eModeration Requirements:
A Case Study in Private Secondary Schools in South Africa

by

VANITHA RAJAMANY

submitted in accordance with the requirements for
the degree of

MASTER OF SCIENCE

In the subject

COMPUTING

at the

University of South Africa

Supervisor: Dr C.J. Van Staden
Co-Supervisor: Professor J. Van Biljon

January, 2020

Declaration

Name: Vanitha Rajamany

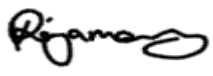
Student number: 7232969

Degree: MSc in Computing

I, Vanitha Rajamany, declare that the dissertation

eModeration Requirements:
A Case Study in Private Secondary Schools in South Africa

is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.



_____ 27/01/2020

Signature Date

Abstract

Despite the increasing importance of digitization in all facets of teaching and learning, digital moderation (eModeration) has received little attention in research and practice. No evidence-based requirements on the secondary school environment could be found for the development of a digital moderation system. This finding provided the rationale for an investigation into the requirements for an efficient eModeration system for IT and CAT assessments at grade 12 level in South Africa. A critical literature review was employed to explore eModeration and the requirements for a digital moderation system. This study is novel in exploring the applicability of post-adoption technology acceptance models to a pre-adoption system. The inquiry was guided by the overarching research question of: *What are the requirements for an efficient eModeration system for IT and CAT SBA assessments at grade 12 level in SA?* This dissertation concludes that there is currently no dedicated eModeration system in use in the secondary school environment. This study draws on the eModeration literature, the technology adoption literature and empirical research in the private secondary school environment of IT and CAT assessments at grade 12 level in South Africa to provide an evidence-based contribution to the requirements for an efficient eModeration system. The findings serve as a theoretical basis for future research into eModeration systems and can make a practical contribution to future practices and policies within schools and assessment bodies.

KEYWORDS: moderation; external moderation; eModeration; technology acceptance; portfolio; school-based assessment (SBA); Information Technology (IT); Computer Applications Technology (CAT); quality assurance; information and communication technologies (ICTs).

Acknowledgements

I would like to express my great appreciation to my supervisor Dr C. Van Staden for her valuable and constructive suggestions during the planning and development of this research. Her willingness to give of her time so generously is much appreciated.

I would also like to express my sincerest gratitude to my co-supervisor Professor J. Van Biljon who so graciously accepted yet another student so late in the year and took the time to respond to every correspondence even when it encroached on her personal time.

Thank you to you both for your patient guidance, encouragement and very useful critiques of this study and most of all for the time taken to meet with me. I am indebted to you for the several discussion sessions and for your valuable insights.

Thank you to my parents who have given me the greatest gift of an education and who have tirelessly inculcated the value of education in me. I am grateful to my sister who has developed the art of criticizing while encouraging; often in the same breath.

To my two boys, I learn something new from you every single day – you inspire me beyond measure.

To my husband, my heartfelt gratitude for supporting my self-actualization goals.

Marthie de Wet – thank you for your quiet support and so promptly assisting me whenever the “formatting bug” struck.

Table of Contents

List of Figures

List of Tables

Acronyms

CAT	Computer Applications Technology
CSR	Case Study Research
DBE	Department of Basic Education
DSR	Design Science Research
DSRP	Design Science Research Process
HOT-Fit	Human-Organization-Technology Fit
ICT	Information and Communications Technologies
IEB	Independent Examinations Board
IS	Information Systems
IT	Information Technology
KZN	Kwa-Zulu Natal
NCS	National Curriculum Statement
NQF	National Qualifications Framework
PC	Personal computer
SA	South Africa
SBA	School based assessment
SR	System Requirements
TAM	Technology Acceptance Model
TOE	Technology-Organizational-Environmental
TR	Task Requirements
TTF	Task Technology Fit
UK	United Kingdom
UNISA	University of South Africa
UR	User Requirements
UTAUT	Unified Theory of Acceptance and Use of Technology

Chapter 1

Introduction

1.1. Background

Information Technology (IT) and Computer Applications Technology (CAT) are core subjects within the National Curriculum Statement (NCS) and it is mandatory for all grade 12 IT and CAT students to provide a portfolio of school-based assessment (SBA) which is a fundamental component in the calculation of their final assessment. The Independent Examinations Board (IEB) is an accredited, independent assessment authority for school and adult based assessment in South Africa (SA) and it is the responsibility of the IEB to ensure the integrity of the SBA. The IEB thus implements a moderation process to certify the reliability and validity of the SBA at each of the following levels:

- School moderation (across colleagues within a school)
- Cluster moderation (across schools within a region)
- Regional moderation (across schools in a region and across regions)
- National moderation (Independent-Examinations-Board, 2015).

The moderation of the SBA can either be done manually or digitally. Manual moderation refers to a paper-based system of moderation while electronic moderation (also referred to as eModeration) refers to the processes involved in making electronic evidence of assessed samples available to an external moderator via a digital platform.

The moderation processes advocated by the IEB are in line with internationally recognized principles as endorsed by Maxwell (2002) who maintains that school-based assessment enforces a responsibility on each school to carry out assessments professionally. The focus is on consistency, comparability and equity of judgments within a particular subject (Maxwell, 2002).

There needs to be public confidence in the data that schools use to establish their development (Department-for-Education-and-Child-Development, 2016; Maxwell,

2002). The decisions that teachers make about student learning must be moderated as part of a school's standard quality assurance practice. The essential purpose of moderation is therefore to augment the consistency of teacher judgements (Department-for-Education-and-Child-Development, 2016).

Grade 12 is a recognized exit point in the South African education system and the results attained by grade 12 learners are an important measure in determining access to tertiary education (Umalusi, 2004). As such, the grade 12 level is administered by a stipulated national assessment and certification process.

The NCS endorses an assessment-led methodology which incorporates the concepts of assessment for learning together with assessment of learning. While assessment of learning demonstrates students' proficiency and confirms whether they have achieved curriculum outcomes; assessment for learning is an interactive process to determine what students know as a means of identifying measures for future learning (Earle, 2006). Constant assessment of learners during the school year underpins the implementation of the NCS and it is through this process that valid, fair and reliable evidence of learner performance is collected and documented as evidence of the student's final result (Independent-Examinations-Board, 2015).

While academic literature makes mention of quality assurance in moderation (Beutel, Adie, & Lloyd, 2014; Bloxham, 2009; Singh, 2004; Van Staden, Van Biljon, & Kroeze, 2015); the concept of social moderation (Adie, 2011, 2012; Adie & Klenowski, 2016; Beutel, Adie & Lloyd, 2014) and the evaluation of e-portfolio projects (Greatorex, 2004), no reference could be found to electronic moderation in secondary schools in SA. This points to a gap in the existing body of academic knowledge on eModeration. Therefore, the rationale for this study is to formulate requirements for an eModeration system which can be utilized for the digital moderation of IT and CAT SBA portfolio tasks at grade 12 in SA secondary schools.

This chapter is structured as follows: the problem statement and research questions are elucidated in section 1.2 Section 1.3 provides an overview of the methodological approach, section 1.4 presents a discussion of the contributions and sections 1.5 and 1.6 delineate the limitations and delimitations respectively. Section 1.7 provides proof of ethical clearance, section 1.8 provides the terms and definitions. Section 1.9 concludes the chapter by presenting the structure of this report.

1.2. Problem Statement

From the literature reviewed, there is no published empirical research to suggest that eModeration is being implemented in IT and CAT within the South African secondary school environment nor any published requirements for what such a system should consist of. The possibilities of employing methods of digital moderation to inform, illuminate and provide policy decisions are therefore endless. This study identifies the following problem: *Within the South African secondary school environment there are no evidence-based requirements for developing a digital moderation system to efficiently manage the moderation of IT and CAT SBA tasks at grade 12.*

1.2.1. Research Questions

The current research is thus guided by the following overarching research question: *What are the requirements for an efficient eModeration system for IT and CAT SBA assessments at grade 12 level in SA?* The following sub questions (see Table 1-1) were formulated to answer the main research question:

Table 1-1: Research Questions

Research Question		Purpose	Strategy	Chapter
RQ1	What are the current processes in the moderation of the secondary school's IT and CAT SBA assessments at grade 12 level?	To determine the current practices of IT and CAT portfolio moderators with the aim of determining how moderation is being carried out in IT and CAT SBA assessments at grade 12 level.	Literature Review Data collection	Two Five
1.1.	How are portfolios (in what format) submitted for external moderation?		Data collection and Analysis	Five
1.2.	What technologies (if any) are used for SBA portfolio moderation processes in IT and CAT?		Data collection and Analysis	Five
RQ2	What are the perceived challenges and benefits of eModeration?	To draw on the extant body of academic knowledge on eModeration.	Literature Review Discussion and Findings	Two Five
RQ3	What are the perceived requirements for an eModeration system?	To draw on the extant body of academic knowledge on eModeration.	Literature Review Discussion and Findings	Two Five
RQ4	How can the perceived challenges and benefits translate into requirements for an eModeration system to be employed for the moderation of	To craft eModeration system requirements for the specific context based on theory and practice (the empirical findings).	Discussion and Findings	Five

Research Question		Purpose	Strategy	Chapter
	grade 12 IT and CAT portfolio tasks?			

1.2.2. Objectives of the Study

Based on the main research question and the sub-questions articulated in 1.2.1, the objectives of this study can be stated as follows:

- To review the existing literature on the current practices followed in the digital moderation of SBA portfolio tasks in the secondary school environment.
- To review and interrogate the extant literature on the challenges and benefits of eModeration.
- To review and interrogate the extant literature on the technologies used for the moderation of portfolios.
- To investigate technology acceptance models with a view to developing requirements for an efficient (defined as a measure of the productivity of a system[1]) eModeration system.
- To interrogate the current moderation practices and the perceived challenges and benefits of eModeration to inform the development of requirements for an efficient eModeration system.

1.2.3. Areas of Investigation

In order to achieve the objectives outlined in section 1.2.2, it was necessary to investigate the following knowledge domains:

- Literature review of current moderation practices, the challenges and benefits of eModeration and the requirements for an eModeration system (cf. Chapter 2).
- Technology adoption models (cf. Chapter 3).
- Methodology theories (cf. Chapter 4).

[1] Available from: http://www.openlearningworld.com/books/Fundamentals%20of%20MIS/SYSTEM%20CONCEPTS%20&%20CONTROLS/System%20Efficiency%20and%20Effectiveness.html. [Accessed: 07/01/2020]

Technology adoption and technology acceptance models and theories have been utilized in various spheres both to understand as well as to predict user behaviour. It is therefore important to differentiate between technology acceptance and technology adoption.

Technology acceptance has been defined as a "positive decision to use an innovation" (Taherdoost, 2018, p. 961) and describes the user's "attitude towards a technology" (Renaud & Van Biljon, 2008, p. 211). Technology adoption, on the other hand, entails the user embracing the use of the technology (Renaud & Van Biljon, 2008). Acceptance is therefore a pre-requisite for adoption and adoption encompasses acceptance. Having acknowledged that a subtle difference exists between these two terms, these terms are hereafter used interchangeably in this study.

Additionally, a construct is an abstract idea being measured using survey questions while a dimension refers to the concrete, measurable expressions of the construct. Thus complex constructs consist of multiple, interconnected dimensions or criteria bound together as a whole which comprise the construct (Dew, 2011). In this study dimensions and criteria will be used interchangeably when extracting the requirements for an eModeration system.

1.3. Overview of the Methodological Approach

1.3.1. Research Paradigm

Mills, Bonner and Francis (2006) maintain that researchers must choose paradigms that are consistent with their views of reality in order to ensure a robust research design. In the same vein, Feilzer (2010, p. 8) maintains that, for a study to be more than just an attempt to "mirror reality", researchers must consider the questions of what the research is for, "who it is for" and how researchers' values influence the research.

Pragmatism is a diverse philosophical worldview employed in social research studies (Hall, 2013; Morgan, 2014). Within this paradigm[2], research is regarded as a human experience built on the beliefs and activities of researchers. Pragmatism takes into

[2] Available from: http://eagle.unisa.ac.za/mediawiki/index.php/Semantic_Web_and_Research_Methodology. [Accessed: 07/01/2020]

account the unpredictable human element thus encouraging researchers to be adaptable and receptive to the appearance of unexpected data (Feilzer, 2010).

Pragmatism seeks answers to questions like how researchers make choices about the way in which they conduct research; why they make the choices they do and “what the impact of making one set of choices” instead of another is (Morgan, 2014, p. 1051). These questions, while not being new, reorients researchers to a different set of problems and purposes; the pursuit of which requires an appraisal of why researchers do things in the way that they do (Morgan, 2014). Pragmatism thus focuses on consequences and includes continuous reflection of evaluation practises and their consequences for people (Hall, 2013).

Pragmatism proposes a philosophy which extends beyond “what works” (Morgan, 2014, p.36) and highlights the significance of connecting principles and behaviours in an inquiry based process of searching for knowledge with the objective of perceptively solving problems in society (Hall, 2013; Morgan, 2014). However, the experiences brought to research and the changes that researchers hope to generate are constrained by the context of the research (Hall, 2013; Morgan, 2014).

Furthermore, Johnson and Onwuegbuzie (2004); Hall (2013) and Biddle and Schafft (2015) assert that research approaches should be combined in ways that offer the best opportunities for answering significant research questions. Pragmatism allows for research approaches to be productively mixed; offering a way of selecting methodological mixes that better assist researchers in answering their research questions (Denscombe, 2008; Johnson & Onwuegbuzie, 2004). On the other hand, Hall (2013), while agreeing that pragmatism embraces the mixing of methods; cautions that there should be an understanding that the mixing of methods must be utilized intelligently to provide information which will be used to make evaluative judgements within a particular perspective. Additionally, pragmatism prompts evaluators to critically consider the instrumentation used, the ways in which the evaluator is an instrument, and how the evaluation is instrumental in problem resolution.

