Roto (2006), with eModerate systems. The users (deans and moderators) and processes (moderation) involved in the eModerate system needed to comply with the user experience constructs in order to be successful. As Pretorius (2012) concluded user experience guidelines can only be implemented successfully if executives supports implementation, staff are trained, and sufficient budget is available, these principles are also relevant to the user experience of eModeration. Various factors affect the user and the context when designing for eModeration user experience.This research confirms the position taken by Mahlke and Thüring (2007) with respect to instrumental and non-instrumental qualities associated with user experience. The User Experience level was designed to include instrumental and non-instrumental qualities. The research was included in the validation phase evaluation measures to ensure that the research conformed to existing frameworks and theories. It should be recognised that higher education institutions are currently investigating the possibility of using technology in their processes, especially with regards to moderation. The User Experience Evaluation Framework for eModeration can be used by managers and educators at academic institutions to implement eModerate systems that could result in positive user experiences.

As Coates and Thakur (2013) pointed out in their study, higher education institutions are under pressure to use online technologies because of expansion and key driving forces associated with cost and pricing. Grainger et al. (2015) indicated that cloud applications allow these institutions to share content or online moderation. Meetings can then be scheduled to process the moderation of the examinations. Grainger et al.'s (2015) primary concern with technology focused on users' limited understanding of moderation, assessment and quality assurance and not on the use of eModerate systems as such or the user experience thereof. The User Experience Evaluation Framework for eModeration went beyond eModeration practices that are used only in focus meetings. This framework was designed so that eModeration systems may be used to complete the moderation of examination scripts and provide feedback electronically.

The future of user experience evaluations of eModerate systems is expected to change as new technologies emerge. The case study presented in this research indicates the benefits to be gained by academic institutions making use of this framework. The focus of this study was on the moderation of examination scripts only (macro level) and not on the moderation of tests and assignments (micro level). Going forward the framework could be expanded to include more users (academic administrators, lecturers or examination officers) and could be implemented at the micro level (assignments and tests during the semester or year) and macro level (not just final examination scripts, but also theses or dissertations).

9.8 Reflection

The study started with a publication that explored how moderation was going green by using eModeration rather than paper-based systems. An in-depth investigation into eModeration and human-computer interaction in a broad sense was undertaken and led to a focus on user experience. The theories associated with user experience and eModeration were then used as a theoretical framework. In the investigation into eModeration and user experience a knowledge gap was identified and guided the researcher in the formulation of the main research problem and subsequent questions. The main problem statement was: no framework exists in the extant literature to evaluate the user experience of electronic script moderation at higher education institutions.

The process of formulating the research topic, research problem and questions was interesting yet challenging. The research was also a personal journey for the researcher who worked in the same environment and who wanted to find a feasible solution for a very practical problem faced by higher educations in SA. Not only did the process of investigation eliminate irrelevant information, but it also afforded the researcher the opportunity to discuss the research with peers within the academic community as well as publish work related to the study. The presentations and publications assisted with refining the research questions, as well as with the design and development of the User Experience Evaluation Framework for eModeration.

The investigation revealed that user experience frameworks exist in eCommerce and mHealth, but that there was no user experience evaluation framework that could be used specifically for eModeration systems. The objective of the research question was to establish an evaluation framework that could be used by the management of academic institutions to evaluate the user experience of an eModerate system and to establish user experience evaluation criteria.

The context in which the study was applied made it necessary to obtain an in-depth understanding of the context, which resonates with interpretivism as a philosophy. However, the practical nature of the problem and the context also called for a pragmatic approach, which involves pragmatism as a philosophy. A mixed methods approach was followed to gather data, before the data was analysed and interpreted, using a case study as a research strategy to answer the research question.

Initially the researcher did not plan to use Design Science Research, but later decided to use this methodology because of the practical nature of the problem. The researcher has learnt a lot through the process and developed an extra research skill set. Design Science Research was a completely new area for the researcher, and proved to be challenging with a research process comprising six steps that included four evaluation and iteration phases. The Design Science Research methodology involved the repetition of steps with each repetition making use of different evaluation techniques as explained in Chapter Eight. In order to contribute to the user experience and eModeration body of knowledge various constructs were identified as well as evaluation criteria, which will enable managers to evaluate the user experience of eModerate systems. The research also focused on the way in which IT support would be needed in order for eModeration systems to be effective and to support managers in their decision making processes. The researcher addressed a series of questions that resulted in the evaluation criteria for the

User Experience Evaluation Framework for eModeration and answered the research problem. The study finally concluded with the empirical validation and the evaluation of the framework both of which were successful.

The User Experience Evaluation Framework for eModeration developed in this study acts as a reference point for higher education institutions and other academic institutions intending to utilise electronic moderation systems to address the user experience gap associated with eModerate systems. The User Experience Evaluation Framework for eModeration derived from this research offers the management of academic institutions a framework that can be used to evaluate a specific system (eModerate system), using specific users (eModerators, eModeration system operator, managers, IT support) in a specific context (higher education institutions).

The User Experience Evaluation Framework for eModeration will be valuable to organisations that wish to evaluate eModerate systems and will aid in improving the quality of their decision making process when deciding which eModerate system to implement. Both eModerators from MGI and participants from Monash University perceived the User Experience Evaluation Framework for eModeration as being valuable. Participants from Monash University indicated that the framework could definitely be used to evaluate the user experience of eModerate systems. Participants from Monash University also saw the potential for utilising the framework at a micro level in their institution.

In a time of innovation, looking at new and better ways of doing things, the User Experience Evaluation Framework for eModeration is pivotal in ensuring the sustainability of eModerate systems. In summary, the contribution of this study was the development of a useful and valuable evaluation framework called the User Experience Evaluation Framework for eModeration that did not exist prior to this research.

"*If you want to reach a goal you must see the reaching in your own mind before you actually arrive at your goal*." Zig Ziglar

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Appendix A: Ethical Clearance

Ethical Clearance MGI

MIDRAND
GRADUATE INSTITUTE

TO WHOM IT MAY CONCERN

RESEARCH ETHICAL CLEARANCE NO: MGI/1/2011/04

4th November 2011

RE: APPROVAL TO CONDUCT RESEARCH AT MIDRAND GRADUATE INSTITUTE (MGI)

MS. CORNE VAN STADEN – STUDENT NUMBER 4902-102-8

This is to confirm that the Research Committee of the Midrand Graduate Institute (MGI), acting on behalf of the Management of MGI, has granted Ms. Corne van Staden approval to undertake a research project towards her PhD (Computer Science) at MGI as follows:

RESEARCH FIELD OF STUDY/TITLE

User experience evaluation of an electronic moderation system: a case study at a private tertiary education institution.

It is understood that appropriate protocols, with particular reference to consent by, and confidentiality for all participants, will be observed. It is further agreed that the results of the study will be made available to the MGI EXCO.

The Management of MGI wishes Ms. Corne van Staden success in her studies.

Professor Melvin M. Kambuwa
Dean: Research and Postgraduate Development

Dr. Johan B. Freysen
Vice Principal (Academic)

44 Alsatian Road, Glen Austin Ext. 3, Midrand, 1685, P O Box 2986, Halfway House, 1685, Tel: +27(0)11 690 1700, Fax: +27(0)11 690 1685, info@mgi.ac.za, www.mgi.ac.za

Directors: Michiel Bornman (Non-Executive), Tom Brown (Managing), Fathima Dada, Darren Fox, Riaan Jonck, Wayne Press, Derick Zitha

UNISA college of science, engineering and technology

Ms CJ van Staden
School of Computing
UNISA
Pretoria

2012-08-20

Permission to conduct research project

Ref: 032/CVS/2012

The request for ethical approval for your PhD (Information Systems) research project entitled "User experience evaluation of an electronic moderation system: a case study at a private higher education institution" refers.

The College of Science, Engineering and Technology's (CSET) Research and Ethics Committee (CREC) has considered the relevant parts of the studies relating to the abovementioned research project and research methodology and is pleased to inform you that ethical clearance is granted for your study as set out in your proposal and application for ethical clearance.

Therefore, involved parties may also consider ethics approval as granted. However, the permission granted must not be misconstrued as constituting an instruction from the CSET Executive or the CSET CREC that sampled interviewees (if applicable) are compelled to take part in the research project. All interviewees retain their individual right to decide whether to participate or not.

We trust that the research will be undertaken in a manner that is respectful of the rights and integrity of those who volunteer to participate, as stipulated in the UNISA Research Ethics policy. The policy can be found at the following URL:
http://cm.unisa.ac.za/contents/departments/res_policies/docs/ResearchEthicsPolicy_apprvCounc_21Sept07.pdf

Please note that if you subsequently do a follow-up study that requires the use of a different research instrument, you will have to submit an addendum to this application, explaining the purpose of the follow-up study and attach the new instrument along with a comprehensive information document and consent form.

Yours sincerely

H H Lotriet

Chair: School of Computing Ethics Sub-Committee

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Ethical Clearance Monash University

Indicate if ethics clearance has been obtained. If yes, please attach certificate

Ethical clearance have been obtained from UNISA and MGI to conduct the study. Ethical clearance from Monash University SA is however required.

YES ✓ NO

Indicate, if any, support would be needed from Monash South Africa

I need 5-10 people that will be willing to participate in the study and evaluate the eModeration User Experience framework.
I would also need access to logistical information from Monash such as assessment and moderation policy, size of the institution, how long the institution have been using eModeration, what type of eModeration system they are using etc. in order for the researcher to sketch the research in context between MGI and Monash SA.

If the project is allowed to take place at Monash South Africa, the undersigned investigators undertake not to reveal the identity of Monash South Africa in any research publication without the necessary approval and that only the collected data will be used.

(This agreement must be signed by all investigators)

Principal Investigator's Name and Signature:

Date: 4/9/2015

Not applicable

Co-Investigator's Name and Signature:

Date

Main Supervisor's Name and Signature:
(If applicable)

Date

APPROVAL:

Prof A Louw
Academic President
Monash South Africa

Date 4/09/15

All communication regarding research to be conducted at the MSA campus must be directed to Ms H Stols, Research Coordinator via e-mail to hester.stols@monash.edu.

Note: Attach the following documents where applicable:

- Ethics clearance certificate
- Explanatory statement
- Informed consent form
- Questionnaires
- Interview questions

Appendix B: Consent forms eModerators, Deans and Monash participants

Information leaflet and consent form for eModerators and Deans at MGI

INFORMATION LEAFLET

PROJECT TITLE: USER EXPERIENCE EVALUATION OF AN ELECTRONIC MODERATION SYSTEM: A CASE STUDY AT A PRIVATE HIGHER EDUCATION INSTITUTION

Primary investigator:	Mrs. CJ van Staden		
Study leader:	Prof Jan Kroeze	Co-study leader:	Prof Judy van Biljon

Dear Sir/Madam

I hereby kindly request your assistance in a study that investigates the factors that influence the user's experience of an electronic moderation system at a private higher education institution (PHEI). The study forms part of the formal qualification: PhD Information Systems at UNISA, for CJ van Staden. It further forms part of the role out of eModeration across faculties at the PHEI. This information leaflet will provide a background to the study and the questionnaire that will follow after electronic moderation.

WHAT IS THE STUDY ALL ABOUT?
The evolvement of the manual moderation process towards the electronic moderation process as used in a virtual learning environment has led to its own unique challenges. These challenges are related to academic processes, people and user experience. This study will investigate the experiences of users, such as deans and moderators, using an electronic moderation system in a virtual learning environment at a private higher education institution.

The term *electronic moderation* or *eModeration* are being defined as: "eModerate can be defined as the electronic moderation of summative examination scripts by external moderators in a virtual learning environment called eModerate" (MGI, 2010:3). In the context of this study, the eModerator will be the moderator of a module who will preside over the electronic moderation of examination scripts and will provide a moderation report on the assessment.

The current moderation process of examination scripts relies on much paperwork, is tedious and time-consuming, is not cost-effective and presents problems regarding the security of scripts. For these reasons, the Midrand Graduate Institute (MGI), has decided to investigate the possibility of moving towards an electronic moderation system. An electronic moderation system moves the moderation of summative assessment off the desk and onto the desktop (computer screen) using different Internet-based technologies such as:

- free online marking tool, such as UNISA online marking tool
- sticky notes in Adobe
- a word document where the module code, student number and changes are recorded.

eModerate, an electronic moderation system used by MGI, was developed by the eLearn team using Moodle open source software. A pilot study was conducted by the researcher in the Information Technology (IT) faculty to determine whether such an electronic moderation system would be cost-effective and also to find ways of managing the processes efficiently without compromising standards, quality and integrity. The outcome of the pilot study indicated that the proposed process had made a positive impact on the environment, budgetary limitations and security issues regarding examination scripts. It also allowed for better turnaround time of moderators' feedback and afforded moderators the opportunity to moderate at a time more convenient to themselves (Van Staden, 2010).

WHAT WILL BE REQUIRED FROM YOU IN THE STUDY?

1. You will be required to moderate a module for a faculty electronically using the eModerate system.
    a. The eLearn developer (Ayo Akindolani) will send you a URL, login and password to the respective module. Only you and the dean have access to the eModerate modules. You will not be able to see other modules.
    b. After login in you will be expected to download the moderation pack which includes: the examination paper, memorandum, marks of the students and the examination scripts of the students.
    c. You then need to moderate the scripts electronically by using one of the following tools:
        i. UNISA online marking tool
        ii. Adobe sticky notes
        iii. Word document that can be found on the eModerate system. In the word document you will type in the student number, the question number, the reason why if differ (if at all), and the mark that you award.
    d. After completion of the electronic moderation you will be expected to upload the examination scripts that include your comments (if you used sticky notes or the ticks if you used UNISA online marking tool or the word document.)
2. You then need to complete the questionnaire that will take about 30 minutes to complete.
3. All answers will be treated as strictly confidential numbers will be used instead of module codes or faculty names.
4. You will be expected to email the questionnaire back to the primary investigator.
5. You will not incur any financial costs by assisting with this study.

WHAT ARE POTENTIAL BENEFITS THAT MY COME FROM THE STUDY?

1. You will be able to moderate modules wherever and whenever.
2. You will not have to wait for an examinations officer to contact you and for a driver to deliver the examination pack to you, vice versa.
3. You will be making a contribution towards improving the services provided by the PHEIs.
4. Information derived from this study will benefit the research community in further research about this field of study.
5. The outcomes of this study will only be provided to the participating institution in a research report format.

WILL YOU BE RECEIVING ANY FINANCIAL COMPENSATION OR INCENTIVE FOR PARTICIPATING IN THE STUDY?

Please note that you will not be remunerated in any form or manner for participating in the study by the primary investigator. You will however still be paid by the PHEI for your role as moderator.

HOW WILL CONFIDENTIALLITY AND ANONYMITY BE ENSURED?

Only the researcher and the supervisors will have access to the completed questionnaires. Answers will be totally anonymous and respondents' identities will not be revealed under any circumstances. The results of this study might be published in a scientific journal and presented at scientific meetings, but again without revealing the identity of the research participants. The original questionnaires will be stored in a safe place for three years, after which they will be destroyed.

WHO CAN YOU CONTACT FOR ADDITIONAL INFORMATION REGARDING THE STUDY?

The primary investigator, Mrs. CJ van Staden, can be contacted during office hours at tel (011) 690 1780 or cell 082 823 2675, or her email: cornev@mgi.ac.za.

DECLARATION: CONFLICT OF INTEREST

The researcher and/or study leaders have no personal relationship or connections with the study and/or its subjects, as well as ulterior motives which may influence the study procedure, data collection, data analysis and publication of results.

A FINAL WORD

Your willingness to assist in the study will be greatly appreciated.

REFERENCES

Midrand Graduate Institute. (2010). *Assessment Policy*. http://www.mgi.ac.za/

Van Staden, C. J. (2010). *IT Moderation Going Green!. Paper delivered at SAICSIT'10. Conference, Bela Bela, Limpopo, South Africa*. Pretoria: UNISA Production Printers.

Consent form

Research Title: User experience evaluation of an electronic moderation system: a case study at a private higher education institution

Researcher: C J van Staden email: cornev@mgi.ac.za
Address: PO Box 2985
Halfway House
1685
Telephone number: (011) 690 1780
Cell: 082 823 2675
Fax: (011) 690 1895

Date: 1 May 2012

To whom it may concern

Thank you for your willingness to complete the relevant questionnaires and/or to be interviewed for this research project. If you are selected to be interviewed, the researcher will contact you to arrange a suitable time for this to take place.

Please note the following:

- Participants' involvement in this study is voluntary; participants have the right not to participate.
- Participants are not obligated to divulge any information which they may consider private.
- Participants have the right to withdraw from the study at any time.
- The project team undertakes to treat information provided by participants as confidential. Participants will not be identified in any document either by surname, first name, or any other detail. In all documentation, reference to any participant will be under a code name. No other person, other than the project team, will be informed about the participants' involvement in this research.
- Participants consent to provide data for analysis to be reported in the study.
- The research findings will be made available to participants should they so request.
- Should participants have any queries regarding the research, now or in future, they are welcome to contact the researcher at the above address.

I understand the content of this document and am willing to participate in this research.

______________________________	______________________	__________
Name and Surname of participant	Signature	Date

Contact number: _______________
After completion, please mail to the researcher: cornev@mgi.ac.za.

Consent form for Monash University participants

INFORMATION LEAFLET – MONASH UNIVERSITY

PROJECT TITLE: USER EXPERIENCE EVALUATION FRAMEWORK OF ELECTRONIC MODERATION: A CASE STUDY AT A PRIVATE HIGHER EDUCATION INSTITUTION

Primary investigator: Mrs. Corné J van Staden
Study leader: Prof Judy van Biljon Co-study leader: Prof Jan Kroeze

Dear Sir/Madam

I hereby kindly request your assistance in a study that investigates the factors that influence the user's experience of an electronic moderation system at a private higher education institution (PHEI). The study forms part of the formal qualification: PhD Information Systems at UNISA, for CJ van Staden. This information leaflet will provide a background to the study.

WHAT IS THE STUDY ALL ABOUT?
The evolvement of the manual moderation process towards the electronic moderation process as used in a virtual learning environment has led to its own unique challenges. These challenges are related to academic processes, people and user experience. This study will investigate the experiences of users, such as deans and moderators, using an electronic moderation system in a virtual learning environment at a private higher education institution.

The term *electronic moderation* or *eModeration* are being defined as: "… as the electronic moderation of summative examination scripts by external moderators in a virtual learning environment called eModerate" (MGI, 2010:3). In the context of this study, the eModerator will be the moderator of a module who will preside over the electronic moderation of examination scripts and will provide a moderation report on the assessment. An electronic moderation system moves the moderation of summative assessment off the desk and onto the desktop (computer screen) using different Internet-based technologies such as:

- free online marking tool, such as UNISA online marking tool
- sticky notes in Adobe
- a word document where the module code, student number and changes are recorded.

The researchers would like to ask your assistance in the third iteration of the Design Science Research process where we present the User Experience Evaluation Framework for eModeration. The researchers' need your feedback on the adequacy of the UX evaluation framework in terms of simplicity, comprehensiveness, generality, exactness, suitability and clarity.

Problem statement

The theoretical problem is that no framework exists to evaluate user experience of electronic script moderation.

WHAT ARE SOME OF THE POTENTIAL BENEFITS THAT WAS IDENTIFIED FROM THE STUDY?

6. You will be able to moderate modules wherever and whenever.
7. You will not have to wait for an examinations officer to contact you and for a driver to deliver the examination pack to you, vice versa.
8. You will be making a contribution towards improving the services provided by PHEIs.
9. Information derived from this study will benefit the research community in further research about this field of study.
10. The outcomes of this study will only be provided to the participating institution in a research report format.

WHAT DID WE EXPECT OF PARTICIPANTS?

1. Participants had to use an eModerate system to moderate a module for a faculty electronically.

2. Participants participated in a survey.
3. Deans were also interviewed to determine their user experience of the eModerate system from a management perspective.
4. Only a few identified eModerators from iteration one was then chosen to take part in evaluating the initial framework.

WHAT IS THE PURPOSE OF THIS FOCUS GROUP?

1. To determine if the User Experience constructs identified by the survey is satisfactory for the User Experience Evaluation Framework of eModeration.
2. To determine if the identified levels (environment, eModeration requirements and User Experience constructs) are adequate for the measuring of the User Experience of eModeration.
3. To evaluate the User Experience Evaluation Framework of eModeration.

WHAT WILL BE REQUIRED FROM YOU IN THE STUDY?

6. You need to read the information that will be mailed to you about the User Experience Evaluation Framework to measure User Experience of eModeration.
7. You then need to take part in focus group that will take about 30 minutes.
8. You will not incur any financial costs by assisting with this study.

WILL YOU BE RECEIVING ANY FINANCIAL COMPENSATION OR INCENTIVE FOR PARTICIPATING IN THE STUDY?
Please note that you will not be remunerated in any form or manner for participating in the study by the primary investigator.

HOW WILL CONFIDENTIALLITY AND ANONYMITY BE ENSURED?
Only the researcher and the supervisors will have access to the completed questionnaires. Answers will be totally anonymous and respondents' identities will not be revealed under any circumstances. The results of this study might be published in a scientific journal and presented at scientific meetings, but again without revealing the identity of the research participants. The original questionnaires will be stored in a safe place for three years, after which they will be destroyed.

WHO CAN YOU CONTACT FOR ADDITIONAL INFORMATION REGARDING THE STUDY?
The primary investigator, Mrs. CJ van Staden, can be contacted during office hours at tel (011) 690 1780 or cell 082 823 2675, or her email: cornev@mgi.ac.za.

DECLARATION: CONFLICT OF INTEREST
The researcher and/or study leaders have no personal relationship or connections with the study and/or its subjects, as well as ulterior motives which may influence the study procedure, data collection, data analysis and publication of results.
I understand the content of this document and am willing to participate in this research.

______________________________	_______________________	___________
Name and Surname of participant	Signature	Date

Contact number: _______________

A FINAL WORD
Your willingness to assist in the study will be greatly appreciated.

Appendix C: Questionnaire Iteration Two

INSTRUCTIONS:	For Office Use Only (col. nr.)
1. Please note that some questions require only one response while others require multiple responses. 2. Please mark your choice with an "X" in the relevant position or complete in the boxes provided. 3. The questionnaire consists of 5 sections, namely: SECTION A: Biographical data – user profile information of participants SECTION B: Questionnaire on moderation SECTION C: Questionnaire on usability and design heuristics SECTION D: Questionnaire on general interface design heuristics criteria to determine user experience SECTION E: Questionnaire on user experience design heuristics Note that all information will be treated as confidential as your privacy is important to us. This research upholds the ethical research principles adhered to by UNISA. The completion of the questionnaire serves as your written consent to participate in the study of user experience evaluation of an electronic moderation system.	1-3

SECTION A: Biographical data - user profile information of participants

1. Do you have any Information Technology related qualification? (4-6)

1. Yes	2. No

If so, please specify:……………………………………………………………………

2. Profession/Career – select only one: (7-15)

1	Junior lecturer	
2	Lecturer	
3	Senior lecturer	
4	Associate Professor	
5	Full Professor	
6	Dean of Faculty	
7	Industry expert	
8	Other	

OTHER, PLEASE SPECIFY…………………………………………..

3. Company of employment:

1	University of Cape Town UCT	
2	University of Fort Hare UFH	
3	University of KwaZulu Natal UKZN	
4	University of Free State UFS	
5	University of Limpopo	

6	North West University NWU	
7	University of Pretoria UP	
8	Rhodes University Rhodes	
9	University of Stellenbosch	
10	University of Western Cape UWC	
11	University of Witwatersrand Wits	
12	University of Johannesburg UJ	
13	Nelson Mandela Metropolitan University NMMU	
14	University of South Africa UNISA	
15	University of Venda	
16	Walter Sisulu University WSU	
17	Cape Peninsula University of Technology CPUT	
18	Central University of Technology CUT	
19	Durban University of Technology DUT	
20	Mangosuthu University of Technology MUT	
21	Tshwane University of Technology TUT	
22	Vaal University of Technology VUT	
23	CTI	
24	MGI	
25	Monash South Africa	
26	Private sector	
27	Government organisation	
28	Other	

OTHER, PLEASE SPECIFY…………………………………………

16-45

4. Participant role:

1. Moderator	2. Dean of Faculty

46-47

5. Indicate the faculty under which the module falls:

	Faculty	
1.	Commerce	
2.	Creative Arts	
3.	Information Technology	
4.	Law	
5.	Social Sciences and Education	
6.	Sciences	
7.	Pre-degree	

48-54

6. Age of participant:

1. 18 – 24	2. 25 – 34	3. 35 – 44	4. 45 – 54	5. 55+

55-59

7. Gender:

1. Male	2. Female

60-61

8. Home language:

1. English	2. Afrikaans	3. Zulu	4. Xhosa	5. Sotho	6.Other

62-67

9. How long have you been an Internet user?

1. 0 – 3 months	2. 3 – 12 months	3. 12 – 24 months	4. 24 – 48 months	5. 48+ months

68-72

10 Please rate your level of computer literacy experience in the following areas by marking with a 'X':

		None	Begin-ner	Indecisive	Interme-diate	Advanced
1.	Word processing	1	2	3	4	5
2.	Spread sheets (e.g. Excel)	1	2	3	4	5
3.	Presentations (e.g. Power Point)	1	2	3	4	5
4.	Emailing	1	2	3	4	5
5	Browsing	1	2	3	4	5
6.	Blogging	1	2	3	4	5
7.	Social media	1	2	3	4	5
8.	Internet Banking	1	2	3	4	5
9.	eCommerce	1	2	3	4	5
10.	eLearn – Virtual Learning Environments	1	2	3	4	5
11.	mLearn – Mobile Learning	1	2	3	4	5
12.	eModeration	1	2	3	4	5
13.	IT professional in programming	1	2	3	4	5

73-138

11 Indicate the tasks you have performed on the Internet by marking those applicable with a 'X':

1.	Browsing for information e.g. academic articles	
2.	Online shopping	
3.	Internet Banking	
4.	Forums	
5.	Social networks	
6.	eModeration	
7.	eLearn	
8.	Search engines	
9.	Other	

OTHER, PLEASE SPECIFY…………………………………………

139-148

12 Indicate where you mostly access the Internet (may select more than one):

1.	Work	

2.	Home	
3.	On the move e.g. mobile	
4.	Internet café	
5.	University	
6.	Other	

OTHER, PLEASE SPECIFY…………………………………………

149-155

13 What is the size of your Internet connection? How much can you download per month? (e.g. 1g)

		Limited	Unlimited	Do not know	Not applicable
1.	Work				
2.	Home				
3.	On the move e.g. mobile				
4.	Internet café				
5.	University				
6.	Other				

OTHER, PLEASE SPECIFY…………………………………………

156-181

14 What medium (hardware) and type of mechanism (modem) do you use to access the Internet? Specifically for the moderation of the module.

		3G connection	ADSL connection	Wireless broadband connection	Other/Don't know
1.	Cell phone				
2.	Laptop				
3.	Desktop PC				
4.	Tablets e.g. iPad, Blackberry, Android, Nokia				
5.	Kindle				
6.	Other				

OTHER, PLEASE SPECIFY…………………………………………

182-207

15. How do you rate the speed of your Internet connection?

		Very Slow		Medium		Fast
1.	Work	1	2	3	4	5
2.	Home	1	2	3	4	5
3.	On the move e.g. mobile	1	2	3	4	5
4.	Internet café	1	2	3	4	5

208-228

SECTION B: Questionnaire on moderation – moderators only	
1. Have you ever used the traditional manual paper-based moderation process of the Private Higher Education institution, Midrand Graduate Institute?	229-230

1. Yes	2. No

2. How many times have you moderated using the traditional manual paper-based moderation process for the Private Higher Education institution, Midrand Graduate Institute? — 231-236

1. 0 times	2. once	3. twice	4. three	5. four	6. five or more times

3. How many modules did you moderate using the manual paper-based process? — 237-242

1. 0	2. 1 – 2	3. 3 – 4	4. 5 – 6	5. 7 – 8	6. 9 – 10

4. On average, how many scripts did you moderate per module? — 243-248

1. 0 – 10	2. 11 – 20	3. 21 – 30	4. 31 – 40	5. 41 – 50	6. 51 or more

5. If you answered "Yes" in question B.1 above, is there anything you specifically like or dislike about the manual paper-based moderation process? Please specify below. — 249-254

Like	1
	2
	3
Dislike	4
	5
	6

6. Have you ever used an eModerate virtual learning environment to moderate examination scripts electronically before this system? — 255-256

1. Yes	2. No

7. How often have you used this eModerate virtual learning environment? — 257-262

1. 0 times	2. ones	3. twice	4. three	5. four	6. five or more times

8. How many modules did you moderate using the eModerate virtual learning environment? — 263-268

1. 0	2. 1 – 2	3. 3 – 4	4. 5 – 6	5. 7 – 8	6. 9 – 10

9. On average, how many scripts did you moderate electronically per module? — 269-274

1. 0 – 10	2. 11 – 20	3. 21 – 30	4. 31 – 40	5. 41 – 50	6. 51 or more

10. Indicate the code(s) of the module(s) and whether it was a semester or year module.

	Module code	Semester 1 June Examination	Semester 2 November Examination	Year module November Examination	
1					
2					
3					
4					

275-291

11. Which features did you use to moderate the scripts electronically?

1. UNISA online marking tool	2. Sticky Notes in Adobe	3. Word document with comments	4. Other, please specify

292-295

12. If you have used eModeration systems, is there anything you specifically like or dislike about the eModerate moderation system? Please specify below.

Like	1
	2
	3
Dislike	4
	5
	6

296-301

13. Please describe what would be important to you in the design of websites in order to create user experience.

____

____

302-303

14. Please rate the change-over from a manual paper-based moderation system to an electronic moderation system with an 'X' in the appropriate box:

	Strongly disagree		to		Strongly agree
1. It is a positive development.	1	2	3	4	5
2. The process is faster.	1	2	3	4	5
3. Fewer people will be involved.	1	2	3	4	5
4. My Internet infrastructure is able to handle the eModerate system.	1	2	3	4	5
5. The process will be easier.	1	2	3	4	5
6. Other, describe other positive comparisons					
7. Other, describe other negative comparisons					

304-331

SECTION C: Questionnaire on usability and design heuristics

Procedure to follow when using the eModerate system as a moderator:

1. Go to the URL provided by the eLearn developer.
2. Use login and password to log into the system.
3. Take about 5 minutes browsing the site to familiarise yourself with the system.

After completion of the above 3 instructions, please answer the following questions by:

- Checking the first/second box with an 'X' if you generally STRONGLY DISAGREE
- Checking the middle box with an 'X' if you are INDECISIVE
- Checking the last box with an 'X' if you generally STRONGLY AGREE

Supply reasons or additional comments under the Reason column provided

Please rate the following on a scale of 1 to 5 where 1 = the worst and 5 = the best.