In a similar vein, Feilzer (2010) argues that pragmatism is a suitable research paradigm for diverse types of research. The pragmatist paradigm has thus been chosen for this study which uses DSR together with a case study data capturing method where both quantitative and qualitative data was captured.

1.3.2. Research Design

The primary aim of any form of scientific research is to generate knowledge (Hevner & Chatterjee, 2010). In scientific research, the emphasis is on the pursuit of knowledge or an understanding of that knowledge to make a meaningful contribution to the existing body of knowledge. Within the realm of education, the goals of educational research are specifically to create awareness and offer contributions for enhancing methodology as well as to improve decision making and policy development in education (Nieveen & Van Den Akker, 2007). The objective of Design Science Research (DSR), on the other hand, is to create rigorously designed artefacts that serve human needs (Goldkuhl, Ågerfalk, & Sjostrom, 2017). The crux of design science within the IS field is thus the development of knowledge via the design of artefacts (Goldkuhl et al., 2017).

Barab and Squire (2004, p. 4) describe education design research as one which occurs in the "buzzing, blooming confusion of real-life settings where most learning actually occurs." The key component is the context within which the research takes place. Thus, a criticism of educational design research is that the findings generally do not provide incontrovertible guidelines that can be effortlessly transferred without some deliberation from the researcher (Barab & Squire, 2004; Mckenney, Nieveen, & Van den Akker, 2007). Educational design research will therefore be inappropriate for the current study, the very purpose of which is to outline requirements for an eModeration system. A DSR approach was thus used to guide and structure the research which includes the case study as the method.

DSR has been described as systematic techniques and perspectives for conducting IS research. DSR involves the analysis of how designed artefacts are used and how they perform with the intention of understanding, explaining and improving on their behaviour (Iivari & Venable, 2009).

De Villiers and Harpur (2013) maintain that the identification of a valid issue which had no satisfactory solution prior to the research should typify a DSR contribution. In line with the viewpoint of De Villiers and Harpur (2013), subsequent research by Goldkuhl et al. (2017) asserts that DSR is essentially driven by the requirements of practical problems and informed by existing academic knowledge. Solutions to stated problems

in the form of designed artefacts thus serve as inputs to practice and add to the existing knowledge base, which is what the current study aims to do.

Research by De Villiers and Harpur (2013) and Goldkuhl, Ågerfalk and Sjostrom (2017) identify problem-solving, the building of original artefacts, and the integration of design with research as key features of DSR. The objective is to develop the necessary knowledge either to create new artefacts or to contribute to the improvement of existing artefacts which makes DSR particularly applicable to this study.

1.3.3. Research Method

Yin (2013) defines a case study as comprising of "an in-depth inquiry into a specific and complex phenomenon (the 'case'), set within its real-world context" (p. 321). Case study research (CSR) is valuable to acquire an in-depth interpretation of a topic in its actual real-life environment. In CSR, the context is inextricably linked to the facts being investigated and, therefore, is central to understanding real-world cases (Morgan, Pullon, Macdonald, Mckinlay, & Gray, 2016; Yin, 2013). CSR is suitable as a method when employing DSR (Van Aken, 2004) since testing an artefact within the context it will function in is a necessary aspect of determining the effectiveness of an artefact.

Flyvbjerg (2006) maintains that research within the social sciences has generally failed to produce context-independent theory. CSR offers tangible, context-dependent knowledge, which the case study is well suited to produce. This study focuses on the specific context of the moderation of IT and CAT SBA tasks in private schools in SA. A case study research method was adopted for this study as it offers the possibility of studying one facet of a question in some depth while also providing the researcher with the opportunity of exploring multiple examples of one phenomenon, by considering the points of view of different stakeholders (Crowe et al., 2011; Verschuren, 2003). A case study method is thus, within the context of this study, especially suitable in exploring how cluster, regional and national moderators conduct the moderation of IT and CAT SBA tasks in IEB schools in SA. The case study, as applicable to this study, is discussed further in section 4.2.3.

1.3.4. Sampling Strategy

The context for this study is grade 12 IT and CAT teachers within IEB schools in SA. The demographics of these participants is illustrated in Table 1-2.

Table 1-2: Sample Participants

Moderators	**Number of participants**
National Moderators	11
Regional Moderators	9
Cluster Moderators	267*

**in many schools, the same educator is involved in teaching both IT as well as CAT. This number is therefore an estimate based on the number of schools offering both subjects. This factor had no effect on the analysis of the data as the final analysis was based on the actual number of participants in the survey.*

The purpose of this study was to investigate and analyse the current moderation practices of these teachers, the perceived challenges and benefits of eModeration and the perceived requirements of an eModeration system to inform the proposed requirements for an eModeration system. Data was collected via a survey. Online questionnaires were developed using Google forms and distributed to survey participants via email.

A focus group interview was thereafter conducted. The findings from the data gathered from the online survey informed the focus group questions. The interview participants were purposefully selected based on their role in the moderation process; with the aim of obtaining a representative sample of cluster, regional and national moderators. Due to access constraints and practical considerations, only IT and CAT teachers from private schools affiliated to the IEB in Johannesburg were selected for the focus group interview.

The interview questions were constructed to engage participants in discussions around current practices in portfolio moderation to gain a deeper understanding into the effectiveness of current moderation practices by interrogating the challenges faced as well as the benefits of current moderation practices. Additional interview questions focused on how teachers/moderators envisaged the process of online portfolio submissions and how the moderation process could be improved.

The objective was therefore to acquire responses to the same issues from a substantial number of people. There was a need for an in-depth appreciation of how ICTs are used to facilitate and enhance the moderation process.

1.3.5. Data Collection and Data Handling

In this study, the collection and investigation of quantitative data was followed by the collection and analysis of qualitative data. The results of the analysis of the quantitative data were used to further interpret, confirm and enhance the findings gleaned from the qualitative data to resolve the research questions.

Quantitative research can be defined as empirical research into a human problem which is measured with numbers and analyzed using statistics. Qualitative research on the other hand, is defined as an interpretive approach to the study of people, cases and processes in their natural environments to descriptively reveal the meaning that people ascribe to their experiences of the world. Qualitative research is neither based on a single methodology nor does it belong to a single discipline (Yilmaz, 2013).

Venkatesh, Brown and Bala (2013) indicate that the divergent findings from quantitative and qualitative strands provide great value to researchers. The often contradictory and complementary conclusions and assumptions results in a re-examination of the conceptual framework thus enriching the researcher's understanding of a phenomenon.

The quantitative data analysis was used to enhance the findings. Combining qualitative and quantitative data analysis provides valuable perceptions into diverse events of significance that cannot be fully appreciated by simply implementing either a qualitative or a quantitative method on its own (Venkatesh et. al., 2013).

1.3.6. Data Analysis

Qualitative and quantitative data was captured via surveys developed using Google forms. The online survey was distributed via email. Responses from the online survey were then used to further structure and refine the questions for a focus group interview attended by cluster and national moderators.

Thematic analysis (TA) was used to analyze the qualitative data obtained. TA,

which can be applied within a range of different frameworks, is fundamentally a method of identifying and analyzing patterns in qualitative data. TA is suitable for an extensive range of research interests and theoretical perspectives and was particularly suitable for this study as TA works with questions about peoples' experiences as well as the representation of phenomena in specific contexts. Additionally, TA is suited to the analysis of various types of data from various sources, can be used for large and small data sets and can be applied to create either data-driven or theory-driven analyses (Clarke & Braun, 2013).

Key words or thoughts that were repeatedly expressed by the participants were encoded to identify general themes and patterns emerging from the raw data. This data was decoded and the results were triangulated with the quantitative data to provide more pertinent results which could potentially provide new insights. Runeson and Höst (2009) maintain that triangulation provides a broader picture by allowing the researcher to view the same entity from different perspectives.

1.4. Research Contribution

The theoretical contribution of this study is the requirements for an eModeration system which are presented as a conceptual model (cf. Figure 5-4) to provide more structure to the findings. These requirements could inform policy making within the IEB and eventually the DOE. Principals, directors of academics and individual teachers should be interested in implementing efficient processes for moderation.

Technology adoption models were used as a basis for constructing a customized questionnaire for the context. A challenge was that the technology acceptance models relate to existing system use while the context for the current study was pre-adoption of an eModeration system. There are not many models which focus on pre-adoption of IT systems nor are there any applicable pre-existing questionnaires relevant to the context of this study. The pre-adoption attributes identified is a practical contribution of this study. The questionnaire is therefore a valuable practical contribution to the existing body of knowledge and novel in its applicability to the pre-adoption of an ICT system.

The findings contribute to practice in terms of understanding current moderation practices and provides insight on the potential benefits, challenges and requirements for the implementation of eModeration from a teacher's perspective.

Software developers should gain valuable insights from the requirements for a system that allows for online submissions, moderation and feedback to assessors. Implementing such a system could create opportunities to ease the workload of already overburdened teachers.

1.5. Limitations

There are several limitations which must be considered. This study used self-reported data from participants. As such, the usefulness of the data will only be as reliable as the quality of the responses. Additionally, the research was limited to private schools only. The results therefore cannot be generalized as they may not necessarily be reflective of public schools.

Another limitation relates to the use of a convenience sample. A major criticism of convenience samples is that "the generalizability of the results will be limited if the sample size cannot be considered as truly representative of the target population" (Davis & Wong, 2007, p.119). Additionally, the probability of measurement bias, resulting from too few people filling in the questionnaire, is much greater (Peersman, 2014). There are about 267 schools offering CAT and IT at IEB schools. In many schools, both the IT and the CAT teacher is the same individual. The sample size was thus limited.

Another drawback was that the researcher is a part of the research community. This introduced the possibility of personal bias.

Additionally, the preliminary literature review did not yield any data relating to digital moderation systems in the SA context. The only pertinent research in terms of the digital moderation process was that of Van Staden (2017) albeit at a tertiary institution. Therefore, reliance was largely placed on reports obtained from various educational bodies and reports published by authors commissioned by these educational bodies rather than on empirical studies.

1.6. Delimitations

An attempt was made to obtain permission from the Department of Basic Education (DBE) so that the views of public school teachers could be caucused. However, despite having filled in the necessary application forms, no response was forthcoming from the officials at the DBE. Thus, the survey was distributed only to IT and CAT teachers within the private school sector. The researcher is part of the community of IT and CAT educators in the private school sector. Therefore, access to IT and CAT teachers' contact details was easily facilitated through existing email distribution lists.

1.7. Ethical Clearance

To provide answers to the research questions, it was necessary to establish how moderation was being conducted in IT and CAT in the secondary school environment. Ethical clearance to conduct the study was obtained from the School of Computing at UNISA (Appendix A). Additionally, permission was obtained from the IEB to conduct the research with IT and CAT educators from schools affiliated to the IEB (Appendix B_1).

1.8. Terms and Definitions

1. Moderation: Moderation is the process of educators sharing their expectations and understanding of standards with each other to improve the reliability of their decisions about student learning[3].

2. eModeration: "the electronic moderation [quality assurance/critical reading] of summative examination scripts by external moderators in a virtual learning environment" (Van Staden et al., 2015, p. 1).

3. Portfolio refers to an "individual file or folder of each learner's work"[4].

[3] Available from: http://assessment.tki.org.nz/Moderation [Accessed: 22 August 2017].
[4] Available from:http://www.sahistory.org.za/article/classroom-draft-national-curriculum-statement [Accessed: 23 August 2017].

4. School Based Assessment is an assessment conducted by the students' own teacher and allows for the collection of several samples of student performance over a period of time[5].

1.9. Dissertation Structure

Chapter one provides an introduction and addresses the research context and problem statement. Chapter two reviews existing literature to provide background information on the purpose of moderation and the different types of moderation and outlines the requirements for an eModeration system. Chapter three provides a literature review of the relevant theoretical models available for the development of technology acceptance models. Chapter four offers a discussion on the research methodology employed, the ethical clearance procedures followed as well as the limitations of this study. The data analysis and results obtained from the study are discussed in chapter five. Chapter six summarizes the findings and key contributions of the study and concludes the study on eModeration of grade 12 IT and CAT portfolio tasks. Refer to Figure 1-1 for a roadmap of the dissertation structure.

1.10. Conclusion

This chapter provided an overview of the rationale for this research study together with detailed background information of the context within which the study was framed. The research problem was stated, followed by the main research question and the related sub-questions. An overview of the research methodology and design was provided to clarify how the research questions would be answered. An overview of the dissemination of questionnaires and the approach to focus group interviews was provided. The limitations, delimitations and ethical considerations were briefly discussed. This chapter culminates with a description of the dissertation structure as well as a depiction of a roadmap indicating the layout of the dissertation.

[5] Available from: http://www.hkeaa.edu.hk/DocLibrary/SBA/HKDSE/Eng_DVD /sba_definition.html [Accessed: 23 August 2017].