Login page	Strongly disagree to Strongly agree					
Do you agree that –	1	2	3	4	5	Reason
1. It is easy to access the login page for the eModerate system.	1	2	3	4	5	
2. It is easy to log into the eModerate system.	1	2	3	4	5	
3. The security on the login page is adequate.	1	2	3	4	5	
4. The information provided on the login page is satisfactory.	1	2	3	4	5	
5. Once logged in, further information on the home page is satisfactory.	1	2	3	4	5	
6. In general I have a favourable opinion of the login process of the eModerate system.	1	2	3	4	5	
7. The functionality of the login page is adequate.	1	2	3	4	5	
Complete the following tasks and then respond to the questions: 4. Download the examination papers, examination scripts, and reports. 5. Moderate the scripts using sticky notes in Adobe or UNISA online marking tool or word document provided. 6. After completion, upload the examination scripts and signed reports.						
After completion of tasks 4, 5 and 6 please answer the following questions:						
	Strongly disagree to Strongly agree					
Do you agree that –	1	2	3	4	5	Reason
8. The layout of the module page is satisfactory.	1	2	3	4	5	
9. It is easy to find information required to download.	1	2	3	4	5	
10. The information provided to moderate the examination scripts is satisfactory.	1	2	3	4	5	

11. The security on the module page is satisfactory (e.g. you should not be able to see modules which you are not moderating).	1	2	3	4	5	
12. The functionality of the eModerate system is good.	1	2	3	4	5	

332-404

Please supply the following information by:

- Checking the first/second box with an 'X' if you generally STRONGLY DISAGREE
- Checking the middle box with an 'X' if you are INDECISIVE
- Checking the last box with an 'X' if you generally STRONGLY AGREE

System Usability	Strongly disagree to Strongly agree				
13. With reference to the homepage – it is clear what is available on the site (i.e. what modules you have access to).	1	2	3	4	5
14. The text is visibly presented.	1	2	3	4	5
15. The most important information is at the top of the page.	1	2	3	4	5
16. The information communicates the intended message.	1	2	3	4	5
17. The way the information is structured supports multiple ways to reach content (i.e. top or left navigation, etc.)	1	2	3	4	5
18. The page layout supports the best ways to reach content.	1	2	3	4	5
19. With reference to the navigational headings, it is easy to anticipate what those sections include.	1	2	3	4	5
20. The navigational heading categories are logically grouped.	1	2	3	4	5
21. It is possible to move through the site without experiencing click fatigue (too many clicks.)	1	2	3	4	5
22. It is clear where you are in the site.	1	2	3	4	5
23. Navigation links are visible.	1	2	3	4	5
24. Navigation links are meaningful.	1	2	3	4	5
25. Links to performing certain functions are logically placed ("download"/ "upload").	1	2	3	4	5
26. Related links are functional.	1	2	3	4	5
27. It is clear when you should upload.	1	2	3	4	5
28. It is clear when you should download	1	2	3	4	5
29. Sufficient information is provided to help participant's moderate examination scripts electronically.	1	2	3	4	5
30. The website provides related content (module moderator's report, result sheets, examination papers and memoranda).	1	2	3	4	5
31. All the functionality required to assist in the moderation process is available.	1	2	3	4	5
32. Contact details are provided for those needing assistance.	1	2	3	4	5
33. The website provides a sufficient set of functions to enable participants to carry out all their tasks.	1	2	3	4	5
34. The site provides the functionality to send a message.	1	2	3	4	5
35. The site provides the functionality to upload documents.	1	2	3	4	5
36. The site provides the functionality to download documents.	1	2	3	4	5
37. The eModerate website enables participants to moderate the module(s).	1	2	3	4	5

	38. The eModerate system uses less time for moderation than the manual system.	1	2	3	4	5		
	39. The eModerate website allows access to the documents needed to complete the moderation task (e.g. memorandum).	1	2	3	4	5		
	40. The eModerate system allows participants to get the job done.	1	2	3	4	5		
	41. Once participants have learned how to use an eModerate system, they can sustain a high level of productivity to carry out their tasks.	1	2	3	4	5		
	42. The eModerate system shortens the time spent completing the entire moderation process compared to the manual paper-based moderation process.	1	2	3	4	5		
	43. The eModerate system's Internet resource requirement is a consideration.	1	2	3	4	5		
	44. The eModerate system requires no transport resources (e.g. examination script moving around between moderator and campus).	1	2	3	4	5		
	45. The email that is generated after assessments have been uploaded is sufficient notice for the process to continue.	1	2	3	4	5		
	46. It is easy for the user to learn how to use the eModerate system.	1	2	3	4	5		
	47. The user needs to learn many things before he/she can utilize the system.	1	2	3	4	5		
	48. There is a quick progression to feeling comfortable with the system.	1	2	3	4	5		
	49. The interface provides support to assist participants in remembering how to carry out tasks, especially for operations they do not use frequently.	1	2	3	4	5		
	50. It is easy to remember what to do next when using the eModerate system.	1	2	3	4	5		
	51. Participants have a login and password with restriction to specific sections, e.g. a moderator can see only the eModerate webpage, while the Dean has access to all.	1	2	3	4	5		
	52. The eModerate page adheres to security and privacy standards.	1	2	3	4	5		
	53. A user would be able to hack into other modules.	1	2	3	4	5		
	54. The eModerate system process is acceptable.	1	2	3	4	5		
	55. The eModerate system is secure.	1	2	3	4	5		
	56. There is a quick response time from the system regarding the uploading of documents.	1	2	3	4	5		
	57. There is a quick response time from the system regarding the downloading of documents.	1	2	3	4	5		405-700
	58. The content is appropriate for moderation needs.	1	2	3	4	5		
	59. The eModerate website is able to fit into the context of a virtual learning environment e.g. in an eLearn system of a higher education institution.	1	2	3	4	5		

SECTION D: Questionnaire on general interface design heuristics criteria to determine user experience

Please supply the following information by:

- Checking the first/second box with an ‘X’ if you generally STRONGLY DISAGREE
- Checking the middle box with an ‘X’ if you are INDECISIVE
- Checking the last box with an ‘X’ if you generally STRONGLY AGREE

Visibility of system status	Strongly disagree to Strongly agree				
1. A user knows at all times where he/she is on the page.	1	2	3	4	5
2. It is clear where a user should go to find the examination scripts to download for moderation.	1	2	3	4	5
3. Do you agree or disagree that each page should be branded with an indication as to which faculty the module belongs to.	1	2	3	4	5
4. Links to other pages are clearly marked.	1	2	3	4	5
User control and freedom	**Strongly disagree to Strongly agree**				
5. There is a “upload” button on each page.	1	2	3	4	5
6. There is a “download” button on each page.	1	2	3	4	5
7. There is clear enough navigation on each page.	1	2	3	4	5
8. There is a logout button on each page.	1	2	3	4	5
Consistency and standards	**Strongly disagree to Strongly agree**				
9. Information on the page is displayed unambiguously.	1	2	3	4	5
10. Information on the page is displayed consistently.	1	2	3	4	5
11. Information in the navigational headings is grouped logically.	1	2	3	4	5
12. Templates are consistent (i.e. module pages, information pages, especially where moderators moderate more than one module.)	1	2	3	4	5
Error prevention, diagnosis and recovery	**Strongly disagree to Strongly agree**				
13. There is nothing on the pages which might confuse the participants.	1	2	3	4	5
14. The eModerate pages constructively suggest a solution (i.e. if anything was to go wrong with down/upload of information, the system provides participants with a detailed error message or a link that will help solve the problem.)	1	2	3	4	5
15. The buttons to upload or view new assignments are consistent.	1	2	3	4	5
16. There are many methods available to allow participants to recover easily from errors.	1	2	3	4	5
17. There are effective error diagnostics.	1	2	3	4	5
Recognition rather than recall	**Strongly disagree to Strongly agree**				
18. Participants are able to recognise where they are by looking at the current page, without having to recall their path from the home page.	1	2	3	4	5
19. Labels are descriptive e.g. .	1	2	3	4	5
20. The process involved in eModeration is relatively easy to remember.	1	2	3	4	5

21. The information provided can be clearly understood after one reading.	1	2	3	4	5
Flexibility and efficiency of use	Strongly disagree to Strongly agree				
22. Instructions are clear, informing participants on what to do next.	1	2	3	4	5
23. The flow of instructions in the process is logical.	1	2	3	4	5
24. The upload process is efficient.	1	2	3	4	5
25. The download process is efficient.	1	2	3	4	5
Aesthetic and minimalist design	Strongly disagree to Strongly agree				
26. The information on the pages is relevant and assists in speeding up the process.	1	2	3	4	5
27. The content is written specifically for eModeration.	1	2	3	4	5
28. The design is minimalistic.	1	2	3	4	5
Help and documentation	Strongly disagree to Strongly agree				
29. There is a help link available on the eModerate module page.	1	2	3	4	5
30. The help function provides sufficient information.	1	2	3	4	5
31. The help function is easy to use.	1	2	3	4	5
32. The help function provides steps to complete the task.	1	2	3	4	5

701-861

33. Please write any additional comments or elaborations you may have in the space below.

____

SECTION E: Questionnaire on user experience design heuristics

Please answer the following questions by:

- Checking the first/second box with an 'X' if you generally STRONGLY DISAGREE
- Checking the middle box with an 'X' if you are INDECISIVE
- Checking the last box with an 'X' if you generally STRONGLY AGREE

Rate the eModerate website based on:					
Aesthetic visual appeal, by indicating your satisfaction with:	Strongly disagree to Strongly agree				
1. The use of colour.	1	2	3	4	5
2. The ease with which the text can be read.	1	2	3	4	5
3. The visual load per page.	1	2	3	4	5
4. The eModerate site compared to other eModerate sites you have seen and used	1	2	3	4	5
Your overall experience of use, by indication your satisfaction with:	Strongly disagree to Strongly agree				
5. The features of eModeration.	1	2	3	4	5
6. The functionality of eModeration.					
7. Content offered.	1	2	3	4	5
8. Navigation structure.	1	2	3	4	5
9. Login page layout.	1	2	3	4	5

10. Module page layouts.	1	2	3	4	5	
11. Ease of use.	1	2	3	4	5	
12. Security with respect to privacy.	1	2	3	4	5	
13. Information architecture (what is presented and how it is structured.)						
Personalisation: I am satisfied with:	Strongly disagree to Strongly agree					
14. The way my name appears in the title bar.	1	2	3	4	5	
15. The ease with which previous sessions can be retrieved.	1	2	3	4	5	
Service quality: I am satisfied with:	Strongly disagree to Strongly agree					
16. The convenience of electronic moderation.	1	2	3	4	5	
17. Interactivity (how the eModerate website facilitates a two-way communication with the user?)	1	2	3	4	5	
Gross-platform service access. I am satisfied that I could access the eModerate pages using a:	Strongly disagree to Strongly agree					
18. Laptop.	1	2	3	4	5	
19. PC.	1	2	3	4	5	862-
20. Mobile device (including tablets.)	1	2	3	4	5	962

21. Positive aspects of the system. Please select one or more of the following words which would describe your positive evaluation of the system:

Easy to use	
Enjoyable	
Appealing	
Useful	
Comprehensive	
Friendly	
Engaging	
Effective	
Pleasing	
Sense of achievement	
Functional	
Other, please specify	

963-975

22. Negative aspects of the system. Please select one or more of the following words which would describe your negative evaluation of the system:

Uncertainty	
Frustrating	
Time-consuming	
Overwhelming	
Irritating	
Ineffective	
Not functional	
Other, please specify	

976-984

Allow me the opportunity to thank you for your time.

Appendix D: Interview schedule and interview questions with Deans Iteration two

Interview Schedule for the following research topic: User experience evaluation of an electronic moderation system: a case study at a private higher education institution

Interviews with Deans at Midrand Graduate Institute

1. Participants time plan

Faculty	Dean	Date
Commerce	Marietjie Pienaar	20/8/2012
Social Science	Dr Mari Laas	21/8/2012
Science	Dr Piet Bothma	22/8/2012
Creative Arts	Sue Giloi	29/1/2014
Law	Tina du Plessis (not participating)	Did not participate
IT	Corné van Staden (researcher)	Researcher

2. Interview process

2.1 Opening

2.1.1 Establish rapport

Thank you [Name of participant] for taking time out of your schedule and participating in this research.

2.1.2 State purpose

I am conducting this research for my PhD Information Systems degree at the University of South Africa (UNISA). It is aimed at gathering your input to evaluate the user experience of the eModeration system of MGI.

2.1.3 State time and procedure

This session will take 40 minutes. I will be asking you a number of questions related to user experience, and I need you to provide me with the answer you deem fit.

The questions are divided into three sections:

- Section A
    - Covers biographic details that gather certain characteristics about you, the participant.
- Section B
    - A questionnaire that gathers information about your perceptions of the eModeration system and process.
    - It also has questions prompting you to rate the system and the tools used for moderation.
- Section C
    - Is the last section, and gathers perceptions you have of the people, process, system and functionality of electronic moderation

You will need to complete Sections A and B by yourself. I will be asking the questions under Section C, where you need to provide me with your preferred response.

2.2 Body of interview

2.2.1 Prompt to read and sign consent form

Before we proceed, I need you to please go through the research consent form. This is in addition to what we've already discussed. It is to make sure you understand what the research is about and all the surrounding conditions for your participation. Once you've read and understood everything, please provide your signature at the bottom of the page. We will then begin.

[Hand over the participant consent form]

2.2.2 Prompt to complete Section A and B

Now we are ready to begin. Please take the next 10 minutes completing Sections A and B for me. You can mark your choice with an "X" in the box provided. Please note that some questions require a single response, while others may require multiple responses, so please answer as you see appropriate. I need you to indicate, through a rating of 1 to 5, how strongly you disagree or agree with having used the eModerate system. The rating scale is as follows:

- 1 – Strongly disagree
- 2 – Disagree somewhat
- 3 – Neither agree nor disagree
- 4 – Agree somewhat
- 5 – Strongly agree

[Give participant Sections A and B of questionnaire]

2.2.3 Administer Section C

[Participant completes Sections A and B].
Thank you.
We will now go through Sections C. Explain how Section C works.

We are no longer using a rating scale, as in the previous section. This section lists open ended structured questions about the eModeration systems: usability and user experience heuristics identified in a literature study. I will be taking you through what these usability and user experience heuristics are. After going through each usability and user experience heuristic, please answer the following questions as you see fit.
[Start asking Section C questions].

Thank you.

2.3 Closing

We are at the end of our interview. I appreciate your time and input. As previously stated, all input gathered from you will be treated confidentially. Thank you, and enjoy the rest of your [day/afternoon/evening].

Interviews with Deans

Section A: Biographical information to be completed by Dean

1.1 Faculty:

1.	Commerce	
2.	Creative Arts	
3.	Information Technology	
4.	Law	
5.	Social Sciences and Education	
6.	Sciences	
7.	Pre-degree	

1.2 Age

1. 18 – 24	2. 25 – 34	3. 35 – 44	4. 45 – 54	5. 55+

1.3 Gender:

1. Male	2. Female

Section B: Questions on the eModeration system and process

1.1 Where do you intend to access the eModerate system from?

1. Home	2. Work	3. Internet café	4. Other specify

1.2 Please rate the change-over from a manual paper-based moderation system to an electronic moderation system with an ‘X’ in the appropriate box:

		Strongly disagree to Strongly agree				
1.	It is a positive development.	1	2	3	4	5
2.	The process is faster.	1	2	3	4	5
3.	Fewer people will be involved.	1	2	3	4	5
4.	My Internet infrastructure is able to handle the eModerate system.	1	2	3	4	5
5.	The process will be easier.	1	2	3	4	5
6.	Other, describe other positive comparisons					
7.	Other, describe other negative comparisons					

1.3 Have you ever used an eModerate virtual learning environment to moderate examination scripts electronically before this system

1. Yes	2. No

1.4 How many modules in your faculty used the eModerate virtual learning environment?

____

1.5 Which feature(s) did the moderators use to moderate the scripts electronically

1. UNISA online marking tool	2. Sticky Notes in Adobe	3. Word document with comments	4. Other, please specify

1.6 Please rate your satisfaction with the tool used by the moderates to electronically moderate the scripts, where applicable. I am satisfied with:

	Tool used to moderate electronically	Strongly disagree to Strongly agree				
1.	UNISA online marking tool	1	2	3	4	5
2.	Sticky Notes in Adobe	1	2	3	4	5
3.	Word document with comments	1	2	3	4	5
4.	Other, please specify	1	2	3	4	5

Section C: Open ended structured interview questions

1.1 Each participants will be asked for their initial impression of the eModerate page(s) (graphic intensity, likes and dislikes, see if participants mention that there is no different language option)

____

1.2 Is there anything missing that you would like to see on the eModerate page(s)?

____

1.3 Is there anything that did not function properly on the eModerate page(s)?

____

1.4 Is there anything wrong with the process of eModerate?

1.5 Are there any changes that you can recommend to the process of eModerate to improve the flow of information?

1.6 Are there any other people that you would like to have access to the eModerate page(s)?

1.7 What do you think of the fact that moderation has moved away from manual paper based to an electronic moderation system?

Appendix E: Interview questions eModerators Iteration Three

INTERVIEW eMODERATORS

PROJECT TITLE: USER EXPERIENCE EVALUATION OF AN ELECTRONIC MODERATION SYSTEM: A CASE STUDY AT A PRIVATE HIGHER EDUCATION INSTITUTION

Primary investigator:	Mrs. Corné J van Staden		
Study leader:	Prof Judy van Biljon	Co-study leader:	Prof Jan Kroeze

Dear Sir/Madam
You have been approached before to take part in a survey that was used to design and develop the first User Experience Evaluation Framework for eModeration. The researchers would like to ask your assistance in the second phase of the Design Science Research process where we present the framework. The researchers' need your feedback on the adequacy of the UX evaluation framework in terms of simplicity, comprehensiveness, generality, exactness, suitability and clarity.

WHAT EXPERTISE DO WE EXPECT OF YOU?

5. You have to have used the eModerate system to moderate a module for a faculty electronically.
6. You took place in the survey during the first phase of the Design Science Research process.

WHAT IS THE PURPOSE OF THIS INTERVIEW?

4. To determine if the User Experience constructs identified by the survey is satisfactory for the design of the User Experience Evaluation Framework of eModeration.
5. To determine if the identified layers (environment, eModeration requirements and User Experience constructs) are adequate for the measuring of the User Experience of eModeration.
6. To determine what user experience issues participants should be added or removed from the framework.

WHAT WILL BE REQUIRED FROM YOU IN THE STUDY?

9. You need to read the information that will be mailed to you about the User Experience Evaluation Framework to measure User Experience of eModeration.
10. You then need to take part in an interview that will take about 15 minutes.
11. All answers will be treated as strictly confidential numbers will be used instead of module codes or faculty names.
12. You will not incur any financial costs by assisting with this study.

WILL YOU BE RECEIVING ANY FINANCIAL COMPENSATION OR INCENTIVE FOR PARTICIPATING IN THE STUDY?
Please note that you will not be remunerated in any form or manner for participating in the study by the primary investigator. You will however still be paid by the PHEI for your role as moderator.
HOW WILL CONFIDENTIALLITY AND ANONYMITY BE ENSURED?
Only the researcher and the supervisors will have access to the completed questionnaires. Answers will be totally anonymous and respondents' identities will not be revealed under any circumstances. The results of this study might be published in a scientific journal and presented at scientific meetings, but again without revealing the identity of the research participants. The original questionnaires will be stored in a safe place for three years, after which they will be destroyed.
WHO CAN YOU CONTACT FOR ADDITIONAL INFORMATION REGARDING THE STUDY?
The primary investigator, Mrs. CJ van Staden, can be contacted during office hours at tel (011) 690 1780 or cell 082 823 2675, or her email: cornev@mgi.ac.za.
I understand the content of this document and am willing to participate in this research.

______________________________	______________________	___________
Name and Surname of participant	Signature	Date

Contact number: _______________

A FINAL WORD
Your willingness to assist in the study will be greatly appreciated.

The following evaluation terms will be used:

- Completeness – the designed artifact is complete and effective when it satisfies the requirements and constraints of the problem it is solving.
- Simplicity - A simple model makes it possible to comprehend the essence of the modelled concept. How easy is the artifact to use?
- Generality – If the model addresses a variation of problems the better the model.
- Exactness – When the model fits the problem closely it is most likely to be accepted.
- Clarity – the purpose of all the constructs of the framework, the operations or use of each facet, and the interaction or flow between constructs is evident.

1. Three levels have been identified after Phase 1 of the Design Science Research process. Do you think the layers are relevant to a User Experience Evaluation Framework for eModeration?
   1.1. If yes please indicate if you would have added any other level?
   1.2. If no please explain why you do not think the levels are not appropriate?
2. Questions specific to each level.
   2.1. Environment level
      2.1.1. Environment level – currently the framework is designed to be used in Private Higher Education Institutions do you think any other organisation besides Higher Education Institutions can benefit from using the framework and for what purpose?
      2.1.2. Do you think the role players identified in the Environment level are adequate?
         2.1.2.1. If not what other role players should be included under the role players involved in the Environment level?
      2.1.3. Do you think the Environment level is comprehensive enough?
      2.1.4. Please rate the Environment level for the following:

	Adequate	**Needs improvement**	**Satisfactory**	**Not Applicable**	**Comment**
Simplicity					
Generality					
Comprehensive					
Relevance					
Exactness					
Clarity					

- 2.2. Requirement level
  - 2.2.1. Do you agree that the constructs identified overall for the eModeration requirement level are relevant?
  - 2.2.2. Is there anything missing from the Requirements level that you would think would be a necessity for such a framework to be implemented successfully?
  - 2.2.3. Is the evaluation criteria for each construct in the requirement level explained clear enough?
  - 2.2.4. Is the evaluation criteria comprehensive enough for constructs in the Requirements level?
- 2.3. eModeration User Experience constructs

Identified constructs under the User Experience instrumental qualities were navigation, effectiveness, efficiency, satisfaction context, content usability of system, visibility of system, error prevention and user control.

- 2.3.2. Do you think all off the constructs are relevant to eModeration?
- 2.3.3. Do you think it is necessary to add more user experience constructs?
- 2.3.4. Do you think the constructs are explained clearly?
- 2.3.5. Do you think the constructs are comprehensive for the User Experience Evaluation Framework for eModeration?
- 2.3.6. Do you think that the constructs identified under the instrumental qualities is complete?

Identified constructs under the User Experience non-instrumental qualities were overall experience, source quality, personalisation, cross-platform and context aware services.

- 2.3.7. Do you think the non-instrumental qualities are clearly explained?
- 2.3.8. Do you think the non-instrumental qualities of the framework is comprehensive?

Appendix F: Interview questions Monash participants Iteration Four

The following evaluation terms will be used (March and Smith, 1995; Hevner and March, 2003; Hevner et al. 2004; Rosemann and Vessey, 2008; Hevner and Chatterjee, 2010; Aier and Fischer, 2011; Peffers et al., 2012):

- Completeness – the designed artifact is complete and effective when it satisfies the requirements and constraints of the problem it is solving.
- Simplicity – A simple model makes it possible to comprehend the essence of the modelled concept. How easy is the artifact to use?
- Generality – If the model addresses a variation of problems the better the model.
- Exactness – When the model fits the problem closely it is most likely to be accepted.
- Clarity – the purpose of all the constructs of the framework, the operations or use of each facet, and the interaction or flow between constructs is evident.

Evaluation of the User Experience Evaluation Framework for eModeration

1. Three levels have been identified after Iteration 1 of the Design Science Research process. Do you think the levels are relevant and adequate to a User Experience Evaluation Framework for eModeration?
   1.1 If so please indicate if you would have added any other level?
   1.2 If not please explain which levels are not adequate and motivate where possible.
2. Simplicity
   2.2 Do you think the User Experience Evaluation Framework for eModeration is simple enough to comprehend the essence of the constructs in the framework? Please motivate your answer according to each level:
      2.2.1 Environment level.
      2.2.2 Requirements level.
      2.2.3 eModeration User Experience constructs level.
   3. Comprehensiveness
   3.2 Do you think the User Experience Evaluation Framework for eModeration systematically address all (or most) constructs required for such a framework? Please motivate your answer under each of the levels.
      3.2.1 Environmental level.
      3.2.2 Requirements level.
      3.2.3 eModeration User Experience constructs level.
   3.3 Do you think that the major aspects of the problem have been covered?
      3.3.1 If no what aspects would you add to the User Experience Evaluation Framework for eModeration and where?

4. Generality

4.2 Environment level – currently the framework is designed to be used in Private Higher Education Institutions do you think any other organisation besides Higher Education Institutions can benefit from using the framework and for what purpose?

4.3 Is the User Experience Evaluation Framework for eModeration general enough to solve more than one problem?

4.4 Do you recommend any changes to the Framework?

4.5 Is the framework general enough to be implemented in a similar environment?

5. Exactness

5.2 Does the designed artifact: User Experience Evaluation Framework for eModeration fit the organisation type?

5.3 Do you accept the User Experience Evaluation Framework for eModeration as is or do you recommend changes?

5.4 Identified constructs under the User Experience instrumental qualities were navigation, effectiveness, efficiency, satisfaction context, content, visibility of system, error prevention and user control. Do you accept the User Experience instrumental qualities or would you add any qualities?

5.5 Identified constructs under the User Experience non-instrumental qualities were overall experience, source quality, cross-platform and context aware services. Do you accept the User Experience non-instrumental qualities or would you add any qualities?

6. Clarity

6.2 Are the evaluation criteria of the constructs of the User Experience Evaluation Framework for eModeration clear in Table 1 and Figure 1 clear?

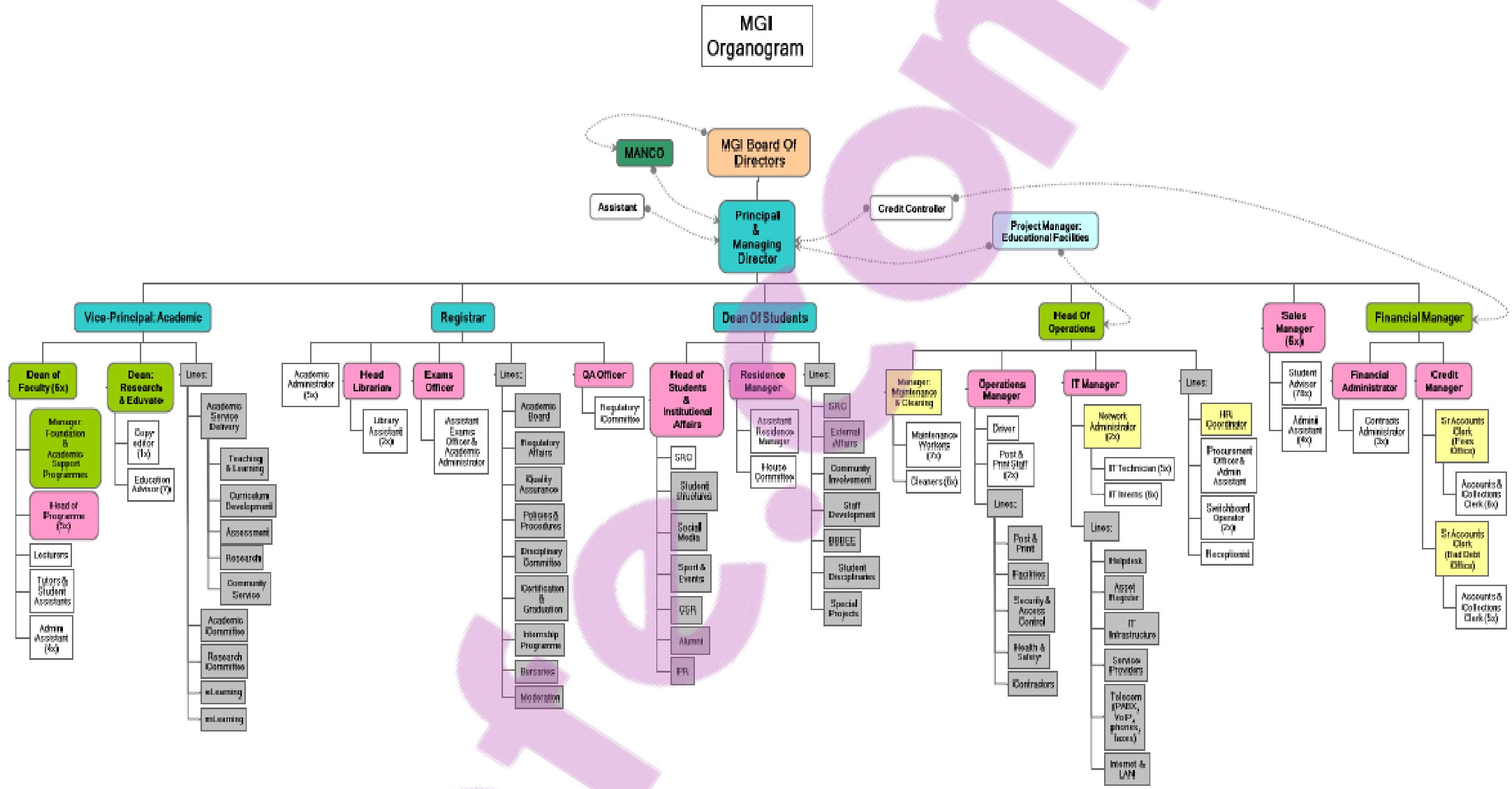
6.3 Is the purpose of the evaluation criteria of the constructs of the framework clear?

6.4 Is the flow between constructs clearly explained in the User Experience Framework for eModeration?

7. In your opinion why the user experience issues named influence eModeration adoption?

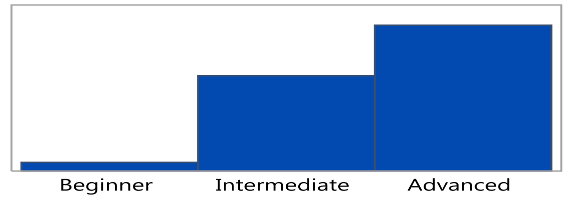
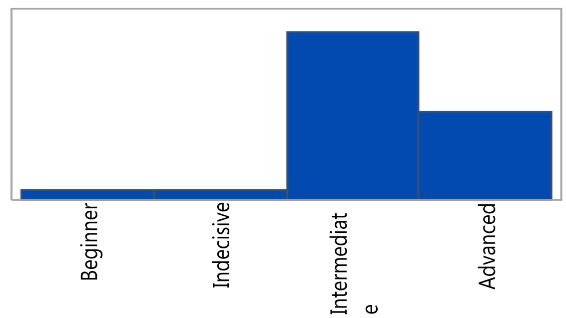
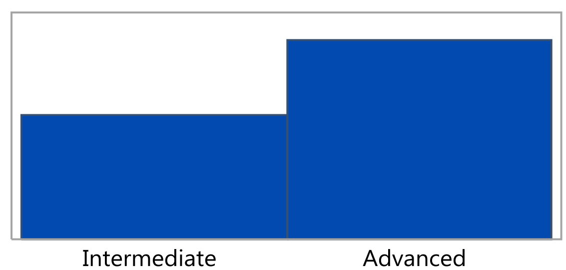
8. In what other areas of Higher Education do you think the designed framework can be used?

Appendix G: MGI Company organigram



Appendix H: Results from Section A of the questionnaire: Biographical information

Table H.1 Respondents experience with document management

Item	Rating	Number		Prob	Graph representing responses
			Level 1		
A.10.1 Word Processing	Beginner	1	3%	0,0294	
	Intermediate	13	38%	0,3823	
	Advanced	20	59%	0,5882	
	Total	34		1,0	
A.10.2 Spread sheets (e.g. Excel)	Beginner	1	3%	0,0294	
	Indecisive	1	3%	0,0294	
	Intermediate	21	62%	0,6176	
	Advanced	11	32%	0,3235	
	Total	34		1,0	
A.10.3 Presentations (e.g. PowerPoint)	Intermediate	13	38%	0,38235	
	Advanced	21	62%	0,61765	
	Total	34		1,0	

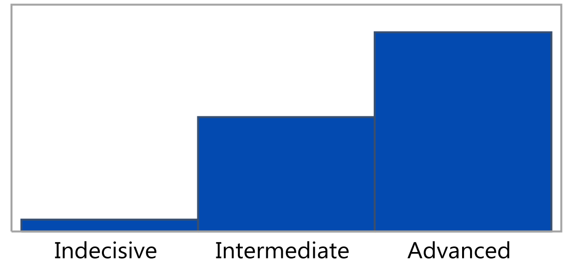
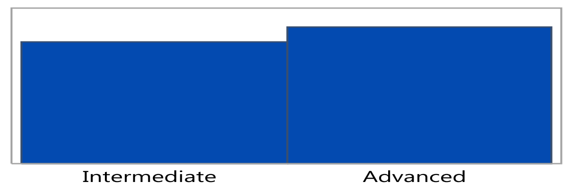
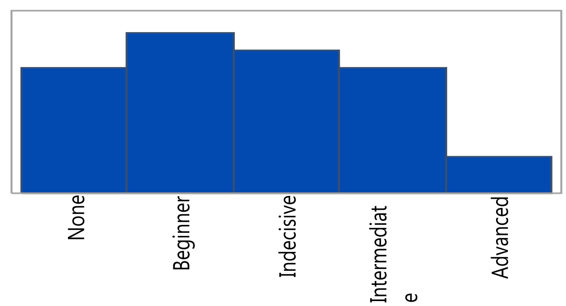
Item	Rating	Number		Prob	Graph representing responses
A.10.4 Emailing	Indecisive	1	3%	0,02941	
	Intermediate	12	35%	0,35294	
	Advanced	21	62%	0,61765	
	Total	34		1,0	

Table H.2 Respondents experience with internet usage

Item	Rating	Number		Prob	Graph representing responses
Level 2					
A.10.5 Browsing	Intermediate	16	47%	0,47059	
	Advanced	18	53%	0,52941	
	Total	34		1,0	
A.10.6 Blogging	None	7	21%	0,2121	
	Beginner	9	27%	0,2727	
	Indecisive	8	25%	0,2424	
	Intermediate	7	21%	0,2121	
	Advanced	2	6%	0,0606	
	Total	33		1,0	
	N Missing	1			