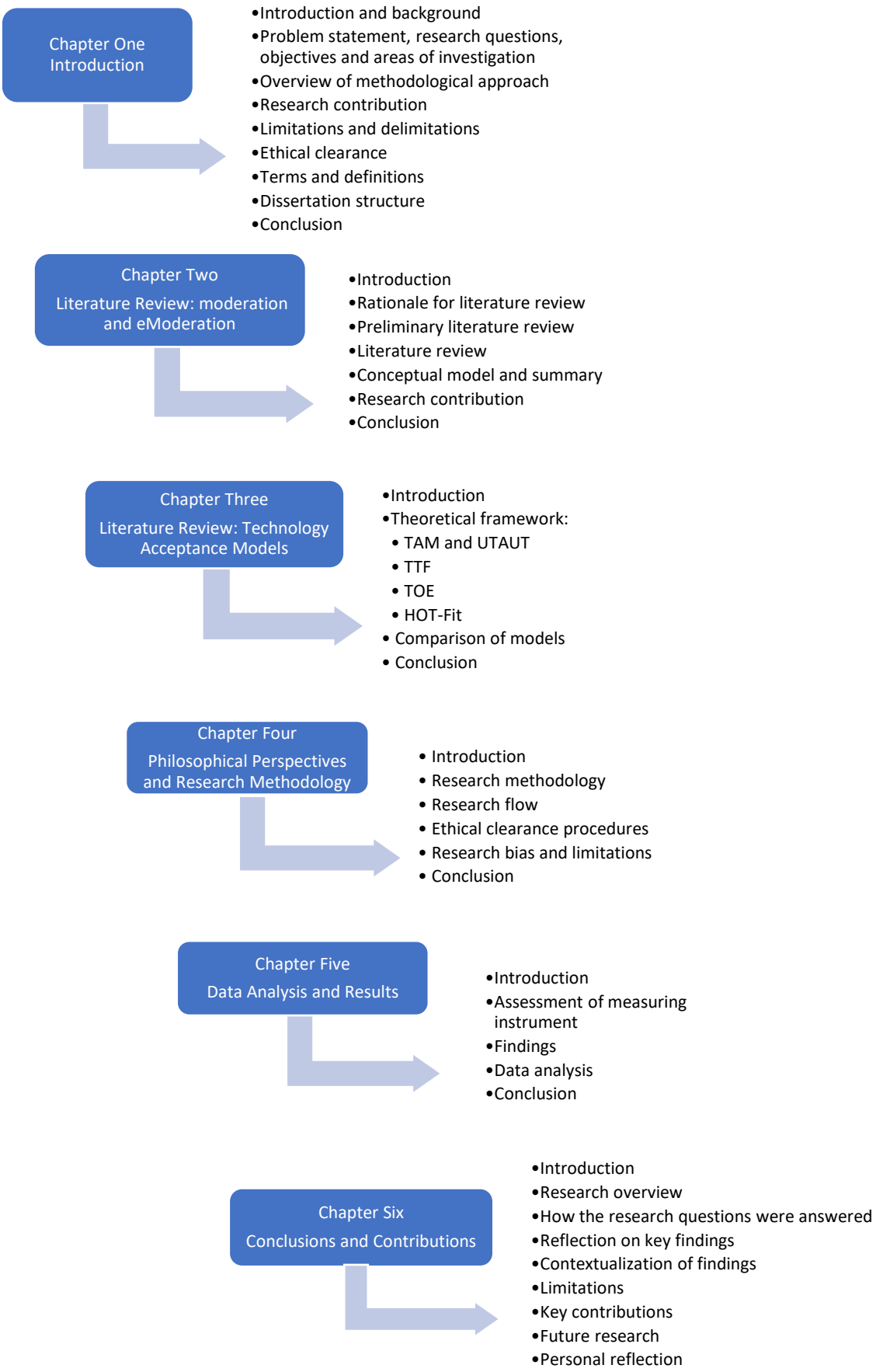


Figure 1-1: Structure of Dissertation

Chapter 2

Literature Review: Moderation

2.1. Introduction

Chapter one provided an introduction and presented the context to this study, discussing the problem statement and research questions to be addressed. A broad overview of the research design and methodology was provided. The value of the research, including the contributions and limitations were also discussed. This chapter will offer a detailed literature review discussing the different forms of moderation, the general purpose of moderation and the challenges and benefits of current moderation practices that will inform this study. Additionally, current literature will be reviewed to determine the requirements for an eModeration system. The information presented in this chapter is necessary in informing the development of the measuring instrument and is instrumental in providing answers to the first research question relating to the current processes in the moderation of the secondary school's IT and CAT SBA assessments at grade 12 level.

2.2. Rationale for Literature Review

The demands for increased accountability and an increased emphasis on the reliability and validity of scores within and across faculties calls for institutions to closely examine current processes and practices in quality assurance (Kuzich, Groves, Hare, & Pelliccione, 2010). Kuzich et al. (2010) and Bloxham, Hughes and Adie (2016) further maintain that assessing and evaluating students' work is an integral aspect of quality assurance within tertiary educational institutions and an essential element of any education system. Prior studies by Singh (2004) and research by Klenowski and Wyatt-Smith (2010) describe quality assurance as the methods, structures and systems in place to establish confidence in the quality of the processes and outcomes to ensure that expected standards are maintained.

It is therefore essential that some form of quality assurance be carried out to ensure that assessments are fair, valid, consistent and reliable. This literature review draws largely from the research conducted by Adie (2009, 2011, 2012); Bloxham (2009);

Klenowski and Wyatt-Smith (2010); Adie, Lloyd and Beutel (2013); Beutel, Adie and Lloyd (2014); Bloxham, Hughes and Adie (2016) and Adie and Klenowski, (2016) who have established themselves as authorities in moderation practices.

Adie (2012) describes moderation as a process where technology mediates the interaction amongst teachers from geographically dispersed areas. On the other hand, Adie, Lloyd and Beutel (2013); Adie and Klenowski (2016) and Beutel, Adie and Lloyd, (2017) discuss moderation as a social, quality assurance process in which a shared understanding of standards is developed from face to face communication between peers and the collaborative development of assessment criteria. Bloxham et al. (2016) highlight different practices in moderation processes and discuss the purpose of moderation.

In the South African context, Van Staden, Van Biljon and Kroeze (2015) demonstrated the efficiency of an eModeration system which was successfully implemented at a higher education institution. However, despite the identified benefits of optimizing moderation procedures, the application of online moderation in the secondary school environment is limited. Subsequent research by Van Staden, Van Biljon and Kroeze (2017) maintains that paper-based moderation is still extensively used at academic institutions in SA.

The current study will thus build on the existing research to interrogate the requirements for an online system to be used to facilitate the moderation process. Unlike the moderation processes described by Adie (2009, 2011, 2012); Adie, Lloyd and Beutel (2013) and Adie and Klenowski (2016) the emphasis of this study is not on the discussions inherent in the processes of quality assurance but rather on the requirements for the development of a digital system which can be implemented to carry out the actual moderation process.

2.3. Preliminary Literature Review

The aim of an effective literature review is to provide a firm foundation for building knowledge (Ellis & Levy, 2006). To this end, a critical literature review was conducted to research the prevailing literature and evaluate its quality by presenting, analyzing and synthesizing material from various sources (Grant & Booth, 2009).

Various researchers, for instance Jesson and Lacey (2006) and Pare, Trudel, Jaana

and Kitsiou (2015) concur that, in addition to telling a story, a good critical literature review should help to expand on current knowledge with the aim of demonstrating that the researcher has extensively researched and critically evaluated the quality of existing literature. The review thus goes beyond mere description to also include some measure of analysis and abstract innovation.

Critical reviews can apply many data synthesis methods to deepen knowledge about a specific area of study with the essential components of a critical literature review being:

- Description skills: an awareness of what is currently known in the subject area under consideration.
- Critical skills: presenting strengths, limitations, bias and omissions from a combination of various resources.
- Analytical skills: indicating how the research fits into a wider context (Jesson & Lacey, 2006; Paré et al., 2015).

A significant aspect of a critical review is to identify a conceptual contribution in order to derive new theory. A critical literature review typically results in a hypothesis or model, not an answer. The resultant model may comprise of a synthesis of existing schools of thought or it may be a completely new interpretation of the existing data (Grant & Booth, 2009).

In this study a multi-pronged search strategy was used. Keyword searches (see Table 2-1) on prominent educational research databases like Education Resources Information Center (ERIC) and Taylor and Francis Online and subject specific databases like IEEE Xplore, ACM Digital Library and ProQuest were conducted via the UNISA library portal. Additionally, specialized search engines like Google Scholar were used. Once articles were identified for inclusion, snowball searching was used to identify further articles using Google Scholar's and the UNISA library's "cited by" and "related searches" functions. Additionally, given that the context of this research is moderation within the secondary education environment, searches of relevant journals and websites likely to have relevant reports in them, for instance, the IEB, the EBSCOhost research platform, the Masters and PhD studies section of UNISA,

Department of Basic Education and the New Zealand Qualification's Authority was carried out.

Table 2-1 indicates the number of hits obtained using generic keyword searches and the broad focus areas of the resulting articles obtained. The searches were done from July 2017 to August 2018. The number of hits obtained were further narrowed down by filtering the search results to articles from the previous 15 years only. The titles of the articles were then scanned to further limit the scope of the articles obtained. All articles describing moderation in environments other than the education environment were discarded from further consideration. Reading through the abstracts of the articles provided a further basis for eliminating or including articles for further consideration. Articles that did not discuss moderation as a quality assurance process were eliminated. Only articles that dealt with the use of online systems for the distribution, storage and annotation of assessments; articles discussing the different types of moderation processes; articles including discussions of the benefits and challenges of online moderation and articles discussing the requirements for online assessment or moderation processes were downloaded for further consideration. Articles discussing the development of digital portfolios were also isolated for further consideration.

The keywords were further refined to include eModeration and digital moderation. These searches yielded results on the moderation of online forum discussions. Searching for "electronic moderation of graded assessments" provided information on the assessment of online collaborative learning. Further refining the searches to include "digital moderation in the secondary school environment" failed to add pertinent studies of eModeration in the SA secondary school sector. One hundred and twelve articles were finally saved for further reference.

Table 2-1: Keyword Search Strategy

Keyword	Number of Hits	Results/Research Focus
Moderation	233000	Methods for integrating mediation and moderation.
eModeration	1700	Moderation of discussion groups within a social media platform.
Digital moderation	68900	Digital ecosystems; learning theories in the digital age.
Digital moderation in the secondary school environment	17200	Digital natives, cyber-bullying in secondary schools, moderating effects of the family environment.
Digital moderation of portfolios	6790	Pairwise comparisons and creating and evaluating digital portfolios.
Online moderation of assessments	17000	Online moderation meetings for standardisation.
Electronic moderation of graded assessments	18400	Assessing online collaborative learning.

Additional searches were conducted for IS technology acceptance models which have been successfully implemented in the educational environment.

The literature review was conducted in two parts:

- A literature review of moderation and eModeration.
- A literature review of technology acceptance models.

Articles that were identified for further reference were thus evaluated and analysed for their relevance to moderation, eModeration and the requirements, challenges and benefits of an eModeration system as depicted in Table 2-2.

Table 2-2: Summary of Major Studies on Moderation

CITATION	Moderation	eModeration	Challenges of eModeration	Benefits of eModeration	Requirements for an eModeration system
(Kuzich et al., 2010)	✔				
(Bloxham et al., 2016)	✔				
(Singh, 2004)	✔				
(Adie, 2009)	✔	✔			
(Adie, 2012)	✔				
(Adie, 2011)	✔	✔	✔		✔
(Adie et al., 2013; Beutel et al., 2017)	✔				
(Adie & Klenowski, 2016)	✔				
(Berger, 2011)					✔
(Maxwell, 2002)	✔				
(Greatorex, 2004)			✔		✔
(Fatimah, Yassin, Mohamad, & Yamat, 2007)					
(Johnson & Greatorex, 2008)			✔		
(Fatimah et al., 2007)			✔		
(Van Staden, Van Biljon, & Kroeze, 2015)	✔			✔	
(Klenowski & Wyatt-Smith, 2010; Wyatt-Smith, Klenowski, & Gunn, 2010)	✔				
(South-African-Qualifications- Authority, 2001; Umalusi, 2004; Independent-Examinations-Board, 2015)	✔				
(Salmon, 2004a; Gregory & Salmon, 2013; Wright, 2015; Hoyos & Cano, 2016)		✔			
(Van Staden, 2010)	✔	✔	✔	✔	✔
(Van Staden, 2017; Van Staden, Van Biljon, & Kroeze, 2017)	✔	✔	✔		✔
(ABC-Awards, 2014)		✔	✔		
(AlphaPlus, 2014)		✔	✔	✔	
(New-Zealand-Qualifications-Authority, 2016, 2016a, 2016b, 2016c)		✔		✔	

Literature identifying technology acceptance models were evaluated and analysed for their applicability to the current study. The relevant literature that was considered is depicted in Table 2-3.

Table 2-3: Summary of Major Studies on Technology Acceptance Models

CITATION	HOTFIT	TOE	TTF	TAM
(Venkatesh & Davis, 1996, 2000; Venkatesh, Morris, Davis, & Davis, 2003; Davis & Wong, 2007; Venkatesh & Bala, 2008; Yen, Wu, Cheng, & Huang, 2010; London, & Johnson, 2011; Wu, Chou, Weng, & Huang, 2011; Babaheidari & Svensson, 2014; Behrend, Wiebe, Hassan & Lowry, 2015; Jeffrey, 2015)				✔
(Dishaw & Strong, 1999; Goodhue, Klein, & March, 2000; Tjahjono, Fakun, Greenough, & Kay, 2001; McGill, 2009; Yen et al., 2010; Yu & Yu, 2010; Tariq & Akter, 2011; Wu & Chen, 2017)			✔	
(Borgman, Bahli, Schewski, & Heier, 2013; Ramdani, Chevers, & Williams, 2013; Gangwar, Date, & Ramaswamy, 2015; Awa, Ukoha, Emecheta, Harcourt, & Harcourt, 2016;)		✔		
(Yusof, Kuljis, Papazafeiropoulou, & Stergioulas, 2008; Erlirianto, Ali, & Herdiyanti, 2015; Muslimin, Hadi, & Nugroho, 2017;)	✔			

2.4. Literature Review of Moderation

2.4.1. What is Moderation?

A wide range of definitions of what moderation is exists. Existing studies and reports, for instance, Maxwell (2002); Centre-for-Learning-and-Development (2012); Independent-Examinations-Board (2015) and Van Staden et al. (2015) define moderation as a process for developing consistent, comparable assessment judgements across different assessors, programmes and schools with the aim of ensuring that assessment is fair, valid and reliable.