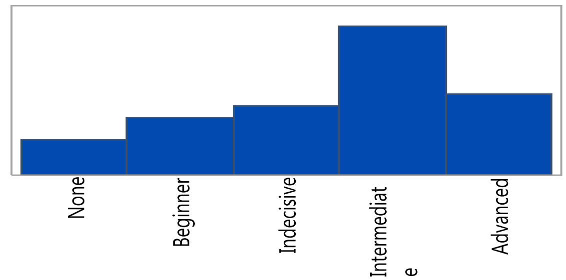
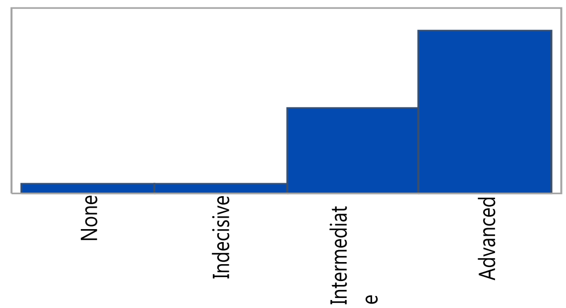
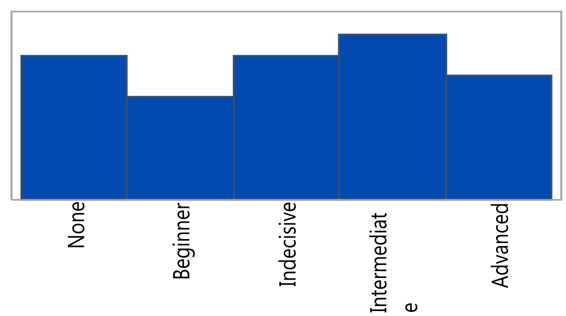
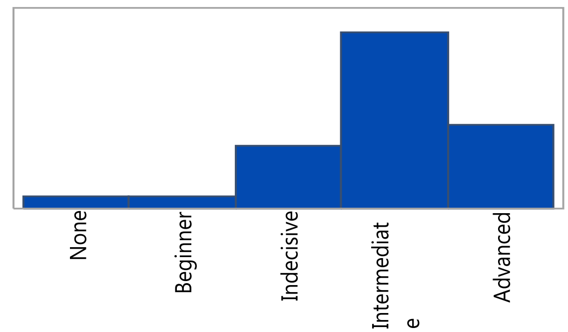
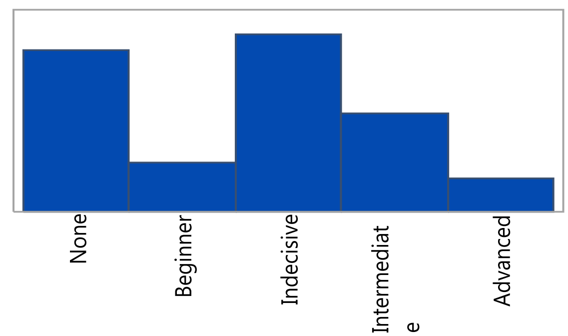
Item	Rating	Number		Prob	Graph representing responses
A 10.7 Social Media	None	3	9%	0,0882	
	Beginner	5	15%	0,1471	
	Indecisive	6	18%	0,1765	
	Intermediate	13	38%	0,3823	
	Advanced	7	20%	0,2058	
	Total		34	1,0	
A.10.8 Internet Banking	None	1	3%	0,0294	
	Indecisive	1	3%	0,02941	
	Intermediate	11	32%	0,3235	
	Advanced	21	62%	0,6176	
	Total		34	1,0	
A.10.9 e_Commerce	None	7	21%	0,2121	
	Beginner	5	16%	0,1515	
	Indecisive	7	21%	0,2121	
	Intermediate	8	24%	0,2424	
	Advanced	6	18%	0,1818	
	Total		33	1,0	
	N Missing	1			

Table H.3 Respondents experience with educational technologies

Item	Rating	Number		Prob	Graph representing responses
Level 3					
A.10.10 eLearn – Virtual Learning Environment	None	1	3%	0,0303	
	Beginner	1	3%	0,0303	
	Indecisive	6	18%	0,1818	
	Intermediate	17	51%	0,5151	
	Advanced	8	25%	0,2424	
	Total	33		1,0	
	N Missing	1			
A.10.11 mLearn – Mobile Learning	None	10	31%	0,3125	
	Beginner	3	9%	0,0937	
	Indecisive	11	34%	0,3437	
	Intermediate	6	19%	0,1875	
	Advanced	2	6%	0,0625	
	Total	32		1,0	
	N Missing	2			
A.10.12 eModeration	None	1	3%	0,0284	
	Beginner	9	26%	0,2647	
	Indecisive	7	21%	0,2058	
	Intermediate	13	38%	0,3823	

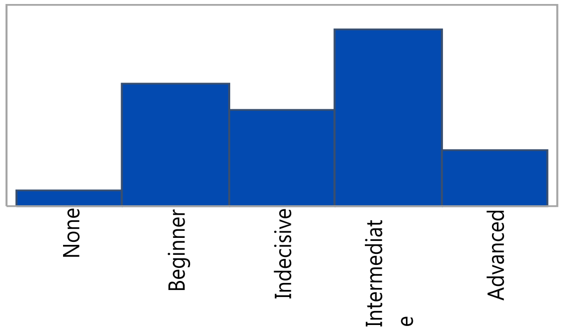
Item	Rating	Number		Prob	Graph representing responses
	Advanced	4	12%	0,1176	
	Total	34		1,0	

Table H.4 Respondents experience as IT professional programming

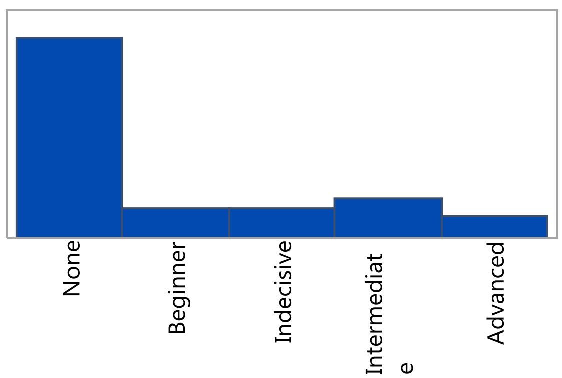
Item	Rating	Number		Prob	Graph representing responses
Level 4					
A.10.13 IT Professional in programming	None	21	64%	0,6363	
	Beginner	3	9%	0,0909	
	Indecisive	3	9%	0,0909	
	Intermediate	4	12%	0,1212	
	Advanced	2	6%	0,0606	
	Total	33		1,0	
	N Missing	1			

Table H.5 Respondents use of internet

Item		Number		Probability
A.11.1. Browsing for information e.g. academic articles	No	1	3%	0,0284
	Yes	33	97%	0,9705
	Total	34		1,0
A.11.2 Online shopping	No	4	12%	0,1176
	Yes	30	88%	0,8823
	Total	34		1,0
A.11.3 Internet Banking	No	1	3%	0,0294
	Yes	33	97%	0,9705
	Total	34		1,0
A.11.4 Forums	No	11	32%	0,3235
	Yes	23	67%	0,6764
	Total	34		1,0
A.11.5 Social Networks	No	5	15%	0,1470
	Yes	29	85%	0,8529
	Total	34		1,0
A.11.6 eModeration	No	3	9%	0,0882
	Yes	31	91%	0,9117
	Total	34		1,0
A.11. 7 eLearn	No	1	3%	0,0294
	Yes	33	97%	0,9705
	Total	34		1,0
A.11.8 Search Engines	No			
	Yes	34	100%	1,0
	Total	34		1,0
A.11.9 Other	No	4	12%	0,1176
	Yes	30	88%	0,8823
	Total	34		1,0

Table H.6 Where do respondents access interment from?

Item – Internet access	Number				Probability		Total
	Yes		No		Yes	No	
A.12.1 Work	3	9%	31	91%	0,0882	0,9117	34
A.12.2 Home	7	21%	27	79%	0,2058	0,7941	34
A.12.3 On the move e.g. mobile	9	26%	25	74%	0,2647	0,735	34
A.12.4 Internet Café			34	100%		1,0	34
A.12.5 University	24	71%	10	29%	0,7058	0,2941	34
A.12.6 Other			34	100%		1,0	34

Table H.7 Respondents size of internet

	Number of respondents who answered									
Item	Limited		Unlimited		Do not know		Not applicable		Total	N miss-ing
A.13.1 Work	4	12%	20	61%	8	24%	1	3%	33	1
A.13.2 Home	18	53%	13	38%	3	9%			34	
A.13.3 On the move	21	75%	5	18%	2	7%			28	6
A.13.4 Internet Café					1	17%	5	83%	6	28
A.13.5 University	1	9%	6	55%	2	18%	2	18%	11	23
A.13.6 Other	1	33%					2	67%	3	31

Table H.8 Respondents hardware devices and mediums they use to access internet

		Number who answered N = 34			
Item	Hardware and medium of internet access	No		Yes	
A.14.1 Cell	A.14.1.1 3G	15	44%	19	56%
	A.14.1.2 ADSL	32	94%	2	6%
	A.14.1.3 Wireless broadband	29	85%	5	15%

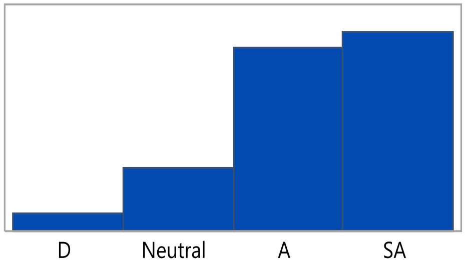
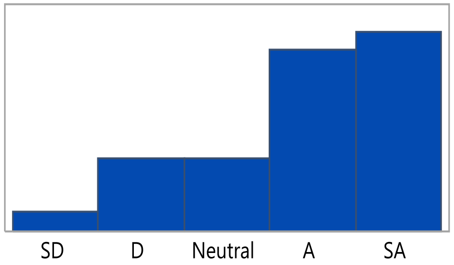
		Number who answered N = 34			
Item	**Hardware and medium of internet access**	**No**		**Yes**	
	A.14.1.4 other	32	94%	2	6%
A.14.2 Laptop	A.14.2.2 ADSL	21	62%	13	38%
	A.14.2.3 Wireless broadband	16	47%	18	53%
	A.14.2.4 other	34	100%		
A.14.3 Desktop PC	A.14.3.1 3G	32	94%	2	6%
	A.14.3.2 ADSL	24	71%	10	29%
	A.14.3.3 Wireless broadband	30	88%	4	12%
	A.14.3.4 other	34	100%		
A.14.4 Tablet	A.14.4.1 3G	26	76%	8	24%
	A.14.4.2 ADSL	29	85%	5	15%
	A.14.4.3 Wireless	25	74%	9	26%
	A.14.4.4 other	34	100%		
A.14.5 Kindle	A.14.5.1 3G	33	97%	1	3%
	A.14.5.2 ADSL	32	94%	2	6%
	A.14.5.3 Wireless	32	94%	2	6%
	A.14.5.4 other	34	100%		

Table H.9 Speed of internet access

Item – Internet connection speed	**Very slow**		**Slow**		**Medium**		**Fast**		**Very fast**		**N**	**N Missing**
A.15.1 Work			3	9%	12	38%	13	41%	4	13%	32	2
A.15.2 Home	2	6%	6	18%	11	33%	9	27%	5	15%	33	1
A.15.3 On the move e.g. mobile			6	21%	12	41%	6	21%	5	17%	29	5
A.15.4 Internet Café							2	100%			2	32

Appendix I: Results from Section B of the questionnaire: Moderators

Table I.1 eModerators perception of using eModeration

Item	SD		D		N		A		SA		Total	N Miss-ing	Graphical representation of results
B.14.1 It is a positive development.			1	3%	4	13%	12	40%	13	44%	30		
B.14.2 The process is faster.	1	3%	4	13%	4	13%	10	33%	11	38%	30		

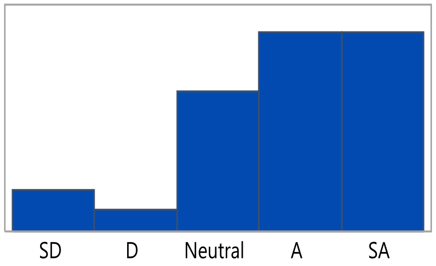
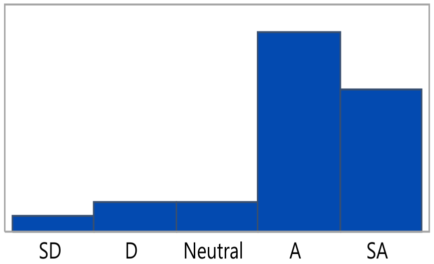
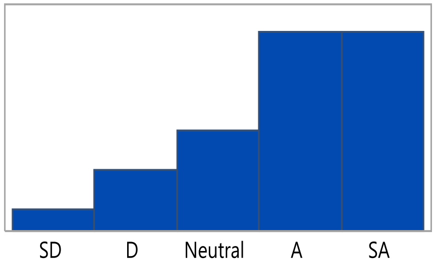
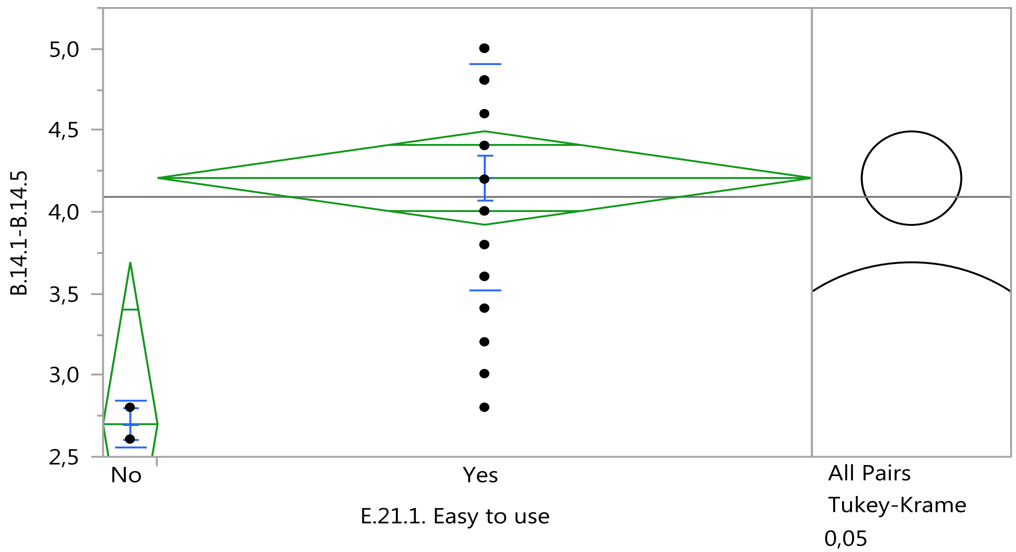
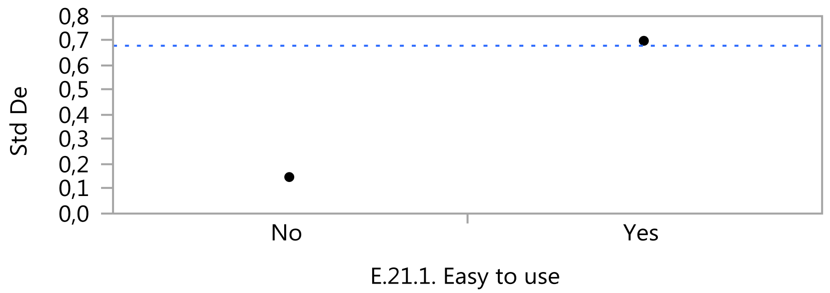
Item	SD		D		N		A		SA		Total	N Miss-ing	Graphical representation of results
B.14.3 Fewer people will be involved	2	8%	1	3%	7	23%	10	33%	10	33%	30		
B.14.4 My internet infrastructure will be able to handle eModeration	1	3%	2	8%	2	8%	14	47%	10	34%	29	1	
B.14.5 The process will be easier	1	3%	3	10%	5	17%	10	34%	10	34%	29	1	

Table I.2 Data analysis between B.14.1-B.14.5 and E.21.1 Easy to use

One-way analysis of B.14.1-B.14.5 by E.21.1 Easy to use	
	
One-way Anova summary of fit	
Rsquare	0.274546
Adj Rsquare	0,244319
Root Mean Square Error	0,680022
Mean of Response	4,092308
Observations (or Sum Wgts)	26
t-Test	
Yes-No assuming equal variance	

Analysis of Variance source: E.21.1 Easy to use						
	DF	**Sum of Square**	**Mean Square**	**F_Ratio**	**Prob>F**	
E.21.1. Easy to use	1	4,200128	4,20013	9,0827	0,0060*	
Error	24	11,09833	0,46243			
C. Total	25	15,29846				
Means for One-way Anova						
Level	**Number**	**Mean**	**Std Error**	**Lower 95%**	**Upper 95%**	
No	2	2,7000	0,48085	1,7076	3,6924	
Yes	24	4,20833	0,13881	3,9218	4,4948	
Std error used a pooled estimate of error variance						
Means and Std Deviations						
Level	**Number**	**Mean**	**Std Dev**	**Std Err Mean**	**Lower 95%**	**Upper 95%**
No	2	2,700	0,41421	0,1000	1,4292	3,9706
Yes	24	4,20833	0,69402	0,14167	3,9153	4,5014
Means comparisons						
Comparisons for all pairs using Tukey-Kramer HSD						
Confidence Quantile		**LSD Threshold Matrix**				
Q*	**Alpha**	**Abs(Dif)-HSD**	**Yes**	**No**		