Singh (2004, p. 59) defines moderation as “a quality assurance process of ensuring the validity of the assessment instruments, fairness of the assessment processes and reliability of the assessment decisions by all assessors, according to agreed standards.” Adie, Lloyd and Beutel (2013) describe moderation as the practice of developing a mutual understanding of assessment criteria and standards and the evidence demonstrating varying qualities of performance amongst teams of educators.

Moderation is an aspect of quality assurance that is carried out at different steps in the assessment process to guarantee that assessments are carried out in line with agreed upon practices. Thus, moderation supports quality assurance (Singh, 2004; Parbhoo, 2011). Singh (2004) further maintains that moderation should be an ongoing process carried out using agreed upon principles and criteria within the school environment.

In the South African context, a formal quality assurance body (Umalusi) was created in 2001 to undertake the role of quality assurance of the national Senior Certificate examinations. As part of its mandate, one of the quality assurance processes undertaken by Umalusi is the moderation of the SBA component of all subjects (Umalusi, 2004).

In the context of this study, moderation will thus be defined as the quality assurance process of ensuring that assessments of grade 12 IT and CAT SBA tasks are valid, fair and reliable across all IEB schools in SA.

In the South African context, institutions' assessments are either carried out by the educational provider or individual assessors. Moderation processes are therefore critical in ensuring the credibility of the educational system as well as ensuring the ethical behaviour of assessors and students (SAQA, 2015). Moreover, within the National Qualifications Framework (NQF), moderation provides an opportunity to upskill educators and enable professional engagement (South-African-Qualifications-Authority, 2001).

Many researchers for instance, Maxwell (2002); Kuzich et al. (2010) and Wyatt-Smith, Klenowski and Gunn (2010) concur that not only must academics share a clear, common understanding of the requisite standards, but student achievement must also be fairly and reliably assessed against these shared standards. Failure to share clear expectations can compromise standards. It is therefore essential that some form of quality assurance process is conducted to certify the validity of judgements made to satisfy the needs of all stakeholders.

However, despite researchers highlighting the importance of maintaining standards when describing moderation; Klenowski and Wyatt-Smith (2010) point to the varying definitions of standards depending on the setting in which they are used as well as the functions they purport to fulfill. For instance, Umalusi (2004) differentiates between

benchmarked standards of assessment and curriculum standards while Klenowski and Wyatt-Smith (2010) discuss the concepts of content standards and achievement standards. Thus, to effectively investigate the moderation process, one must first determine how such measures of quality are shared amongst professionals. Therefore, for the purposes of the current study, a distinction was drawn between content standards and achievement standards.

While content standards refer to the knowledge imparted and are applicable to systems and institutions, achievement standards refer to performance standards and indicate the quality of students' achievement (Klenowski & Wyatt-Smith, 2010). The latter provides a basis for reporting on the quality of students' performance and is the focus of this research.

2.4.2. Purpose of Moderation

Attention is increasingly being focused on teacher-designed assessment based on achievement standards (Adie, 2012). One approach to the quality assurance of these assessments is moderation (Van Staden et al., 2015). It is therefore vital that adequate systems for moderation are established to determine the authenticity of skills-based education as well as to meet systemic demands for accountability (Adie, 2009).

Every assessment must comply with the principles of validity and reliability. Assessment of student learning is therefore a crucial requirement of any education institution (Bloxham et al., 2016). Although the conventional rationale behind moderation processes has been to agree on final marks, moderation has mainly become part of a cycle within the assessment process. The moderation process has evolved to incorporate authentication, professional endorsement and monitoring and most importantly accountability (Maxwell, 2002; Van Staden et al., 2015).

Many studies, for instance Umalusi (2004), Adie, Lloyd and Beutel (2013) and (New-Zealand-Qualifications-Authority, 2016c), differentiate between internal and external moderation at tertiary institutions. Internal moderation is described as the process of corroborating the consistency of judgements and standards inside an organization while external moderation incorporates expert judgement to ensure uniformity with national standards. Similarly, the New-Zealand-Qualifications-Authority (2016a) describes external moderation as the process of checking assessment practices

across all organizations or people who assess against unit standards. In the South African context, external moderators who are generally highly experienced experts in their subject areas are employed to perform the function of determining consistency with national standards (Umalusi, 2004).

Face to face and technologically facilitated moderation meetings offer educators an opportunity to examine and expose their common understandings. These shared understandings inform educators' appraisal choices grounded in specified achievement standards (Adie, 2012). Further research by Adie and Klenowski (2016) concurs that moderation as a quality assurance process plays a pivotal role in educators' professional development. An increase in the reliability and correlation of assessment results informs future teaching practices.

Adie and Klenowski (2016) and Kuzich et al. (2010) identify two main purposes of moderation:

- Achieving consistency in how standards are interpreted in relation to the quality of students' work as well as comparability. Comparability relates to the consistency of the judgements made in relation to one another as well as to their consistency with the advocated assessment standards.
- Achieving quality control with the aim of improving teachers' assessments and methodologies for improved learning. As a function of moderation, quality assurance provides a means of bolstering confidence in the quality of moderation processes and outcomes.

In combination, these purposes of moderation secure confidence in the quality, impartiality and equity of assessments.

Another aim of moderation is to ensure that assessments are aligned with recognized specifications and norms. The constant collaboration and participation between practitioners provides vital learning opportunities thus enhancing teaching practices (Adie & Klenowski, 2016; Department-for-Education-and-Child-Development, 2016). Additionally, through the moderation process, teachers collaboratively validate and exchange their understandings of what indicates quality in student work; ensuring that standards are acceptable and compliant with current policy (Independent-Examinations-Board, 2015).

Subsequent research by Van Staden (2017) contends that moderation ensures that different assessors make similar decisions about learners' performance and that there is both external as well as internal verification of the validity and reliability of the assessments being made.

Within the context of the current study, the objective of moderation is to externally verify the validity of teachers' internal assessments of IT and CAT portfolio tasks. It is therefore necessary to interrogate different moderation processes to efficiently achieve this goal.

2.4.3. Types of Moderation

Moderation processes within educational institutions generally refer to developing a shared understanding of different qualities of performance. Maxwell (2002) identifies two basic forms of moderation and recommends that schools link moderation for accountability to moderation for improvement.

- Moderation for accountability: This type of moderation usually involves external control and validation with the aim of publicly confirming assessment results.
- Moderation for improvement: The purpose of this type of moderation is to improve educators' capability of consistently assessing student assessments and making comparable judgements thus ultimately enriching the overall quality of assessment programmes in schools. This form of moderation incorporates collaborative methods of supporting teachers' professional development and does not usually involve the external control and validation that moderation for accountability does.

2.4.3.1. Social Moderation

Maxwell (2002) refers to "social moderation" (refer to Figure 2-1) as moderation that involves "human judgements" (p. 14) while Beutel, Adie and Lloyd (2017) refer to social or "consensus" (p. 4) moderation when referring to many assessors using a common framework to make judgements of an assessment task. Social moderation refers to educators engaging with each other in a consultative negotiation of the application of standards (Maxwell, 2002). As depicted in Figure 2-1, social moderation can take the form of online moderation forums or face-to-face peer moderation.

The very essence of moderation for improvement lies in teachers exchanging ideas on their interpretation of standards and assessment methods and how they arrive at their judgements. Social moderation practices afford educators the opportunity of engaging with other educators in a consultative negotiation of the application of standards thus validating their judgements (Maxwell, 2002).

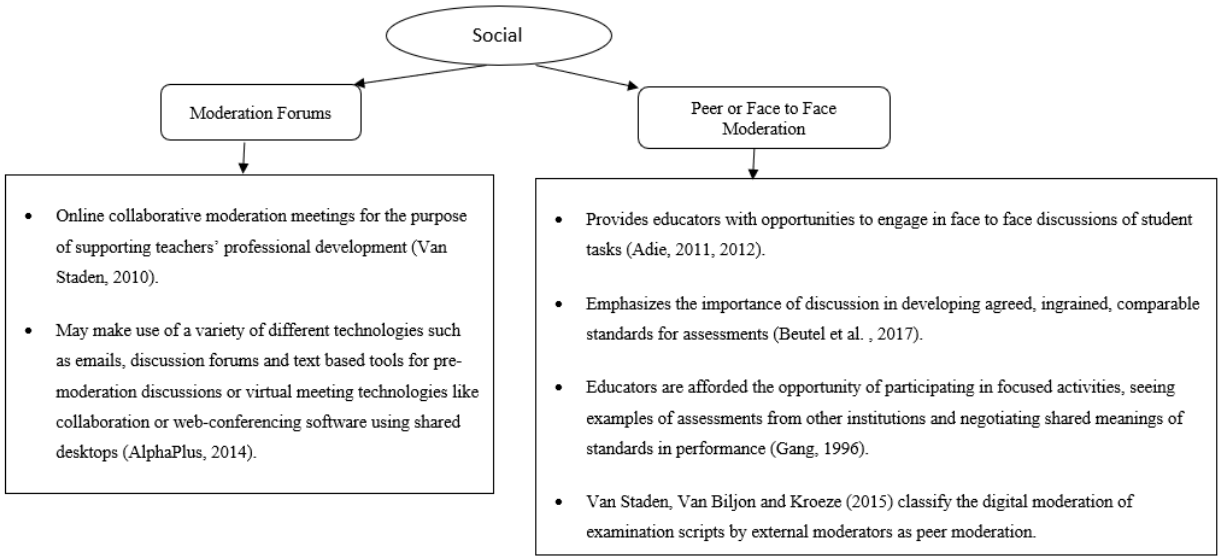


Figure 2-1: Social Moderation

Maxwell (2002*)* suggests that teachers could engage in professional conversations about assessments by either pairing within the school or with teachers at other schools. Such pairs could occur within specific learning areas at the same grade level or within learning areas at different grade levels. These pairings could possibly then evolve into larger more formalized groupings of teachers (Maxwell, 2002).

In the same vein, Adie (2009) contends that the introduction of information and communication technologies (ICTs) into the educational arena is invaluable in guiding teaching practices. To this end, Adie (2009) proposes that online moderation meetings are a viable approach for educators from different areas to meet so that they can share and construct common interpretations of quality in assessment. Adie (2009) further maintains that ICT systems will foster dialogue amongst diverse groups of dispersed educators thus encouraging increased consistency in their assessments.

While Beutel et al. (2017) criticize social moderation as a process where power relationships may jeopardize a true analysis of marking judgements; the AlphaPlus

(2014) report, on the other hand, argues that online social moderation creates a sense of democracy where all participants are equal and the moderation process is less likely to be influenced by domineering personalities.

Additionally, collaborating with other educators beyond their local environments via an online platform affords participants the opportunity to embrace different viewpoints. Online moderation requires rules and principles which particularly support this mode of operation while also recognizing the environment in which moderation is conducted (Adie, 2012).

2.4.3.2. eModeration

The following section interrogates the prevailing literature and seeks to provide an evidence based, comprehensive definition of eModeration by first differentiating between a manual and an electronic moderation process as depicted in Table 2-4.

Table 2-4: Manual Versus Electronic Moderation Process
Adapted from: Van Staden, 2017

	MANUAL MODERATION	**ELECTRONIC MODERATION**
DECRIPTION	Paper-based system	Assessments and moderation functionality are available via an electronic platform
PRESENTATION OF MARK	Manual (usually by making use of a green pen)	Electronic (using some form of an online marking tool)
DIFFERENCES	• physical copies of assessed work must be transported between different locations • labour intensive • requires huge amount of physical storage space	• electronic processes control the flow of data • more efficient process • requires additional technology

Van Staden (2017) describes an electronic moderation system as one which presents a user interface allowing the user to scan in paper based, marked scripts. The moderator then uses electronic tools to indicate additional comments or changes in mark allocations. The moderated assessment is thereafter uploaded onto the system to be accessed digitally by the marker (Van Staden et al., 2017).

Other researchers have described eModerators and eModeration in very different contexts. Salmon (2004) and Gregory and Salmon (2013) refer to an eModerator as a

facilitator mediating electronic conferences where resources are available online and all interaction occurs solely via networked technologies. The eModerator promotes “human interaction and communication through the modelling, conveying and building of knowledge and skills” (Salmon, 2004, p. 4). eModerators are described as “champions who make the learning come alive” (Salmon, 2004, p. 12). Additionally, Salmon (2004), Gregory and Salmon (2013), Wright (2015) and Hoyos and Cano (2016) define eModeration as the management of the collaboration between online instructors and their students and the skills that online instructors implement to establish an instructor’s presence in an online setting.

Researchers have suggested different ways in which eModeration can be carried out. Adie (2009) highlights online moderation meetings for teachers as a way for a diverse group of geographically dispersed teachers to develop consistency in judgements. Subsequent research by Adie (2011), further extends the idea of online moderation meetings by positioning technology in the role of mediating the interactions between educators involved in standardization. Van Staden et al. (2017) on the other hand, describes eModeration as an electronic quality assurance process using an online tool.