2,06390	0,05	Yes	-0,4052	0,4754		
		No	0,4754	-1,4035		
Positive values show pairs of means that are significantly different.						
Wilcoxon/Kruskall-Wallis Tests (Rank Sums)						
Level	Count	Score sum	Expected score	Score mean	(Mean-mean0)/Std 0	
No	2	3,500	27,000	1,7500	-2,228	
Yes	24	347,500	324,000	14,4792	2,228	
2-Sample Test, Normal Approximation						
S	**Z**	**Prob>[Z]**				
3,5	-2,2276	0,0259*				
1-way Test, Chi-Square Approximation						
Chi-Square	**DF**	**Pof>ChiSq**				
5,1807	1	0,0228*				
Tests that the Variance are Equal						



Level	**Count**	**Std Dev**	**MeanAbs Dif to Mean**	**MeanAbsDif to Median**
No	2	0.1414214	0,1000	0,1000
Yes	24	0,6940221	0,59166	0,5916667
Test	F Ratio	DF Num	DF Den	p-Value
O’Brien[.5]		0	23	
Brown-Forsythe	3,7212	1	24	0,0656
Levene	4,0015	1	24	0,0569
Bartlett	1,6518	1		0,1987
F Test 2-sided	24,0833	23	1	0,3194
Warning small sample sizes. Use caution.				
Welch’s Test				
Welch Anova testing Means Equal, allowing Std Dev Not Equal				
F Ratio	**DF Num**	**DF Den**	**Prob >F**	
75,6605	1	7,6943	<,0001*	
t Test = 8,6983				

Appendix J: Results from Section C of the questionnaire

Table J.1 Descriptive statistics N = 34 for Section C of questionnaire

Variables: usability constructs	Mean	Std Dev	Items that forms part of the construct	SD		D		N		A		SA		N Miss
C.1-C.7 Login page	4,13	0,71	C.1 It is easy to access the login page.			1	3%	1	3%	19	56%	13	38%	
			C.2 It is easy to log onto the eModerate system.			1	3%	1	3%	18	53%	14	44%	
			C.3 The security of the login page is adequate.			2	6%	3	9%	15	45%	13	33%	1
			C.4 The information provided on the login page is satisfactory.	1	3%			8	24%	15	44%	10	29%	
			C.5 Once logged in, further information on the home page is satisfactory.			3	9%	8	24%	13	38%	10	29%	
			C.6 In general I have a favorable experience opinion of the login process of eModeration.			2	6%	3	9%	18	53%	11	32%	
			C.7 The functionality of the login page is adequate.			2	6%	3	9%	18	53%	11	32%	
C.8-C.12 Module page	3,97	0,65	C.8 The layout of the module page is satisfactory.					7	22%	18	56%	7	22%	2
			C.9 It is easy to find information required to download.			2	6%	6	19%	17	53%	7	22%	2
			C.10 The information provided to moderate the examination scripts are satisfactory.			1	3%	6	19%	19	59%	6	19%	2
			C.11 The security on the module page is satisfactory.					3	9%	20	63%	9		2
			C.12 The functionality of the eModerate system is good.	1	3%	3	9%	5	16%	15	47%	8		2

Variables: usability constructs	**Mean**	**Std Dev**	**Items that forms part of the construct**	**SD**		**D**		**N**		**A**		**SA**		**N Miss**
C.13-C16 Communicate intended message	4,14	0,63	C.13 It is clear what is available on the site (homepage)	1	3%			4	12%	18	53%	11	32%	
			C.14 The text is visibly presented					6	18%	17	21%	11	32%	
			C.15 The most important info is at the top of page					6	18%	17	21%	11	32%	
			C.16 The information communicates the intended message					7	21%	16	47%	11	32%	
C.17-C.20 Page display and information architecture	3,98	0,66	C.17 The way the info is structured supports multiple ways to reach content			2	6%	5	15%	18	53%	9	26%	
			C.18 Page layout supports the best ways to reach content			2	6%	5	15%	19	56%	8	24%	
			C.19 Reference to navigational headings, it's easy to anticipate what those sections include					13	38%	13	38%	8	24%	
			C.20 Navigational heading categories are logically grouped					5	15%	21	62%	8	24%	
C.21-C.24 Site wide navigation	4,01	0,73	C.21 Its possible to move through the site without extending click fatigue	1	3%			7	21%	18	53%	8	24%	
			C.22 It is clear where you are on the site	1	3%	1	3%	4	12%	19	56%	9	26%	
			C.23 Navigation links are visible			2	6%	3	9%	20	59%	9	26%	
			C.24 Navigation links are meaningful			1	3%	4	12%	21	62%	8	24%	
C.25-C.28 Contextual navigation	4,04	0,66	C.25 Links to performing certain functions are logically placed					6	18%	19	56%	9	26%	

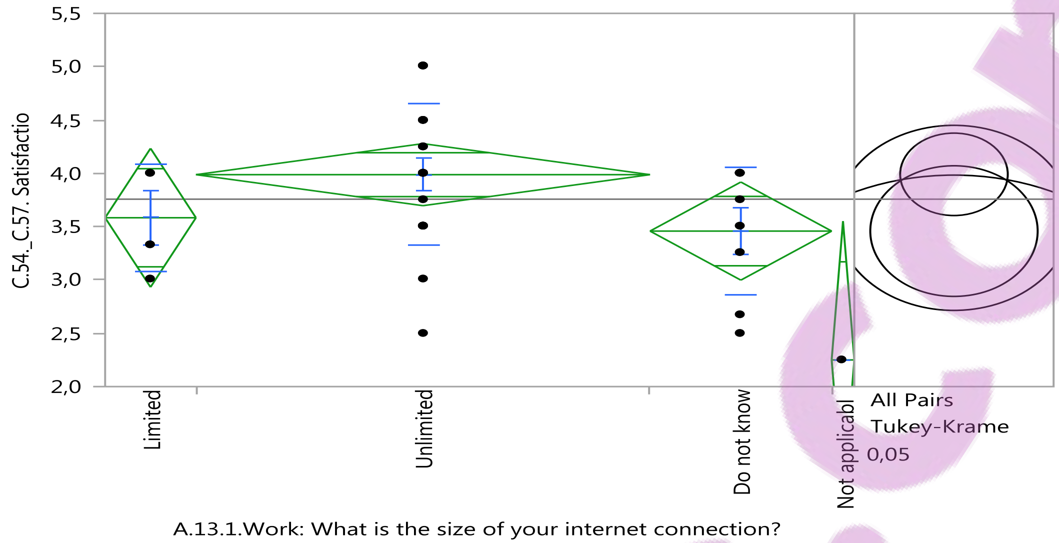
Variables: usability constructs	Mean	Std Dev	Items that forms part of the construct	SD		D		N		A		SA		N Miss
			C.26 Related links are functional	2	6%			4	12%	20	59%	8	24%	
			C.27 It is clear when you should upload	1	3%			6	18%	18	53%	9	26%	
			C.28 It is clear when you should download					7	21%	18	53%	9	56%	
C.29-C.33 Value of information provided	3,99	0,85	C.29 Sufficient info is provided to help the participants moderate examination scripts electronically	1	3%	2	6%	6	18%	12	36%	12	36%	1
			C.30 The website provides related content			1	3%	5	15%	14	42%	13	39%	1
			C.31 All the functionality required to assist is available			3	9%	3	9%	15	45%	12	36%	1
			C.32 Contact details are provided	1	3%	2	6%	9	27%	14	42%	7	21%	1
C.33-C.36 Utility	4,05	0,73	C.33 The website provides a sufficient set of functions to enable participants to carry out all their tasks			1	3%	7	21%	14	42%	11	33%	1
			C.34 The site provides the functionality to send a message	3	9%	1	3%	13	41%	9	28%	6	19%	2
			C.35 The site provides the functionality to upload documents	1	3%	1	3%	4	12%	19	56%	9	26%	
			C.36 The site provides the functionality to download documents					5	15%	21	62%	8	24%	
C.37-C.40 Effectiveness of task	3,93	0,8	C.37 The eModerate website enables participants to moderate the modules					9	28%	14	44%	9	28%	2
			C.38 Uses less time than the manual system	3	9%	4	12%	6	18%	13	38%	8	24%	
			C.39 eModeration system allows access to docs needed to complete moderation task	2	6%			3	9%	18	54%	11	33%	

Variables: usability constructs	**Mean**	**Std Dev**	**Items that forms part of the construct**	**SD**		**D**		**N**		**A**		**SA**		**N Miss**
			C.40 eModerate system allows participants to get the job done	3	9%			5	15%	14	41%	12	35%	
C.41-C.45 Efficiency of resources	4,15	0,64	C.41 Once participants have learned how to use an eModerate system they can sustain a high level of productivity to carry out tasks			2	6%	3	9%	15	45%	13	39%	1
			C.42 eModerate systems shortens time spent completing the moderation process as opposed to the manual system	3	9%	2	6%	6	18%	11	33%	11	33%	1
			C.43 eModerate system's internet resource requirement is a consideration			1	3%	7	21%	14	41%	12	35%	
			C.44 eModerate requires no transport resources					1	3%	11	32%	22	65%	
			C.45 Email generated after assessments have been uploaded is sufficient notice for the process to continue					9	26%	14	41%	11	32%	
C.46-C.50 Learnability	3,81	0,81	C.46 It is easy for the user to learn how to use the eModerate system	1	3%	1	3%	8	24%	11	33%	12	36%	1
			C.47 The user needs to learn many things before he/she can utilise system	2	6%	12		6		11	32%	3	9%	
			C.48 There is quick progression to feeling comfortable with the system	4	12%			5	15%	19	56%	6	18%	
			C.49 The interface provides support to assist participants in remembering how to carry out tasks	1	3%	2	6%	9	26%	16	47%	6	18%	
			C.50 Easy to remember what to do next when using system			3	9%	7	21%	17	50%	7	21%	

Variables: usability constructs	Mean	Std Dev	Items that forms part of the construct	SD		D		N		A		SA		N Miss
C.51-C.53 Security	3,66	0,65	C.51 Participants have a login and password with restriction to specific sections					5	15%	15	44%	14	41%	
			C.52 eModerate page adheres to security and privacy standards			1	3%	5	15%	20	61%	7	21%	1
			C.53 A user would be able to hack into other modules	9	27%	6	18%	10	30%	5	15%	3	9%	1
C.54-C.57 Satisfaction	3,79	0,73	C.54 eModerate system process is acceptable			2	6%	2	6%	21	62%	9	26%	
			C.55 System is secure					7	22%	18	56%	7	22%	2
			C.56 Quick response time for uploading docs	2	6%	2	6%	11	33%	13	38%	6	18%	
			C.57 Quick response time from the system regarding download of documents	2	6%	3	9%	9	26%	13	38%	7	21%	
C.58-C.59 Context	4,09	0,68	C.58 Content is appropriate for moderation needs			1	3%	6	18%	19	56%	8	24%	
			C.59 eModerate website fit into context of virtual learning environment					6	18%	16	47%	12	35%	

Table J.2 Wilcoxon/Kruskall-Wallis Test (Rank sum) for satisfaction and size of internet connection

One-way Analysis of C.54.-C.57. Satisfaction by A.13.1.Work: What is the size of your internet connection?



Level	Count	Score sum	Score mean	(Mean Mean0/Std0)
Limited	4	55,500	13,8750	-0,671
Unlimited	20	401,000	20,0500	2,261
Do not know	8	103,500	12,9375	-1,363
Not applicable	1	1,0000	1,0000	-1,651

Means for One-way Anova

Level	Number	Mean	Std error	Lower 95%	Upper 95%
Limited	4	3,583	0,318	2,932	4,234
Unlimited	20	3,987	0,142	3,695	4,275
Do not know	8	3,458	0,224	2,998	3,918
Not applicable	1	2,250	0,636	0,948	3,551
Std error uses a pooled estimate of error variance.					
One-way Test, Chi-Square Approximation					
Chi-Square		**DF**		**Prob>ChiSq**	
6,7460		3		0,0805	

Appendix K: Results from Section D of the questionnaire: interface design heuristics

Table K.1 Usability interface design constructs N=34

Variables: interface design heuristics constructs	**Mean**	**Std Dev**	**Items that forms part of the construct**	**SD**		**D**		**N**		**A**		**SA**		**N Miss**
D.1-D.4 Visibility of system status	4,01	0,62	D.1 User knows at all times where is on page					9	26%	15	44%	10	29%	
			D.2 It is clear where user should go to find examination scripts to download			1	3%	3	9%	17	50%	13	38%	
			D.3 Should page be branded with an indication as to which faculty the module belongs to			2	6%	9	26%	13	38%	10	29%	
			D.4 Links to pages are clearly marked			1	3%	8	24%	19	56%	6	18%	
D.5-D.8 User control and freedom	4,1	0,65	D.5 There is an upload button on each page			1	3%	5	15%	18	53%	10	29%	
			D.6 There is a download button on each page			1	3%	5	15%	19	56%	9	26%	
			D.7 Clear navigation on each page			1	3%	4	12%	19	56%	10	29%	
			D.8 Logout button on each page			1	3%	5	15%	17	50%	11	32%	
D.9-D.12 Consistency and standards	4,21	0,65	D.9 Info displayed unambiguously					7	21%	17	50%	10	29%	
			D.10 Info displayed consistently					3	9%	19	56%	12	35%	
			D.11 Info in navigational headings is grouped logically					7	21%	14	42%	13	38%	
			D.12 Templates are consistent					4	12%	16	47%	11	32%	
D.13-D.17 Error prevention	3,64	0,9	D.13 Nothing on pages which might confuse participants			1	3%	3	9%	14	41%	8	24%	

Variables: interface design heuristics constructs	Mean	Std Dev	Items that forms part of the construct	SD		D		N		A		SA		N Miss
			D.14 eModerate pages constructively suggest a solution	4	12%	4	12%	7	21%	11	32%	7	21%	
			D.15 Buttons to upload new assignments are consistent			1	3%	6	18%	16	47%	10	29%	
			D.16 Many methods available to allow participants to recover easily from errors	2	6%	4	12%	7	21%	14	41%	6	18%	
			D.17 Effective error diagnostics	1	3%	5	16%	13	42%	7	23%	5	16%	3
D.18-D.21 Recognition	3,98	0,68	D.18 Participants are able to recognise where they are by looking at the current page			1	3%	8	24%	19	58%	5	15%	1
			D.19 Labels are descriptive			1	3%	9	27%	15	45%	8	24%	1
			D.20 Process involved in eModeration is relatively easy to remember					5	15%	19	56%	10	29%	
			D.21 Info provided can be clearly understood in one reading	1	3%			7	21%	15	44%	11	32%	
D.22-D.25 Flexibility	4,12	0,76	D.22 Instructions are clear	1	3%			4	12%	18	53%	11	32%	
			D.23 Flow of instructions is logical					4	12%	19	56%	11	32%	
			D.24 Upload process is efficient	2	6%			7	21%	12	35%	13	38%	
			D.25 Information on page is relevant	1	3%			9	26%	13	38%	11	32%	
D.26-D.28 Aesthetics	4,1	0,7	D.26 Content is written specifically for eModeration			1	3%	9	26%	13	38%	11	32%	
			D.27 Content is written specifically for eModeration			1	3%	5	15%	16	47%	12	35%	
			D.28 Design is minimalistic					5	15%	19	56%	10	29%	
D.29-D.32 Help and documentation	3,46	1,11	D.29 There is a help link	2	6%	4	12%	11	32%	10	29%	7	21%	

Variables: interface design heuristics constructs	Mean	Std Dev	Items that forms part of the construct	SD		D		N		A		SA		N Miss
			D.30 Help function provides sufficient info	3	9%	2	6%	14	41%	8	24%	7	21%	
			D.31 Help function is easy to use	2	6%	3	9%	13	38%	8	24%	7	21%	
			D.32 Help function provides steps to complete task	2	6%	2	6%	13	41%	8	25%	7	21%	2