An alternative approach proposed by ABC-Awards (2014) is for electronic assessments to be made available for external verification by submitting assessed work on a CD-ROM. The proposed system would consist of rules and procedures for providing access to marked samples via a computer (ABC-Awards, 2014). While the submission appears to be in a digital format, it is unclear whether the actual moderation process is also carried out digitally. Additionally, there is no clarity as to what form these samples can take or how this process will differ from manual moderation as samples of assessed work will still be physically sent from one point to another albeit via a digital medium.

In the UK, Wharfe and Karrim (2005) presented their work on an ePortfolio system to support teachers’ assessments of digital portfolios for standardization and consistency. Wharfe and Karrim (2005) questioned the validity of assessing digitally created work via hard copy alone. The assumption was that there is a greater possibility of the assessment being valid if the educator viewed the actual digital file (Wharfe & Karrim, 2005).

A subsequent report by Lynch (2014) summarizes eModeration as a process where

electronic media is used to support assessment, moderation and the secure storage of student evidence; quality assure the production of student evidence; produce evidence for making assessment decisions; record results electronically and upload students' work to a secure site for moderation. Lynch (2014) stressed the importance of teachers involved in eModeration being confident in the use of the technology involved; having appropriate access to the schools' network systems and having confidence in the processes involved.

The New-Zealand-Qualifications-Authority (2016) maintain that teachers would benefit from a more streamlined moderation process and subsequently established the Digital Moderation Project for all external moderation to be completed online (New-Zealand-Qualifications-Authority, 2016). It was envisaged that this process would establish a community of shared good practice for educators. The objective was to submit moderation material via an online digital platform and the project focus was on making external moderation more relevant to assessors by providing an application to support their internal moderation practices "improving the timeliness and usability of external moderation outcomes" (New-Zealand-Qualifications-Authority, 2016c, p. 2). However, there is no evidence of the successful implementation of this system nor any feedback in terms of the efficacy of the implementation of such a system within the New Zealand educational system.

Despite the divergence in the descriptions of eModeration systems however, researchers agree that moderation systems provide a setting for teachers to collaboratively derive and articulate their shared understandings thus increasing the reliability of their assessments (Adie, 2009; AlphaPlus, 2014; Harpe et al. 2009; Darling-Hammond, 2010; Webb & Gibson, 2013; Milne, Heinrich & Morrison, 2008). A subsequent international study conducted by Schulz, Isabwe and Reichert (2015) indicates that 64.4% of teachers use ICT tools when conducting assessments. It is therefore a reasonable assumption that if educators are assessing digitally, then the process of moderation should also be conducted electronically. The focus of the current study will thus be on investigating the integration of ICT tools for the eModeration of IT and CAT SBA tasks within the South African secondary school environment.

In summary, eModeration is essentially the evaluation of candidate performance and standards of assessment using a digital medium. The requirements for an eModeration system will thus be drawn from the actual use of an online system to conduct the moderation process rather than using technology to mediate the interactions amongst educators engaging in discussions around standardization.

Drawing on the existing work of Van Staden (2017) and reports commissioned by the New Zealand Qualifications Authority, a pertinent definition within the context of this study, therefore, is that eModeration involves the electronic quality assurance of summative portfolio tasks by external moderators within a digital environment. While the purpose of moderation does not change, a digital moderation approach will focus on *how* moderation occurs via a digital platform.

2.5. Benefits of eModeration

In a study at a South African tertiary institution, Van Staden (2010) found that moderators preferred to use an eModeration system rather than a paper-based system. The advantages of online moderation are usually ascribed to convenience and cost savings (AlphaPlus, 2014; Van Staden, 2010).

The electronic development and storage of evidence provides remote access to moderators resulting in greater flexibility, convenience and accessibility (ABC-Awards, 2014). Moderators have the flexibility of carrying out their moderation functions in their own time and place without the need to be in close proximity to the institutions whose assessments are being moderated. Van Staden (2010) and Van Staden et al. (2015) further indicate that an electronic moderation system can hasten the delivery of assessments to eModerators and the return of moderated assessments to the institution thus ensuring that results are published timeously.

Using ICTs to prepare and provide evidence of assessments is relevant as well as practical given that Information Technology is recognized as a key skill for learners as well as educators. Evidence of assessments can thus be collected in a more naturally occurring way enabling assessors and moderators to view the work in the way it was intended; for instance, web sites and presentations most often include components that are lost when assessed material is printed. The advantage to digital submissions,

therefore, is that work produced electronically can be submitted in the same format used to create it thus eradicating the need to produce a hard copy version (ABC-Awards, 2014).

Additionally, utilizing electronic evidence requires less physical space to store assessment materials while also reducing the use of consumables like paper, toner, etc. (ABC-Awards, 2014; Van Staden et al., 2017). Not only does this reduction make such a system more environmentally friendly; but the costs of consumables are decreased as no physical copies of the original assessments need to be made. An eModeration system also negates the need for the transportation of hard copies to and from the moderator, thus reducing operational costs and minimizing the logistical problems associated with transporting assessed portfolios to and from the moderator (AlphaPlus, 2014; Van Staden, 2010; Van Staden et al., 2017). The online moderation process also limits the loss of moderation reports and marked scripts which are conventionally posted or couriered.

Online standardization affords the benefit of increased reliability thus creating the possibility of a greater range of more robust and valid assessment methods in addition to the ability to monitor the performance of examiners (AlphaPlus, 2014; Chamberlain & Taylor, 2011). Additionally, Van Staden (2010) asserts that online systems provide greater security.

Van Staden et al. (2015) established the efficacy of an eModeration system in enhancing productivity. An electronic moderation system requires fewer personnel to manage the moderation process; relying instead on electronic processes to control the flow, thus ensuring that the moderation process is more efficient.

In summary, prevailing literature has identified cost savings, convenience, reduction of consumables, increased reliability and productivity as particular benefits of eModeration.

2.6. Challenges of eModeration

Van Staden (2017) defines technology in the context of eModeration systems as encompassing infrastructure, applications, communications architecture and development capabilities. Many studies for instance, Raikes, Greatorex and Shaw

(2004), Adie (2011) and AlphaPlus (2014) indicate that not all participants in an online standardization meeting are necessarily comfortable with the use of technology. This factor is of particular concern for online standardization where it is possible that an assessor's approach to the online standardization process may be hampered by his/her discomfort with the use of the technology (AlphaPlus, 2014). Adie (2011) concurs with this finding, indicating that educators' anxiety and negativity to the technology may result in them not fully engaging in the moderation process. A related challenge would be the additional skills that educators could possibly need to interact with an eModeration system (ABC-Awards, 2014).

In the context of the social moderation of assessments, Adie (2011) and AlphaPlus (2014) identify the lack of visual cues provided by face to face contact in an online environment as a factor which creates discomfort and a sense of displacement for teachers having to question the judgments made by others and in turn defend their own judgements of their assessments. Participants in a study carried out by Adie (2011) indicated that the absence of visual cues and an inability to determine the true intention of the feedback that they were receiving restricted participation in the moderation process and placed them at a disadvantage.

An additional disadvantage identified by AlphaPlus (2014) is the lack of transparency in determining who or how many people are being addressed in the online environment which could lead to misunderstandings. Raikes et al. (2004) suggest that this loss of face-to-face interaction amongst assessors and moderators might affect quality.

The ICT infrastructure necessary to develop digital portfolios has been identified as a particular challenge of eModeration systems by Greatorex (2004) and Fatimah et al. (2007). A good computer network capable of high-speed uploading and downloading of projects is essential as any instability in the network can create challenges for the uploading of projects.

Greatorex (2004) has further identified technological limitations as a factor that could hamper the implementation of eModeration systems. Making comparative judgements of students' work and the ability to make a holistic judgement of individual student's work is a critical aspect of the moderating process. Johnson and Greatorex (2008) indicate that judgements are impaired when moderators must scroll up and down and

manage different pages in documents. Searching through different portfolio pieces of the same candidate presents difficulties with searching through more than one item of evidence at the same time. Moderators also experienced difficulties when trying to view and compare more than one candidate's work as well as viewing the marking grid simultaneously.

Technological developments such as using a stylus to directly annotate on a tablet's surface, using interactive paper or tracking patterns using digital pens have been made to emulate handmade annotation practices. However, as with any new technological developments there are also concerns to address. Johnson and Greatorex (2008) have identified "screen parallax and resolution issues" (p.46) as two such concerns. Parallax problems usually arise when using touch screens and occur when marks are not aligned with the location where the user initially touched the screen. Resolution issues are a result of text needing to be enlarged on mobile devices so that they are more readable (Johnson & Greatorex, 2008).

Additionally, Johnson and Greatorex (2008) indicate that annotation practices using computing technology could be hampered by the limited accessibility of tools. The process thus becomes less reliable and increases the cognitive demands made on the educator.

Actions must also be taken to ensure that the requisite assessments are available to the external moderator in a format that can support the verification task and at the required time. Storing of learner portfolios on an external system could potentially risk exposing confidential learner information to unauthorized third parties. It is also a possibility that assessment samples could be altered during the eModeration process. In addition, due to the nature of the submissions, it is difficult to verify the authenticity of the work presented (ABC-Awards, 2014). Furthermore, an electronic moderation system requires additional technology like scanners and virtual environments, thus increasing the initial costs of an eModeration system (Van Staden, 2017).

In summary, prevailing literature has identified educator anxiety, lack of adequate ICT infrastructure, costs of additional hardware and tools, the interface and the availability of suitable annotation tools as particular challenges of eModeration.

2.7. Requirements for an eModeration System

Chamberlain and Taylor (2011) advance the view that technological developments offer the possibility of developing online tools for remote standardization of marking. With this in mind, assessment institutions in the UK have been investigating the efficacy of technology for online standardization.

Ticks are usually used by assessors to indicate correct responses in assessments. Moderators thereafter use teacher annotations, indicating where credit has been given and why, to facilitate their moderation (Greatorex, 2004). A lack of ticks and additional comments in candidates' work creates greater difficulty for moderators to review assessments in the conventional manner. Should the moderation be done digitally, an annotation tool is invaluable in developing a shared perspective of standards (Adie, 2011; Greatorex, 2004). These tools are used to focus attention on the annotated evidence of the accomplishment of a particular standard (Adie, 2011). A suggestion, therefore, would be for internal assessors to use the onscreen marking tool to mark in red while moderators could use a green pen to easily distinguish consistency in judgements (Van Staden, 2010).

Additional requirements as advocated by Van Staden (2010) include adding a due date to the page and enabling the scanning of scripts in colour to easily determine where marks have been allocated.

Berger (2011) and Van Staden (2017) identify important features of IS systems albeit from different viewpoints. While Van Staden (2017) discusses the use of an eModerate system within the SA tertiary environment, Berger (2011) discusses an eAssessment system which, for the purposes of this research, has been adapted for the moderation of portfolio submissions. The identified requirements are as follows:

- Reusability: Existing content can be reused on different platforms. It thus becomes unnecessary to develop additional or different content should a different system be used.
- Manageability: Refers to the ability of a system to track moderation procedures.
- Accessibility: Refers to the possibility for all relevant stakeholders to gain access to, customize and deliver content without the constraints of time or place.

- Durability: It should be unnecessary to redesign or redevelop content whenever new versions of the system are installed.
- Scalability: Ensures that minimal effort is expended to extend the system.
- Affordability: The system must be cost effective for the primary users of the system or based on free technologies so that the institution has no licensing issues.
- Security and reliability: Student projects and marks are sensitive information which must be securely stored. Additionally, authentication is an important requirement, with each user having his or her own space together with email and discussion facilities. The privacy and confidentiality of each school's work must be guaranteed while all access to a student's private space should be denied.
- Usability: The tool should be user friendly and self-explanatory.
- Portability: It should be possible to set up the system on another server without difficulty.
- Infrastructure: The institution hosting the eModeration system should have satisfactory infrastructure, adequate applications and a communication architecture that adequately communicates the intended message. Additionally, the eModerator's access to adequate internet infrastructure is also an important requirement.
- Bandwidth: Increased bandwidth will increase the efficiency of the system.

Additionally, Van Staden (2010) suggests that files could be zipped for upload and the relevant stakeholders should receive automated notifications on completion of the moderation. There should also be sufficient space for comments which the moderator might need to make.

Any technology being used must be appropriate for the task it purports to carry out. Hence, an important consideration is if the technology does indeed enhance task performance. If there is a good fit between the task being carried out and the technology being used to complete the task, then there is an increased probability of greater utilization of the technology which is particularly important for online standardization. Online standardization has distinct characteristics and best results can only be obtained if the requisite processes are directly supported by the technology being used (AlphaPlus, 2014).

2.8. Summary of Literature Review

The literature reviewed indicates that the New Zealand Department of Education envisages the complete transition from a paper-based moderation system to an online system by 2020 (New-Zealand-Qualifications-Authority, 2016). In SA, while there is evidence of the existence of eModeration systems within the higher education domain, there is no published evidence of the existence of an eModeration system in the secondary school environment. This points to a knowledge gap in the use of online systems for the submission and moderation of portfolios which needs to be explored.

Thus, the focus of this research was to determine the requirements for the development of an online system to be used as a tool for the digital moderation of IT and CAT portfolio tasks in private secondary schools in SA. The specific aim was to investigate current practices, processes and procedures of moderation with the intention of informing the next steps in promoting efficient and effective eModeration practices as reflected in the summarized literature review depicted in Figure 2-2. The focus of this study was therefore to produce requirements extracted from the perceived challenges and benefits of current moderation processes for the development of an online digital moderation system specifically for implementation at grade 12 level in South African private secondary schools.

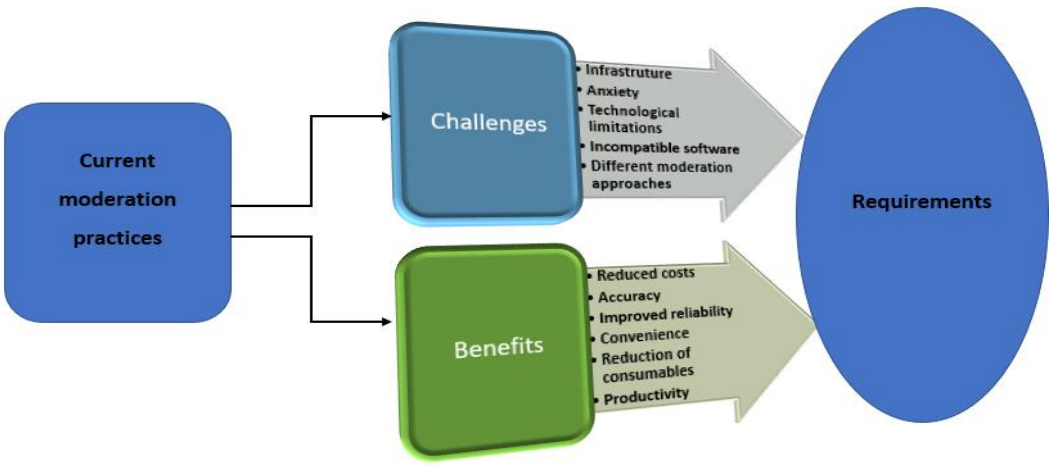


Figure 2-2: Summary Abstracted from Literature Review

The review of academic literature revealed a dearth of published studies on eModeration. Additionally, the literature reviewed indicates that the New Zealand Department of Education envisages the introduction of a moderation project using a digital tool with a complete transition from a paper based system to an online system

by 2020 (New-Zealand-Qualifications-Authority, 2016, 2016). Within the South African context, while there is evidence of the existence of eModeration systems within the higher education domain, there is no published evidence of the existence of an eModeration system in place in the secondary school environment. This points to a knowledge gap in the use of online systems for the submission and moderation of portfolios which needs to be explored.

The scarcity of data on ICT-mediated moderation practices, especially in secondary schools within the South African context and an absence of research on the efficacy of online moderation therefore support the relevance of this study. There is currently no published research that describes how a shared understanding of assessment standards in grade 12 IT and CAT can be promoted via an online platform across IEB schools.

Within the context of eModeration, this study makes an original contribution to knowledge of standards-based assessment in five ways. First, the study examines current processes in the moderation of IT and CAT SBA assessments (cf. Section 2.4.3, Section 5.3 and Section 5.4.1) as a means of increasing the reliability of judgements made within a standards framework. Secondly, the study examines the format of portfolio submissions to an external moderator (cf. Table 5-6, Table 5-7 and Table 5-9; Section 5.4.1.1). Next, the study investigates what technology (if any) is used to facilitate the moderation process (cf. Section 5.4.1.2). The study thereafter analyzes the challenges and benefits of eModeration (cf. Section 5.4.2). Lastly, the study analyzes the challenges and benefits of an eModeration system with the aim of extrapolating pertinent characteristics to inform the requirements for an efficient online moderation tool (cf. Section 5.4.4).

2.9. Conclusion

This chapter provided a detailed discussion of the prevailing literature regarding moderation of assessments within SA private secondary educational institutions. The discussion began with a general overview of the approach to finding pertinent literature and the different search strategies employed. A comprehensive literature review detailing what moderation is, the purpose of moderation and the different types of moderation processes was provided. Preliminary findings, as displayed in Table 2-1

indicate no evidence of published literature on eModeration as defined in this study within the private secondary school sector in SA. The paucity of data on the efficacy of ICT mediated moderation systems is a limiting aspect of this study.

Chapter 3
Literature Review: Technology Acceptance Models

3.1. Introduction

Chapter two offered an overview of the search strategy used to obtain pertinent literature on moderation. A detailed literature review offered insights into what moderation is, the purpose of moderation and the different types of moderation employed at educational institutions. The chapter concluded with a summarised representation of how the challenges and benefits of eModeration will inform the requirements for the development of an eModeration system. This chapter outlines the theory framing this study. A comprehensive discussion will be provided on four IS models selected for further discussion. An analysis of the relevance of each model to the study context will be presented. Based on the exclusionary and inclusion criteria, the most appropriate model will then be isolated to frame this study.

3.2. Background

Studies into the acceptance of technology stem from the sphere of information systems (IS) and the models that have been developed have been successfully implemented in the educational environment (Pynoo, Devolder, Tondeur, Van Braak, Duyck & Duyck, 2011; Rienties, Giesbers, Lygo-Baker, Ma, & Rees, 2016). Various models for instance, TAM, (Venkatesh & Bala, 2008; Venkatesh & Davis, 1996; Venkatesh, Morris, Davis, & Davis, 2003), UTAUT (Venkatesh et al., 2003), TTF (Goodhue & Thompson, 1995), a combination of TTF and UTAUT (Zhou, Lu, & Wang, 2010), TOE (Ramdani, Chevera & Williams, 2013) and the HOT-Fit model exist in IS literature (Erlirianto et al., 2015).

The aspects considered essential to how humans accept technological interventions must be considered in order to determine what the characteristics of an eModeration system are. An integral aspect of the TAM/UTAUT, TTF, TOE and HOT-Fit models is the human element in the adoption of IS artefacts. Consequentially, these models were specifically isolated for further discussion and analysis to explore their applicability in the context of digitally moderating evidence of assessment and in an attempt to select the most pertinent framework for this study.

3.3. Theoretical Framework

3.3.1. TAM and UTAUT

The Technology Acceptance Model (TAM), the latest construction of which is the TAM3 model (Figure 3-1) developed by Venkatesh and Bala (2008) is a widely used, well-established post adoption model for forecasting user acceptance of new technology.

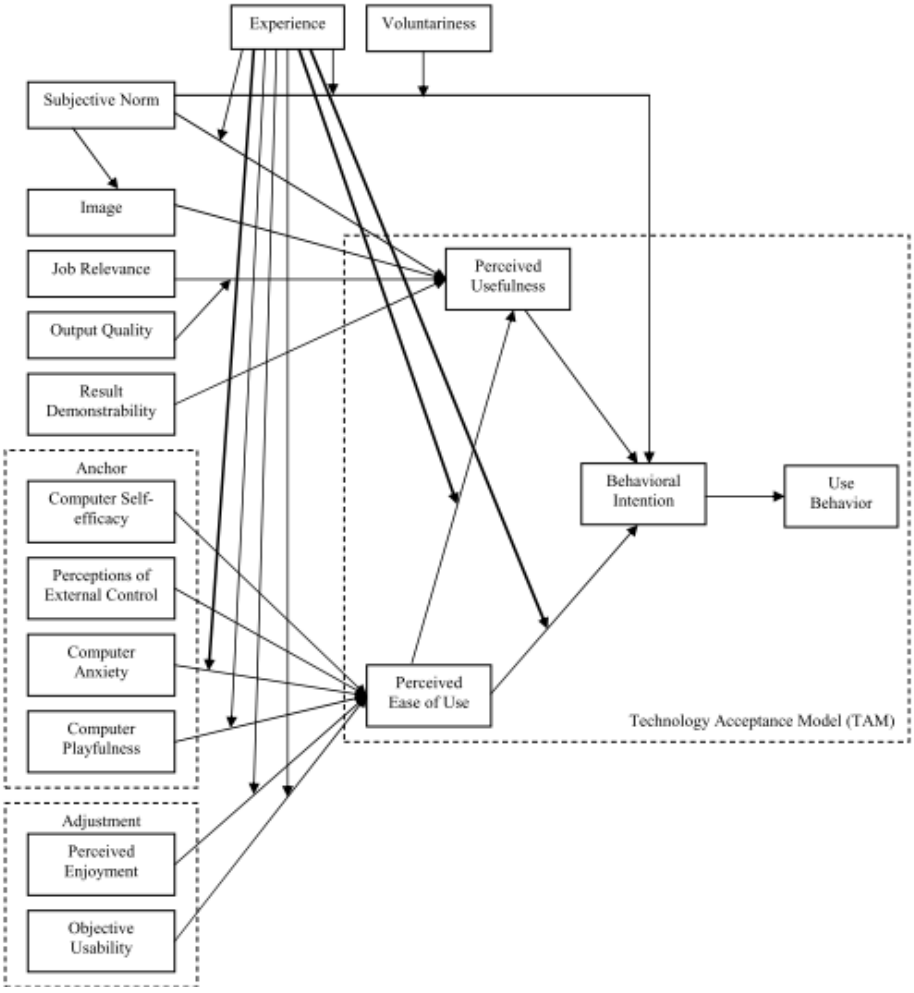


Figure 3-1: TAM 3 Framework ***(Venkatesh & Bala, 2008)***

TAM was primarily designed to offer a theoretical base to explain user behaviour when adopting an IS (Hassan & Lowry, 2015). Although TAM was initially designed to predict adoption of new technologies in business environments, there is evidence of its use within educational settings as well (Babaheidari & Svensson, 2014; Behrend et al., 2011; Jeffrey, 2015).

TAM hypothesizes that an individual's behavioural intent to use a system is jointly determined by the user's perception of how useful the system is and how easy it is to use (Davis & Wong, 2007; Venkatesh & Davis, 2000). In other words, users' perceptions of the ease of use and usefulness of using a new system have an effect on their eventual acceptance of that system (Wu, Chou, Weng, & Huang, 2011).

Individuals form opinions of the usefulness of a system by comparing the functionality of the system to the tasks they need to perform in their jobs. Venkatesh and Davis (2000) maintain that users will not readily accept a system, irrespective of how efficient the system is, if they cannot immediately identify tangible benefits in their job performance as a direct result of utilizing the system. Job relevance is therefore a key element in judging the effects and applicability of using a system in accomplishing job outcomes (Wu et al., 2011).

Venkatesh and Bala (2008) refer to the concept of peer support to describe the activities carried out by colleagues in the workplace which assists other individuals in using a new system effectively. Venkatesh and Bala (2008) further argue that, although there is no empirical basis indicating the role of peer support in IT acceptance, peer support could possibly be an important intervention that can lead to greater user acceptance. Prior research indicates that if colleagues are in favour of the use of a system, then social influence processes will play a role in enabling others within the organization to have more favourable perceptions of the use of the system (Venkatesh & Davis, 2000). Researchers are thus urged to explore how peer support influences the elements of perceived usefulness and perceived ease of use thus enhancing user acceptance of technology.

An eModeration system will require collaboration amongst educators. Peer support will thus likely play a huge role in educators' individual perceptions and influence in the adoption of such a system. TAM has proven to be extremely useful in explaining

teachers' acceptance of educational technology (Rienties et al., 2016; Wu et al., 2011). The investment of resources in a digital moderation system, however, would not be beneficial if teachers do not use the system. It is therefore vital to take cognizance of the factors that impact teachers' intention to use an eModeration system.

A criticism of TAM is that there is an implicit assumption that the potential users' usage of a given information system or technology is voluntary (Yen, Wu, Cheng, & Huang, 2010a). Additionally, TAM has been found to be lacking due to its focus on usage prediction rather than actual use in the educational setting (Rienties et al., 2016). Further research into the TAM model, therefore, led to the development of the Unified Theory of Acceptance and Use of Technology (UTAUT) model by incorporating human and social variables to increase its predictive capabilities (Rienties et al., 2016; Venkatesh et al., 2003).

Various studies have used the UTAUT model as a baseline framework to measure the use and adoption of technology (Ain, Kaur, & Waheed, 2015). The UTAUT model has been proven to be up to 70% accurate at predicting user acceptance of IT innovations (Moran, Hawkes, & Gayar, 2010). The key determinants included in the UTAUT model are "performance expectancy, effort expectancy, social influence and facilitating conditions" (Lai, 2017, p. 33). Additionally, the moderating determinants of gender and age were added on to the existing determinants of experience and voluntariness of use, as demonstrated in Figure 3-2.

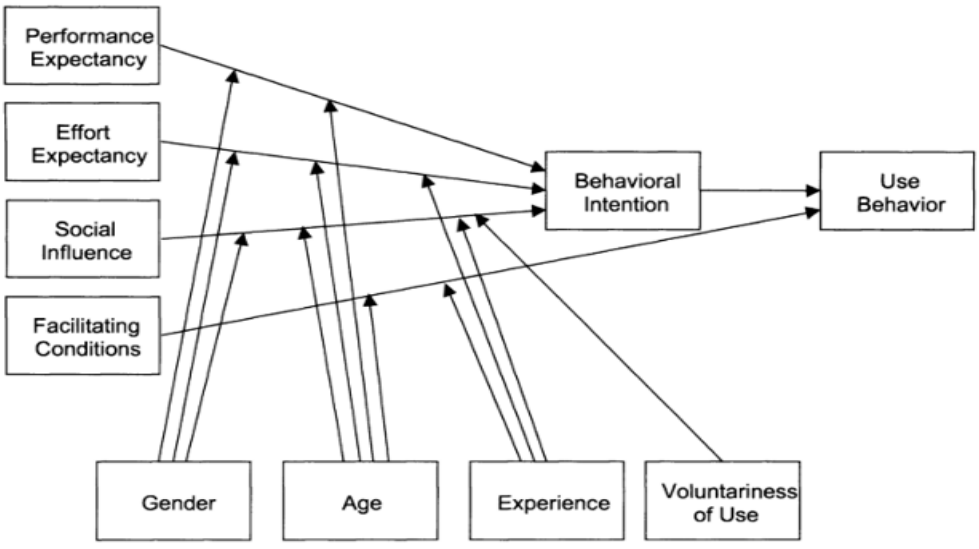


Figure 3-2: UTAUT Model ***(Venkatesh et al., 2003)***

Further investigation of the UTAUT model did not indicate any aspects that improved on the TAM framework specifically to fit the eModeration context. Hence, UTAUT was not considered further in the comparison of models (cf. Table 3-2).