Appendix L: Results from Section E of the questionnaire: user experience

Table L.1 User experience constructs N=34

Variables: user experience constructs	Mean	Std Dev	Items that forms part of the construct	SD		D		N		A		SA		N Miss
E.1-E.4 Aesthetic visual appeal	4	0,68	E.1 Use of colour			3	9%	6	18%	19	56%	6	18%	
			E.2 Ease with which text can be read			1	3%	2	6%	21	62%	10	29%	
			E.3 Visual load per page	1	3%			5	15%	18	53%	10	29%	
			E.4 The eModerate site compared to other eModerate sites you have seen and used	1	3%			9	29%	12	39%	9	29%	3
E.5-E.13 Overall experienced	4,12	0,6	E.5 Features of eModeration			1	3%	6	18%	16	47%	11	32%	
			E.6 Functionality of eModeration			2	6%	4	13%	15	47%	11	34%	2
			E.7 Content offered	1	3%	2	6%	3	9%	16	48%	11	33%	1
			E.8 Navigation structure			1	3%	5	15%	19	56%	9	26%	
			E.9 Login page layout					4	12%	19	56%	11	32%	
			E.10 Module page layouts					3	9%	20	59%	11	32%	
			E.11 Ease of use			2	6%	6	18%	15	45%	10	30%	1
			E.12 Security with respect to privacy					4	12%	20	61%	9	27%	1
			E.13 Info architecture					4	15%	15	58%	17	65%	8
E.14-E.15 Personalisation	4,14	0,99	E.14 Way my name appears in the title bar	1	3%	1	3%	5	15%	10	30%	16	48%	1
			E.15 Ease with which previous sessions can be retrieved	1	3%	2	6%	4	13%	10	31%	15	47%	2

Variables: user experience constructs	Mean	Std Dev	Items that forms part of the construct	SD		D		N		A		SA		N Miss
E.16-E.17 Service quality	3,94	1,06	E.16 Convenience of eModeration	1	3%	2	6%	7	21%	9	26%	15	44%	
			E.17 Interactivity	1	3%	2	6%	8	24%	10	33%	12	36%	1
E.18-E.20 Cross-platform	4,43	0,65	E.18 Laptop			1	3%	3	9%	13	38%	17	50%	
			E.19 Desktop PC					1	3%	11	38%	17	59%	5
			E.20 Mobile device	3	13 %	5	22 %	5	22%	5	22%	5	22%	11

Appendix M: Cronbach alpha

Cronbach's α

Construct	Items left out	Cronbach	Reliability
B.14.1 – B.14.5 eModeration requirements		**0,879**	**N = 30 Good**
B.14.1. It is a positive development	None	0,8361	
B.14.2. The process is faster	None	0,8429	
B.14.3. Fewer people will be involved	None	0,8811	
B.14.4. My internet infrastructure is able to handle the eModerate system	None	0,8854	
B.14.5. The process will be easier	None	0,8162	
C.1 – C.7		**0,9431**	**N=34 Good**
C.1. It is easy to access the login page	None	0,9370	
C.2. It is easy to log onto the eModerate system	None	0,9386	
C.3. The security on the login page is adequate	None	0,9421	
C.4. The information provided on the login page is satisfactory	None	0,9299	
C.5. Once logged in, further information on the home page is satisfactory	None	0,9397	
C.6. IN general I have a favourable opinion of the login process of the eModerate system	None	0,9258	
C.7. The functionality of the login page is adequate	None	0,9258	
C.8 –C.12		**0,888**	**N=34 Good**
C.8. The layout of the module page is satisfactory	None	0,8639	
C.9. It is easy to find information required to download	None	0,8471	
C.10. The information provided to moderate the examination scripts are satisfactory	None	0,8461	
C.11. The security on the module page is satisfactory	None	0,8520	
C.12. The functionality of the eModerate system is good	None	0,9172	
C.13 –C.16		**0,904**	**N=34 Good**
C.13. It is clear what is available on the site (homepage)	None	0,8857	
C.14. The text is visibly presented	None	0,8505	
C.15. The most important info is at the top of page	None	0,8911	
C.16. The information communicates the intended message	None	0,8774	
C.17 – C.20		**0,898**	**N=34 Good**
C.17. The way the info is structured supports multiple ways to reach content	None	0,8711	
C.18. Page layout supports the best ways to reach content	None	0,8549	
C.19. Ref to navigational headings, its easy to anticipate what those sections include	None	0,9026	
C.20. Navigational heading categories are logically grouped	None	0,8456	
C.21 – C.24		**0,931**	**N=34 Good**
C.21. It's possible to move through the site without extending click fatigue	None	0,9599	
C.22. It is clear where you are on the site	None	0,8950	
C.23. Navigation links are visible	None	0,8835	
C.24. Navigation links are meaningful	None	0,8986	
C.25 – C.28		**0,9281**	**N=34 Good**

Construct	**Items left out**	**Cronbach**	**Reliability**
C.25. Links to performing certain functions are logically placed	None	0,8983	
C.26. Related links are functional	None	0,9568	
C.27. It is clear when you should upload	None	0,8790	
C.28. It is clear when you should download	None	0,8875	
C29 – C.32		**0,9288**	**N=34 Good**
C.29. Sufficient info is provided to help the participants moderate examination scripts electronically	None	0,9136	
C.30. The website provides related content	None	0,9175	
C.31. All the functionality required to assist is available	None	0,8813	
C.32. Contact details are provided	None	0,9157	
C.33 – C.36		**0,6829**	**N=34 Good**
C.33. The website provides a sufficient set of functions to enable participants to carry out all their tasks		0,4949	
C.34. The site provides the functionality to send a message	None	0,9170	
C.35. The site provides the functionality to upload documents	None	0,5868	
C.36. The site provides the functionality to download documents		0,4615	
C.37 – C.40		**0,861**	**N=34 Good**
C.37. The eModerate website enables participants to moderate the modules	None	0,8335	
C.38. Uses less time than the manual system	None	0,8171	
C.39. eModeration system allows access to docs needed to complete moderation task	None	0,8658	
C.40. eModerate system allows participants to get the job done	None	0,7617	
C.41 – C.45		**0,780**	**N=34 Acceptable reliability**
C.41. Once participants have learned how to use an eModerate system they can sustain a high level of productivity to carry out tasks	None	0,6299	
C.42. eModerate systems shortens time spent completing the moderation process as opposed to the manual system	None	0,7367	
C.43. eModerate system's internet resource requirement is a consideration	None	0,7615	
C.44. eModerate requires no transport resources	None	0,7767	
C.45. Email generated after assessments have been uploaded is sufficient notice for the process to continue	None	0,7640	
C.46 – C.50		**0,723**	**N=34 Acceptable reliability**
C.46. It is easy for the user to learn how to use the eModerate system		0,6631	
C.47. The user needs to learn many things before he/she can utilise system	None	0,8787	
C.48. There is quick progression to feeling comfortable with the system	None	0,6311	
C.49. The interface provides support to assist participants in remembering how to carry out tasks	Out	0,5510	

Construct	**Items left out**	**Cronbach**	**Reliability**
C.50. Easy to remember what to do next when using system	Out	0,5609	
C.51 – C.53		**0,309**	
C.51. Participants have a login and password with restriction to specific sections		0,1085	
C.52. eModerate page adheres to security and privacy standards		0,2574	
C.53. A user would be able to hack into other modules		0,3999	
C.54 – C.57		**0,7841**	**N=34 Acceptable reliability**
C.54. eModerate system process is acceptable	None	0,7187	
C.55. System is secure	None	0,8382	
C.56. Quick response time for uploading docs	None	0,6773	
C.57. Quick response time from the system regarding download of documents	None	0,6174	
C.58 – C.59		**0,853**	**N=34 Good**
C.58. Content is appropriate for moderation needs			
C.59. eModerate website fit into context of virtual learning environment			
D.1 – D.4		**0,790**	**N=34 Acceptable reliability**
D.1. User knows at all times where is on page	None	0,7963	
D.2. It is clear where user should go to find examination scripts to download	None	0,6889	
D.3. Should page be branded with an indication as to which faculty the module belongs to	None	0,7570	
D.4. Links to pages are clearly marked	None	0,7084	
D.5 – D.8		**0,898**	**N=34 Good**
D.5. There is an upload button on each page	None	0,8192	
D.6. There is a download button on each page	None	0,8220	
D.7. Clear navigation on each page	None	0,9176	
D.8. Logout button on each page	None	0,9055	
D.9 – D.12		**0,9544**	**N=34 Good**
D.9. Info displayed unambiguously	None	0,9477	
D.10. Info displayed consistently	None	0,9337	
D.11. Info in navigational headings is grouped logically	None	0,9438	
D.12. Templates are consistent	None	0,9361	
D.13 – D.17		**0,921**	**N=34 Good**
D.13. Nothing on pages which might confuse participants	None	0,9127	
D.14. eModerate pages constructively suggest a solution	None	0,8961	
D.15. Buttons to upload new assignments are consistent	None	0,9143	
D.16. Many methods available to allow participants to recover easily from errors	None	0,8994	
D.17. Effective error diagnostics	None	0,8917	
D.18 – D.21		**0,899**	**N=34 Good**
D.18. Participants are able to recognise where they are by looking at the current page	None	0,8826	
D.19. Labels are descriptive	None	0,8585	
D.20. Process involved in eModeration is relatively easy to remember	None	0,8626	

Construct	**Items left out**	**Cronbach**	**Reliability**
D.21. Info provided can be clearly understood in one reading	None	0,8796	
D.22 –D.25		**0,901**	**N=34 Good**
D.22. Instructions are clear	None	0,9137	
D.23. Flow of instructions is logical	None	0,8585	
D.24. Upload process is efficient	None	0,8717	
D.25. Download process is efficient	None	0,8361	
D.26 – D.28		**0,894**	**N=34 Good**
D.26. Information on page is relevant	None	0,7897	
D.27. Content is written specifically for eModeration	None	0,8451	
D.28. Design is minimalistic	None	0,8970	
D.29 – D.32		**0,995**	**N=34 Good**
D.29. There i a help link	None	0,9973	
D.30. Help function provides sufficient info	None	0,9945	
D.31. Help function is easy to use	None	0,9918	
D.32. Help function provides steps to complete task	None	0,9918	
E.1 – E.4		**0,897**	**N=34 Good**
E.1. Use of colour	None	0,8896	
E.2. Ease with which text can be read	None	0,8719	
E.3. Visual load per page	None	0,8389	
E.4. The eModerate site compared to other eModerate sites you have seen and used	None	0,8697	
E.5 – E.12		**0,954**	**N=34 Good**
E.5. Features of eModeration	None	0,9466	
E.6. Functionality of eModeration	None	0,9500	
E.7. Content offered	None	0,9485	
E.8. Navigation structure	None	0,9509	
E.9. Login page layout	None	0,9465	
E.10. Module page layouts	None	0,9472	
E.11. Ease of use	None	0,9527	
E.12. Security with respect to privacy	None	0,9533	
E.13. Information architecture	None	0,9499	
E.14 – E.15		**0,877**	**N=34 Good**
E.14. Way my name appears in the title bar			
E.15. Ease with which previous sessions can be retrieved			
E.16 –E.17		**0,923**	**N=34 Good**
E.16. Convenience of eModeration			
E.17. Interactivity			
E.18 –E.20		**0,536**	**N=34 Unacceptable**
E.18. Laptop	Out	0,2922	
E.19. PC	Out	0,3644	
E.20. Mobile device		0,8145	

Appendix N: Initial evaluation criteria tool

Evaluation criteria

Rate the eModerate system according to criteria identified in the User Experience Evaluation Framework for eModeration using the evaluation criteria tool below.

- **Checking the first/second box with an 'X' if you generally STRONGLY DISAGREE**
- **Checking the middle box with an 'X' if you are INDECISIVE**
- **Checking the last box with an 'X' if you generally STRONGLY AGREE**

	Criteria	Strongly disagree to Strongly agree				
		1	2	3	4	5
	Environment level					
1.	**Role players**					
	1.1 Roles					
	1.1.1 All the roles are clearly defined.					
	1.2 Responsibilities					
	1.2.1 All the responsibilities are clearly defined.					
2.	**Organisation**					
	2.1 Higher Education Institution					
	2.1.1 I agree that eModeration can be used in Higher Education Institutions.					
	eModeration Requirements level					
3.	**Process**					
	3.1 Accessing the platform					
	3.1.1 The process of accessing the eModeration platform is clear.					
	3.1.3 The login process is simple enough.					
	3.1.4 The process of accessing the eModeration information is clear.					
	3.2 Uploading/downloading					
	3.2.1 The process of uploading files is simple enough.					
	3.2.2 The process of downloading files is simple enough.					
4.	**Procedure**					
	4.1 eModerate					
	4.1.1 The procedure to do eModeration is comprehensive.					
	4.1.2 The procedure provided exact steps to follow in order to complete the eModeration task.					
	4.2 Feedback					
	4.2.1 The procedure to provide feedback in the process is comprehensive.					
5.	**eModeration**					
	5.1 Network infrastructure					
	5.1.1 The network infrastructure is reliable.					
	5.1.2 No unauthorised access.					

	Criteria	Strongly disagree to Strongly agree				
		1	2	3	4	5
	5.2 Service quality					
	5.2.1 Services provided by eModeration are reliable.					
	5.2.2 The service provided is simple but is adequate to complete the task.					
	5.3 Support					
	5.3.1 eModeration provides clear support to its users.					
	5.4 Security					
	5.4.1 As user I can only see the pages that I am connected to.					
	5.4.2 Login in with a password adds a level of security to eModeration.					
	5.4.3 Security levels are adequate.					
6.	**Devices**					
	6.1 Type of devices					
	6.1.1 eModeration works on laptops.					
	6.1.2 eModeration can be done using tablets.					
	6.1.3 eModeration can be done using desktops.					
7.	**Technology**					
	7.1 Software					
	7.1.1 The software used to create the eModeration pages are comprehensive.					
	eModeration user experience construct level					
8.	**Instrumental qualities**					
	8.1 Navigation					
	8.1.1 It is clear what is available on the site.					
	8.1.2 The simplicity of the page layouts allows for easy navigation.					
	8.1.3 It is easy to find information required to download.					
	8.1.4 It is clear where the user should go next.					
	8.2 Effectiveness					
	8.2.1 The system allows the user to complete the task of eModeration.					
	8.2.3 eModeration accomplishes what it is designed for.					
	8.2.4 eModeration allows access to the documents needed to complete the task.					
	8.3 Efficiency					
	8.3.1 Using eModeration is faster than manual paper-based moderation.					
	8.3.2 The steps required to complete the task is less than manual paper-based moderation.					
	8.3.3 Not a lot of effort is required to complete the moderation task.					
	8.4 Satisfaction					
	8.4.1 The response time when interacting with eModeration is fast.					

	Criteria	Strongly disagree to Strongly agree				
		1	2	3	4	5
	8.4.2 The usability of eModeration is satisfactory.					
	8.4.3 As user I am satisfied with what is provided on eModeration.					
	8.5 Context					
	8.5.1 As user I see the use of eModeration as meaningful in Higher Education Environments.					
	8.5.2 The infrastructure needed for the context of eModeration is sufficient.					
	8.6 Content					
	8.6.1 The content provided to complete the eModeration task is adequate.					
	8.6.2 The information provided to do eModeration is exact.					
	8.6.3 The content is structured is such a way that it facilitates the achievement of the eModeration task.					
	8.6.4 The content is relevant to moderation.					
	8.7 Visibility of system					
	8.7.1 You know where you are on the site at all times.					
	8.7.2 You know where you are supposed to go to because of the clarity of links and buttons.					
	8.7.3 The feedback provided by the system keeps me informed about my status on the system.					
	8.8 Error prevention					
	8.8.1 There is a help function available to recover from errors.					
	8.8.2 The link to the eModeration system operator is functional.					
	8.9 User control					
	8.9.1 There is a ‘home’ button on each page.					
	8.9.2 The user can ‘up-/download’ files to moderate.					
9.	**Non-instrumental qualities**					
	9.1 Overall experience					
	9.1.1 The overall experience of the system is satisfactory.					
	9.1.2 eModeration is easy to use.					
	9.1.3 eModeration navigation is simple enough to follow without requiring learning and memorising.					
	9.2 Source quality					
	9.2.1 The information required to eModerate is up-to-date.					
	9.2.2 The information provided is accurate.					
	9.2.3 The information provided is clear enough to follow.					
	9.3 Cross-platform					
	9.3.1 eModeration can be done using laptops.					
	9.3.2 eModeration can be done using tablets.					

	Criteria	Strongly disagree to Strongly agree				
		1	2	3	4	5
	9.3.3 eModeration can be done using a desktop.					
	9.4 Content aware services					
	9.4.1 As user I am aware of the services that the eModerate system have to offer.					
	9.4.2 I am aware of online marking tools that can be used to do eModeration.					

Refined evaluation criteria after evaluation and iteration four

Evaluation criteria tool

Rate the eModerate system according to criteria identified in the User Experience Evaluation Framework for eModeration using the evaluation criteria tool below.