3.3.2. TTF

Technology offers many beneficial tools to complete everyday tasks. The relationship between tasks and the technology used to execute those tasks can have a substantial effect on technology use and the subsequent outcomes of such use (Yu & Yu, 2010). Dishaw and Strong (1999) maintain that the ability of an IT system to support a task is expressed by the task-technology fit (TTF), which indicates a matching of the abilities of the technology to the demands of the task. A basic TTF model is depicted in Figure 3-3.

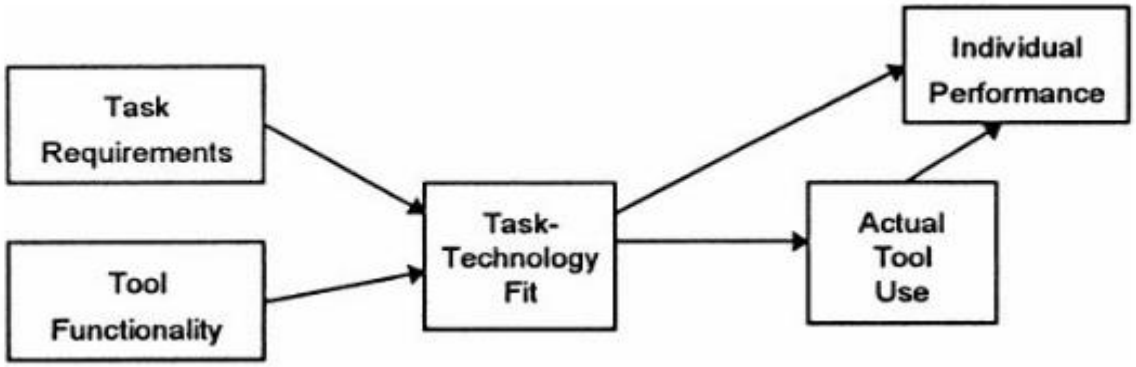


Figure 3-3: TTF Model ***(Dishaw & Strong, 1999)***

TTF describes technology as a tool used by individuals to complete a task. The technology characteristics are evaluated based on the degree to which they meet the task needs (McGill, 2009). TTF therefore refers to the degree of fit of a technological solution in assisting individuals at executing their jobs. The theoretical foundation stresses the necessity for a fit between the abilities of the system and the particular functions to be achieved. The TTF instrument, which is part of the TTF model, hypothesizes that task and technology characteristics determine suitability (fitness) and that the level of utilization of technology is determined by the degree of fitness (McGill, 2009; Tjahjono et al., 2001). The degree to which the capabilities of the Information System (IS) match the tasks that the user must perform is, therefore, a major aspect in explaining job performance levels (Wu & Chen, 2017). It is therefore important to understand the relationship between tasks and technology.

Goodhue (1998) contends that an IT system will be used if, and only if, the functionality available supports or fits the activities of the user. Any system not offering sufficient support will therefore, by extension, not be utilized. Tariq and Akter (2011) further postulate that, to prove its effectiveness, the technology being used must both fit the specific tasks it has been designed to achieve as well as be willingly accepted by users of the technology. Therefore, “although TTF is not as well developed as TAM, the concept of task-technology fit is an important user evaluation construct in predicting the utilization of a technological innovation” (Yen et al., 2010a, p. 908).

Additionally, TTF performance expectancy has a substantial effect on users’ adoption of technology. TTF assumes that “performance impacts are dependent” on the fit between “technology characteristics, task requirements and individual abilities” (see Figure 3-3) (Goodhue, Klein & March, 2000, p. 88). Thus, it is not just the technology which affects performance (Goodhue, Klein & March, 2000).

Tariq and Akter (2011) argue that the ability to predict performance is a vital contribution made by TTF. In contrast, TAM focuses on usage prediction only. Additionally TTF, in contrast to TAM, focusses on utilization rather than intention to use which, Tariq and Akter (2011) argue, does not necessarily lead to actual use. While certain authors for instance, Tjahjono et al. (2001) and Tariq and Akter (2011) emphasize reliance on TTF rather than reliance on TAM, other authors e.g. Dishaw and Strong (1999) and Yen et al. (2010) integrate TAM and TTF.

The core concept in TAM is that users’ adoption of technology is governed by their beliefs (perceived ease of use and perceived usefulness) while the core concept in TTF is the fit between the task and the technology utilized to complete the task. These core beliefs are important in understanding why individuals choose one technology over the other in carrying out their tasks (Yen et al., 2010a). Dishaw and Strong (1999) suggested an integrated model incorporating beliefs of IT and the fit between technology and task characteristics. The integrated model (cf. Figure 3-3) postulates that users’ beliefs regarding the utility and ease of use of technology are affected by both technology and task characteristics, their resulting fit and the users’ experience thereof.

3.3.3. TOE

Research into ICT adoption generally considers technological, environmental and organizational factors which influence ICT adoption (Borgman et al., 2013; Ramdani et al., 2013). Tornatzky and Fleischer's Technology-Organizational-Environmental (TOE) framework (cf. Figure 3-4) was developed to examine the adoption of IS artifacts within organizations and has emerged as a holistic theoretical framework underpinning IT adoption (Borgman et al., 2013; Gangwar et al., 2015; Ramdani et al., 2013).

The technology construct of the TOE framework, generally comprised of relative advantage, complexity and compatibility, refers to both the internal as well as external technologies relevant to an enterprise's functioning (Borgman et al., 2013). Decisions on technology acceptance are therefore based on the technology that currently exists and finding a fit with the existing technological innovations.

The organizational context refers to the size and resources of the institution; with the size of the organization being an important facilitator in the adoption of IT systems. The environmental factor relates to the context within which the organization functions inclusive of its competitors, access to outside resources and the actual industry within which it functions (Borgman et al., 2013). The TOE framework therefore has been described as an integrated framework offering a holistic and guiding theoretical basis for ICT adoption (Ramdani et al., 2013).

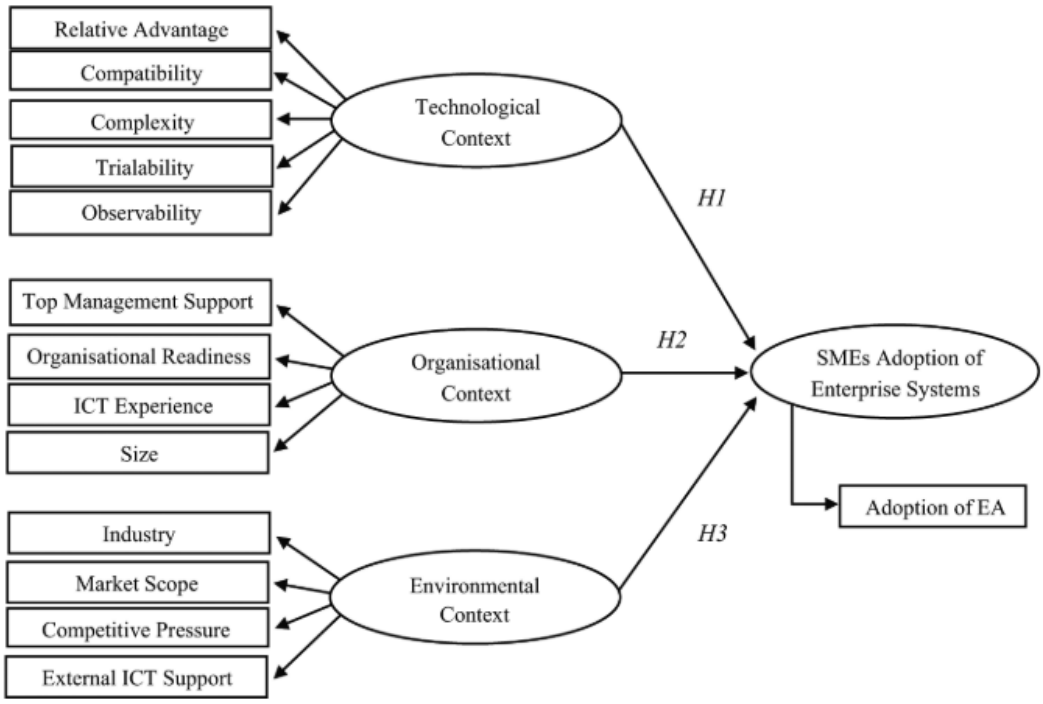


Figure 3-4: TOE Framework ***(Ramdani et al., 2013)***

Additionally, Awa, Ukoha, Emecheta, Harcourt and Harcourt (2016) assert that the TOE framework brings both human and non-human actors into the network.

3.3.4. HOT-Fit Model

The HOT-Fit model is based on the DeLone McLean IS Success Model and the IT-Organization Fit Model presents a framework to help understand the interrelationship of the human, organization and technology aspects in the implementation of information systems as demonstrated in Figure 3-5 (Erlirianto, Ali & Herdiyanti, 2015; Muslimin, Hadi & Nugroho, 2017).

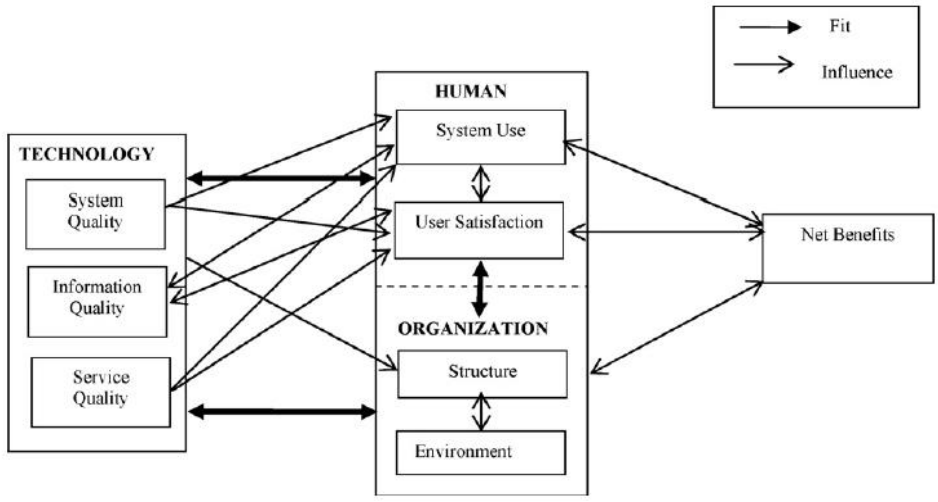


Figure 3-5: HOT-Fit Framework ***(Erlirianto et al., 2015)***

The human, organization and technology aspects are key elements of any Information System and the fit between these elements is pivotal in the successful implementation of information systems. The key tenet of the HOT-Fit model is that technology acceptance has three facets i.e. the user, the technologies and the organizational contexts which cumulatively affect the net benefits of using an information system. The greater the fit between the human, technology and organization aspects, the greater the potential of the system (Muslimin, Hadi & Nugroho, 2017).

An important aspect of the HOT-Fit model is the human or user characteristics. System use and user characteristics are important elements of the human factor in information system use. These items include measures affecting information system usage such as actual use, levels of use, training, knowledge and acceptance of or resistance to system use (Muslimin et al., 2017; Yusof et al., 2008).

The technology characteristics comprises the system quality, service quality and information quality which have a bearing on the benefits arising from the use of the system. The organization element includes items such as the nature of the organization, the size of the organization, the source of finance, the nature of top management support etc. (Yusof et al., 2008).

3.4. Summary

This review has discussed four different models and identified their characteristics based on the extant literature. TAM and its various derivatives strives to clarify the link between the acceptance and adoption of technological innovations and consequently the behavioural intention to use this technology (Gangwar et al., 2015). However, not much is known about the pre-adoption factors that lead to usefulness and ease of use, specifically with respect to secondary school moderators utilizing a digital moderation system. It is thus necessary to consider additional measures specifically in this population, beyond simple usage intentions.

Each of the previously identified models i.e. TAM/UTAUT, TTF, TOE and HOT-Fit identifies the common characteristics of the Human, Organizational and Technological factors that affect or influence technological adoption. Table 3-1 depicts these aspects and the specific contexts in which they are represented and/or analyzed in that specific model. For example in the TTF model, technology characteristics refers to the

technology used by individuals to perform their tasks while in the TOE model, the technology context refers to internal and external technologies which are relevant for the firm (Borgman et al., 2013; Yen et al., 2010a) Additionally TOE identifies technological, organizational and environmental factors that determine usage (Ramdani et al., 2013).

However, a criticism of the TOE framework is that TOE is too generic. The TOE framework lacks a common set of clearly identifiable constructs applicable to varied contexts (Gangwar et al., 2015; Ramdani et al., 2013). As depicted in Table 3.1 the human element is composed of the technological, organizational and environmental arenas while the construct defined in the Organization characteristic is the environmental context. There is thus a repetition of constructs in each of the Human, Organization and Technology characteristics. The lack of a clear delineation of the constructs could therefore create confusion as to which context that particular construct is representing at any given time.