- **Checking the first/second box with an 'X' if you generally STRONGLY DISAGREE**
- **Checking the middle box with an 'X' if you are INDECISIVE**
- **Checking the last box with an 'X' if you generally STRONGLY AGREE**

	Criteria	Strongly disagree to Strongly agree				
		1	2	3	4	5
	Environment level					
1.	**Role players**					
	1.1 Roles					
	1.1.1 All the roles are clearly defined.					
	1.2 Responsibilities					
	1.2.1 All the responsibilities are clearly defined.					
2.	**Organisation**					
	2.1 Higher Education Institution					
	2.1.1 I agree that eModeration can be used in Higher Education Institutions.					
	2.1.2 I agree that eModeration can be used in academic institutions making use of moderation					
	eModeration Requirements level					
3.	**Process**					
	3.1 Accessing the platform					
	3.1.1 The process of accessing the eModeration platform is clear.					
	3.1.3 The login process is simple enough.					
	3.1.4 The process of accessing the eModeration information is clear.					
	3.2 Uploading/downloading					
	3.2.1 The process of uploading files is simple enough.					
	3.2.2 The process of downloading files is simple enough.					
4.	**Procedure**					
	4.1 eModerate					
	4.1.1 The procedure to do eModeration is comprehensive.					

	Criteria	Strongly disagree to Strongly agree				
		1	2	3	4	5
	4.1.2 The procedure provided exact steps to follow in order to complete the eModeration task.					
	4.2 Feedback					
	4.2.1 The procedure to provide feedback in the process is comprehensive.					
	4.2.2 The procedure to provide feedback to eModerator and management of examination process is comprehensive.					
5.	**eModeration**					
	5.1 Network infrastructure					
	5.1.1 The network infrastructure is reliable.					
	5.1.2 No unauthorised access.					
	5.2 Service quality					
	5.2.1 Services provided by eModeration are reliable.					
	5.2.2 The service provided is simple but is adequate to complete the task.					
	5.3 Support					
	5.3.1 eModeration provides clear support to its users.					
	5.3.2 Provision is made for IT support.					
	5.3.3 Upgrading support is adequate.					
	5.4 Security					
	5.4.1 As user I can only see the pages that I am connected to.					
	5.4.2 Login in with a password adds a level of security to eModeration.					
	5.4.3 Security levels are adequate.					
	5.5 Devices					
	5.5.1 eModeration works on laptops.					
	5.5.2 eModeration can be done using tablets.					
	5.5.3 eModeration can be done using desktops.					
	5.6 Technology					
	5.6.1 The software used to create the eModeration pages are comprehensive.					
	5.7 Resources					
	5.7.1 The institution will have the budget to afford the system.					
	5.7.2 The institution have sufficient IT infrastructure to handle an eModerate system.					
	5.7.3 The institution have the staff to support the system					
	5.7.4 Implementing an eModerate system is cost effective for the institution					
	eModeration user experience construct level					
6.	**Instrumental qualities**					
	6.1 Navigation					
	6.1.1 It is clear what is available on the site.					

	Criteria	Strongly disagree to Strongly agree				
		1	2	3	4	5
	6.1.2 The simplicity of the page layouts allows for easy navigation.					
	6.1.3 It is easy to find information required to download.					
	6.1.4 It is clear where the user should go next.					
	6.2 Effectiveness					
	6.2.1 The system allows the user to complete the task of eModeration.					
	6.2.3 eModeration accomplishes what it is designed for.					
	6.2.4 eModeration allows access to the documents needed to complete the task.					
	6.3 Efficiency					
	6.3.1 Using eModeration is faster than manual paper-based moderation.					
	6.3.2 The steps required to complete the task is less than manual paper-based moderation.					
	6.3.3 Not a lot of effort is required to complete the moderation task.					
	6.4 Satisfaction					
	6.4.1 The response time when interacting with eModeration is fast.					
	6.4.2 The usability of eModeration is satisfactory.					
	6.4.3 As user I am satisfied with what is provided on eModeration.					
	6.5 Context					
	6.5.1 As user I see the use of eModeration as meaningful in Higher Education Environments.					
	6.5.2 The infrastructure needed for the context of eModeration is sufficient.					
	6.6 Content					
	6.6.1 The content provided to complete the eModeration task is adequate.					
	6.6.2 The information provided to do eModeration is exact.					
	6.6.3 The content is structured is such a way that it facilitates the achievement of the eModeration task.					
	6.6.4 The content is relevant to moderation.					
	6.7 Visibility of the system					
	6.7.1 You know where you are on the site at all times.					
	6.7.2 You know where you are supposed to go to because of the clarity of links and buttons.					
	6.7.3 The feedback provided by the system keeps me informed about my status on the system.					
	6.8 Error prevention					
	6.8.1 There is a help function available to recover from errors.					

	Criteria	Strongly disagree to Strongly agree				
		1	2	3	4	5
	6.8.2 The link to the eModeration system operator is functional.					
	6.9 User control					
	6.9.1 There is a ‘home’ button on each page.					
	6.9.2 The user can ‘upload/download’ files to moderate.					
7.	**Non-instrumental qualities**					
	7.1 Overall experience					
	7.1.1 The overall experience of the system is satisfactory.					
	7.1.2 eModeration is easy to use.					
	7.1.3 eModeration navigation is simple enough to follow without requiring learning and memorising.					
	7.2 Source quality					
	7.2.1 The information required to eModerate is up-to-date.					
	7.2.2 The information provided is accurate.					
	7.2.3 The information provided is clear enough to follow.					
	7.3 Cross-platform					
	7.3.1 eModeration can be done using laptops.					
	7.3.2 eModeration can be done using tablets.					
	7.3.3 eModeration can be done using a desktop.					
	7.4 Content aware services					
	7.4.1 As user I am aware of the services that the eModerate system have to offer.					
	7.4.2 I am aware of online marking tools that can be used to do eModeration.					

Appendix O: Refined User Experience Evaluation Framework for eModeration after evaluation and iteration three

EVALUATION FORM

An evaluation of a User Experience Evaluation Framework for eModeration

The purpose of this evaluation form is to serve as a tool to identify the relevant eModeration user experience constructs associated with three levels, namely: environment, requirements and user experience.

The procedure to follow:

- Read through Table 1 that describes the identified evaluation criteria and constructs
- Observe the structure of Figure 1, the proposed User Experience Evaluation Framework for eModeration.
- Participate in the interview to determine if the proposed framework is fit for the intended purpose, i.e. can it be used to evaluate the user experience of an eModerate system?

Table 1 Identified User Experience Evaluation Criteria for eModeration – description of constructs in framework

<table>
<tr><th colspan="2">Environment level</th></tr>
<tr><td rowspan="2">Users</td><td>ROLES
Managers:
• To manage the identification of eModerators for respective modules.
• To manage the information needed for eModeration by the eModeration system operator.
• To manage the eModeration process and the outcomes.
eModeration system operator:
• Manages the online process, access, security and navigation.
• IT Support for the eModeration system operator.
eModerator:
• The eModerator’s role will be to use the eModerate system.
• The eModerator role is to moderate examination scripts electronically.</td></tr>
<tr><td>RESPONSIBILITIES
Manager:
• To communicate to the eModeration system operator a list of all eModerators.
• To oversee the process of eModeration.
• To provide feedback to lecturers after the eModeration process is complete.
eModeration system operator:
• To create eModerate pages for each module and assign secure access rights to eModerators.
• To upload information needed for eModeration.
• To handle queries from eModerators.
• To ask for IT support in cases where they cannot resolve the problems.
eModerator:
• Responsible to download scripts.
• To eModerate the examination scripts electronically.
• After eModeration, upload the electronic scripts back onto the system.</td></tr>
<tr><td>Organisation</td><td>HIGHER EDUCATION INSTITUTION
• The application domain is Higher Education Institutions.
• It can also be used in schools and colleges.</td></tr>
</table>

eModeration Requirements Level	
Process	**ACCESSING THE PLATFORM** • To create appropriate login pages. • To create eModerate pages per module. • To assign and award secure access to the relevant people to their respective eModerate pages per module.
	UP-/DOWNLOADING • To put a process in place for the uploading of examination papers, memoranda, reports and examination scripts for moderation. • To put a process in place for eModerators to upload the eModerated scripts and feedback reports. • The manager to track the process off moderation. • After eModeration is complete the manager can download eModerator reports and provide feedback to internal examiners in the process.

Procedure	**eModerate**
	• To use the eModerate procedure that explains in detail the specific tasks to execute with eModeration, for example, by whom, when and how the procedure is performed.
	• The eModerate procedure uses different users who perform specific tasks
	    ○ Managers involved in eModeration provide information to the eModeration system operator to create module pages and assign eModerators to the pages.
	    ○ eModeration system operator receives information from manager, creates pages and users (eModerators).
	    ○ eModerators involved in eModeration follow procedure by accessing eModerate system, downloading examination scripts, electronically moderating scripts and finally uploading scripts and moderation reports.
	    ○ Managers receive notification that the eModeration task is complete and then down-load scripts and reports.
	    ○ Managers act upon reports and provide feedback to internal examiner.
	    ○ eModeration system operator to ensure continuity between users and system.

	FEEDBACK • A procedure must be in place for the eModerator to provide feedback on moderation to manager using the eModerate system. • The procedure should make provision for feedback from the manager to the internal examiner. • The system should also make provision for feedback to users on the status of the processes, i.e. the scripts have been uploaded and are ready for download to be moderated and vice versa, through automatic email generation to users by system.
eModeration	**NETWORK INFRASTRUCTURE** • Ensure appropriate network infrastructure for reliable and time effective distribution of the eModeration documentation. • Ensure appropriate and access connectivity to network infrastructure. • All role players should have internet access for eModeration to be successful.
	SERVICE QUALITY • Ensure that the level of service provided by the eModerate system is satisfactory. • Ensure that the quality provided by eModeration is satisfactory for a good user experience. • Ensure that the user does not experience frustration when interacting with the eModeration product. • Ensure that the eModerate system is easy to navigate, user friendly and users can get information that they need to complete the task. • Ensure that the eModerate system provides a two-way communication between the users.
	SUPPORT

	• Provide adequate support from the eModeration system operator to managers and eModerators. • IT support for eModeration system operator required. • Ensure that system maintenance and upgrades are available.
	SECURITY • Ensure that the eModerate system is secure and only accessible to legitimate users of the system. • Unique logins and password to be created for all users. • Ensure that login details are communicated effectively to users and how it would be communicated. • Levels of security to be built into the system, for example manager to have access to all modules, eModerators should only have access to the page(s) that they eModerate.
Devices	**TYPES** • Ensure that users can access the eModeration process using different types of devices, i.e. tablets, desktops or laptops of their choice as long as these are cross-platform. • Ensure adequate (reliable, acceptable performance in terms of speed) hardware and software for the use of eModeration interaction.
Technology	**SOFTWARE** • Moodle can be used as a software package. • An alternative option is Google documents. • The software should be accessible to all role players.
eModeration User Experience construct level	
Instrumental qualities	**NAVIGATION** • Ensure quick and easy navigation through pages to accomplish the tasks. • Ensure that users know where they are and have options of where to go next. • Ensure a balance between navigational options not to overwhelm user. • Ensure that related information is placed together. • Ensure that common browser standards are followed. • Ensure that each page has all the required navigation buttons, such as previous or next and home. • Terminology used should be understandable.
	EFFECTIVENESS • Ensure that eModerators can effectively moderate papers electronically using the eModerate system. • Ensure that facilities and activities are available to encourage interaction with the eModerate system. • Ensure effective access to information to complete the task. • Ensure that the users achieve their goal when using the system.
	EFFICIENCY • To ensure a high level of productivity maintained by users when using the eModerate system. • To ensure that the user should be able to complete the task in a shorter time frame than when using the manual paper-based method. • To ensure that the number of steps required to complete the task should be kept to a minimum. • To ensure efficient uploading notification to all users in the control of the process. • To ensure that fewer resources are required to complete the task, i.e. no transportation of examination scripts. • To minimise the effort required to complete the task of eModeration.
	SATISFACTION • Consider that the eModerate users' satisfaction levels when interacting with the product are influenced by the product qualities: utility, usability and visual appeal.

	• The satisfaction levels as influenced by stimulation of the product use and quality perception by users. • Ensure that the users are satisfied with what is available on the eModerate system.
	CONTEXT • Refers to the environment in which the user operates. • Ensure that users understand that in an eModeration environment the usage context includes the aim of the product i.e. to electronically moderate examination scripts. • Ensure that the users perceive the eModeration activity as meaningful. • Ensure that the representation is understandable and meaningful, i.e. ensuring that the symbols, icons and names used are intuitive within the context of eModeration tasks. • Ensure that the context of the organisational settings does not affect the eModeration activity. • Ensure that the infrastructure, services, users and technology to be used are adequate and that it would contribute to the interaction in context.
	CONTENT • Information provided to the users should be clear and easy to navigate when they interact with the system. • Provide the appropriate, comprehensive and accurate information. • Provide content that is relevant to moderation. • Ensure that the content is structured in a way that facilitates the achievement of the users' goals. • Ensure that the users are aware of the assessment format with its unique characteristics of specific module assessment.
	VISIBILITY OF SYSTEM • Ensure that the visual appeal or aesthetics of the system is appealing to the users of the eModerate system. • Navigation and visibility of navigation links should be clear and unambiguous. • The eModerate site should not contain irrelevant information, which could distract users as they perform their tasks. • Ensure that the eModerate system keeps the users informed about the process through constructive and appropriate feedback as they interact with the system, i.e. a message explaining how long it will take to down-/upload files. • Ensure that each page is 'branded' so that there is an indication as to which section it belongs.
	ERROR PREVENTION • Ensure that users should be able to recover easily from errors. • Ensure that some error prevention help functions are made available to users. • Ensure that a link to the eModerate operator is available. • Ensure that the users can get IT support if needed.
	USER CONTROL • Ensure that role players have control of information as it goes through the eModeration. • Ensure that managers are in control of the process of eModeration. • eModerators can also control where and when they want to complete the task. • Clearly marked 'exit' needs to be visible.
Non-instrumental attributes	**OVERALL EXPERIENCE** • It is important that the users' overall interaction with the system is positive in order to contribute to a positive user experience. • Ensure that the overall experience by the users of the system is enjoyable.
	SOURCE QUALITY • Ensure that the quality of the information required to complete the task of eModeration is accurate and complete. • Ensure that the source quality is clear, relevant, appropriate and engaging to role players when using the eModerate system.

	PERSONALISATION • Ensure that all the role players can see that they are logged in. • Ensure that all the role players can see what they have access to. • Ensure some personalisation of their eModerate page(s).
	CROSS-PLATFORM • To ensure that managers and eModerators are able to access the eModerate system using different platforms and different devices.
	CONTEXT AWARE SERVICES • The users should be made aware of the services that the eModerate system offers. • Ensure that meaningful contextual information associated with the eModerate content is provided.

Appendix P: Library search summary

	User Experience	eModeration and assessment	Design Science Research
ACM	60		10
AIS	13	3	
American Psychological Association Inc.	1		
Academic Publishing Int		5	2
CICSD			1
CHI	40		
CiteSeer	1		
COIF			2
COST workshop	1		
Decision Sciences Institute			1
eBooks	8	2	6
Elsevier	8	3	3
Emerald group	1		
EbscoHost		20	34
Google Scholar	8	10	5
Gobler			1
HCI	4		
Higher Education Journal online	1	4	
IEEE	2		
IOS Pres	4		
MIS			8
ProQuest	4		4
QUT EDU		3	5
Scandinavian JIS			3
Science Direct	7		
Springer	5		3
Taylor and Francis	15		
Web	5		2
Total	188	50	90

Source	Number
AARE	1
ACM	60
AIS	13
Affective human factors	2
AMME	2
AJJS	2
APA	1
AUIC	2
ATEAC	1
AJN	1
Assessment Evaluation in Higher Education	7
ACWWWA	1
AMCIS	1
BIT	4
Books	75
British Journal of Education Technology	2

B Technology Journal	1
COST	2
CHI	15
COIT	1
DESRIST	2
DSS	1
ECCE	1
EDU	2
EJIS	4
Elsevier 1	1
ESWC	1
ICIC	1
ICAFIH	1
IEEE	5
IIE	1
IIS	2
IIER	1
IJPIS	1
IJAIS	1
ILD	1
Innovation in Education and Teaching International	1
InSite	1
IPSSEIS	1
IS & eBusiness Management	1
IJMI	1
ISRI	1
IRMAC	1
IJAR	1
IJAR	1
IJTAES	1
JETM	1
Journals	25
HCI	18
HERDSA	1
HE Innovation in Education Teaching International 1	1
MindTek	1
MIS	15
New Technologies in Higher Education	1
MIT	1
MBC	1
Network learning conference	1
LICK	1
PIT06	1
Policies and Procedures	8
QCA	1
SAICSIT	7
SAQA	2
Thesis/Dissertations	10
UXPA	1
USER	1
Workshops	12