Table 3-1: Characteristics of TAM, TOE, TTF and HOT-Fit

	TAM	**TTF**	**TOE**	**HOT-FIT**
HUMAN	Social Influence Processes: Beliefs about the use of a system which determine an individual's intention to use the technology. (Jeffrey, 2015; Wu et al., 2011).	Individual Characteristics: Physical interactions with the system (Yu & Yu, 2010).	Technology: Technical know-how; Organizational: Demographic composition of organization. Environment: Corporate culture, perceived values (Awa et al., 2016; Ramdani et al., 2013).	Includes measures affecting information system usage such as actual use, levels of use, training, knowledge (Mohd et al., 2008; Muslimin, Hadi & Nugroho, 2017).
ORGANIZATION	Facilitating conditions refers to organizational support (Venkatesh & Bala, 2008).	Task requirements or characteristics describe the process by which users use recorded knowledge to make decisions (Goodhue & Thompson, 1995; McGill, 2009).	Environmental context relates to the operational facilitators and inhibitors of user adoption of technology (Awa et al., 2016) • Financial resources • Technological resources (Gangwar et al., 2015).	Includes items like the nature of the organization, the size of the organization etc. (Mohd et al., 2008; Muslimin, Hadi & Nugroho, 2017).

	TAM	TTF	TOE	HOT-FIT
TECHNOLOGY	Cognitive Instrumental processes: Users will not readily accept a system, irrespective of how efficient the system is, if they cannot immediately identify tangible benefits in their job performance as a direct result of utilizing the system (Venkatesh & Davis, 2000; Wu et al., 2011).	Technology characteristics refer to the technology used by individuals to support them in their tasks. Task characteristics refer to "the actions carried out by individuals in turning inputs into outputs" (Tripathi & Jigeesh, 2015, p.9188; Yen et al., 2010; Yu & Yu, 2010).	Technology describes adoption of an internal and external pool of available technologies. Includes relative advantage, complexity and compatibility (Awa et al., 2016).	Comprises of system quality, service quality and information quality (Mohd et al., 2008; Muslimin, Hadi & Nugroho, 2017).

Venkatesh and Bala (2008) identify system characteristics as the most important qualities of a system which encourage users to either develop favourable or unfavourable perceptions pertaining to the usefulness or ease of use of the system. Venkatesh and Bala (2008) and Wu et al. (2011) further identify social influence, which describes the social processes guiding individuals to formulate perceptions of various aspects of an ICT system and facilitating conditions denoting the organizational support facilitating the use of an IT system.

While TAM is excellent in providing an explanation of the behavioural intentions of potential users, it is weak in terms of predicting actual utilization (Yu & Yu, 2010). In contrast, TTF provides a greater understanding of the interrelationship between individual and task characteristic fitness which affects users' choice of utilizing an information system. Additionally, Yen et al. (2010) and Irick (2008) concur that the disregard of task characteristics and how well the technology supports the essential task requirements are a particular weakness of TAM. Yu and Yu (2010) maintain that the role of individual characteristics and task characteristics are essential aspects of the task performance chain. Therefore, the physical and task-oriented actions related to interactions with the system must be considered in order to understand the person's use of the system (Irick, 2008; Tripathi & Jigeesh, 2015; Yu & Yu, 2010).

An understanding of how educators' characteristics and their fit with task characteristics lead to specific task-oriented actions in the use of an eModeration system will therefore be especially important for developers. Considering this statement, a comparison of all four models was conducted as illustrated in Table 3-2. To investigate additional factors expected to influence usefulness perceptions for this specific community of educators, constructs from the pre- and post-adoption HOT-Fit model were used as a basis to compare the constructs of the different models discussed previously (cf. Section 3.3).

3.5. Comparison and Analysis of Models

In an attempt to elicit the desirable characteristics of an eModeration system and to inform the questionnaire for data collection, the three major constructs of Human, Organization and Technology were extracted from the HOT-Fit model (cf. Table 3-2). The related dimensions and variables were thereafter extracted to determine if they were important features in the other three models.

The ticks (✔) in green under the "Included in Model" column (Table 3-2) indicate all variables, based on the extant literature, considered to be relevant to an eModeration system, while the crosses (x) in red indicate those not relevant to the context of the study.

The following exclusion and inclusion criteria were used to determine their applicability to the current study. Critical characteristics in Table 3-2 (indicated by a tick under the "Critical Characteristic" column) are characteristics that are deemed to be essential to the functioning of the system and therefore there is an expectation that these characteristics should be innate in a system. For instance, Awa et al. (2016) identify security issues as critical adoption factors. A system is not worth considering if these essential characteristics are not present. These characteristics, for example security and reliability, were thus excluded from the questionnaire and were not investigated any further.

Those characteristics that can only be measured post adoption i.e. when one has a fully functional system in place were also excluded. Characteristics, identified from the literature, that are specific to particular organizations and contexts were also excluded as they are not pertinent to the eModeration context.

Additionally, availability and accessibility overlap; with accessibility being a more encompassing term. These dimensions were thus combined. While all models indicate external communication as a relevant, important dimension, this characteristic is not relevant to the current context based on the way this dimension has been defined in literature. Certain dimensions, for example external communication, are arguably important. However, these have not necessarily been included, as the dimensions were prioritized according to their relevance to the context in which they are being analysed. Relevant criteria were thus listed and thereafter prioritised.

Many dimensions, while appearing in HOT-Fit, TAM and TTF are not evident in TOE. Additionally, most of the dimensions that are included are not relevant to an eModeration system. As illustrated in Table 3-2 many of the constructs that were eventually selected for further analysis do not appear in the TOE model. Hence, TOE was not considered any further.

Lai (2017) maintains that TAM has been designed to explicitly explain users' behaviour across an extensive range of end-user ICTs and user populations. While TAM contributes significantly more to an eModeration system than TOE does, the focus of TAM is on the determinants influencing Perceived Usefulness and Perceived Ease of Use of a system (Jeffrey, 2015). These constructs can only be comprehensively tested when one has a fully functional system in place. Similarly, TTF is suitable for measuring technology applications which are already in use and is especially appropriate for the testing of new technology to obtain feedback on its use (Lai, 2017). Both TAM and TTF were therefore eliminated from further consideration.

While HOT-Fit considers both pre- as well as post-adoption criteria, HOT-Fit appears to be more pertinent in considering pre-adoption criteria than any of the other models under consideration. The current study is on pre-adoption; hence HOT-Fit is more appropriate than any of the other three models under consideration.

3.6. Conclusion

This chapter provided a detailed discussion of the most frequently used models which predict user adoption of technology in the IS domain. The discussion began with a general overview of each model. A detailed comparison of the different models was presented. A justification was then provided for exclusionary and inclusion criteria to

inform the development of the questionnaire for the purpose of data gathering. Based on an attribute level comparison and matching of those attributes to the context of pre-adoption in eModeration a set of attributes was selected for the survey questionnaire. The selected attributes are a subset of the HOT-Fit model, which was the most appropriate model to use in the eModeration context. Many of these attributes were common to the TAM/UTAUT and TOE models. The value of this chapter was to ensure a comprehensive, integrated set of attributes grounded in the existing literature. This pre-adoption set of attributes is a novel contribution that could be adapted for other studies. The following chapter will provide a detailed discussion of the research methodology employed as well as the procedures followed to obtain ethical clearance to conduct the study.

Table 3-2: Comparison of Models ***(Babaheidari & Svensson, 2014; Borgman et al., 2013; Erlirianto et al., 2015; Irick, 2008; Mohd et al., 2008; Muslimin et al., 2017; Ramdani et al., 2013; Tripathi & Jigeesh, 2015; Venkatesh & Bala, 2008)***

MODELS			HOTFIT		TOE		TTF		TAM		INCLUSION / EXCLUSION CRITERIA			
Description			Human-Organization-Technology fit		Technology-Organization-Environment		Task Technology Fit		Technology Acceptance Model		Construct common to 3 or more models	Critical Characteristic	Relevant pre-adoption characteristic	Variable included in final analysis?
Construct	Dimensions	Variables	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration				
TECHNOLOGY	System Quality	Data Accuracy	✓	✓			✓	✓			☒	✓		☒
		Data Currency	✓	✓			✓	✓			☒	✓		☒
		Relative Advantage			✓	✓			✓	✓	☒		☒	☒
		Output Quality					✓	✓	✓	✓	☒	✓		☒
		Ease of Use	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
		Ease of learning	✓	☒			✓	✓	✓	✓	✓			✓
		Availability	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
		Flexibility	✓	✓					✓	✓	☒		☒	☒
		Reliability	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	☒
		Security	✓	✓	✓	✓					☒	✓		☒
		Database contents	✓	☒							☒		☒	☒
		Usefulness of system features and functions	✓	✓			✓	✓	✓	✓	✓		☒	☒
		Technical support	✓	☒	✓	☒	✓	☒	✓	✓	✓		☒	☒
		Resource utilization	✓	☒							☒			☒
		Response time	✓	☒			✓	✓			☒	✓		✓
		Turnaround time	✓	☒							☒			☒
		Efficiency	✓	✓			✓	✓	✓	✓	✓	✓	☒	☒

MODELS			HOTFIT		TOE		TTF		TAM		INCLUSION / EXCLUSION CRITERIA			
Description			Human-Organization-Technology fit		Technology-Organization-Environment		Task Technology Fit		Technology Acceptance Model		Construct common to 3 or more models	Critical Characteristic	Relevant pre-adoption characteristic	Variable included in final analysis?
TECHNOLOGY	Information Quality	Importance	✓	☒			✓	☒			☒			☒
		Relevance	✓	✓			✓	✓	✓	✓	✓		☒	☒
		Compatibility	✓	✓	✓	✓	✓	✓			✓		✓	✓
		Complexity			✓	✓					☒		☒	☒
		Usefulness	✓	✓	✓	✓	✓	✓	✓	✓	✓		☒	✓
		Format	✓	✓							☒		✓	✓
		Legibility	✓	✓			✓	✓			☒		✓	✓
		Conciseness	✓	✓			✓	✓			☒			☒
		Completeness	✓	✓			✓	✓			☒			☒
		Timeliness	✓	✓			✓	✓			☒	✓		☒
		Data entry methods	✓	✓							☒		☒	☒
		Accuracy	✓	✓			✓	✓	✓	✓	✓	✓	☒	
		Reliability	✓	✓			✓	✓	✓	✓	✓	✓	☒	☒
	Service Quality	Quick responsiveness	✓	x							☒		☒	☒
		Assurance	✓	x							☒		☒	☒
		Empathy	✓	x							☒		☒	☒
		Follow up service	✓	x							☒		☒	☒
		Technical support	✓	x	✓	☒	✓	☒	✓	☒	✓		☒	☒

MODELS			HOTFIT		TOE		TTF		TAM		INCLUSION / EXCLUSION CRITERIA			
Description			Human-Organization-Technology fit		Technology-Organization-Environment		Task Technology Fit		Technology Acceptance Model		Construct common to 3 or more models	Critical Characteristic	Relevant pre-adoption characteristic	Variable included in final analysis?
Construct	Dimensions	Variables	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration				
HUMAN	System Use	Voluntariness	✓	x					✓	☒	☒			☒
		Motivation	✓	✓					✓	✓	☒			☒
		Attitude	✓	✓					✓	✓	☒		✓	✓
		Expectation	✓	✓							☒		☒	☒
		Duration of use	✓	☒							☒		☒	☒
		Actual vs reported use	✓	☒							☒		☒	☒
		Nature of Use	✓	☒							☒		☒	☒
		Purpose of Use	✓	☒							☒			☒
		Level of Use	✓	☒							☒		☒	☒
	User Satisfaction	Self- efficacy	✓	✓			✓	✓	✓	✓	☒		☒	☒
		Perceived usefulness	✓	✓	✓	✓	✓	✓	✓	✓	☒		☒	☒
		Satisfaction with specific functions	✓	☒					✓	☒	☒		☒	☒
		Overall satisfaction	✓	☒					✓	☒	☒		☒	☒
		Enjoyment	✓	☒					✓	☒	☒		☒	☒
		Software satisfaction	✓	☒					✓	☒	☒		☒	☒
		Perceived ease of use			✓	✓	✓	✓	✓	✓	✓		☒	✓

MODELS			HOTFIT		TOE		TTF		TAM		INCLUSION / EXCLUSION CRITERIA			
Description			Human-Organization-Technology fit		Technology-Organization-Environment		Task Technology Fit		Technology Acceptance Model		Construct common to 3 or more models	Critical Characteristic	Relevant pre-adoption characteristic	Variable included in final analysis?
Construct	Dimensions	Variables	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration				
ORGANIZATION	Structure	Management support	✓	☒	✓	☒	✓	✓	✓	☒	✓		☒	☒
		Nature of organizaton	✓	☒	✓	✓			✓	☒	✓		☒	☒
		Culture	✓	☒	✓	☒			✓	☒	✓		☒	☒
		Planning	✓	☒			✓	☒	✓	☒	✓		☒	☒
		Clinical process	✓	☒					✓	☒	☒		☒	☒
		Autonomy	✓	☒							☒		☒	☒
		Communication	✓	☒									☒	☒
		Leadership	✓	☒	✓	☒			✓	☒	✓		☒	☒
		Teamwork	✓	☒							☒		☒	☒
		Training and education			✓	☒	✓	☒	✓	☒	✓		✓	✓
		Strategy	✓	☒					✓	☒	☒		☒	☒
	Environment	Financing source	✓	☒	✓	☒					☒		☒	☒
		Government	✓	☒	✓	☒					☒		☒	☒
		Politics	✓	☒							☒		☒	☒
		Localization	✓	☒							☒		☒	☒
		Competition	✓	☒	✓	☒					☒		☒	☒
		Inter-organizational relationship	✓	☒	✓	☒					☒		☒	☒
		Population served	✓	☒							☒		☒	☒
		External communication	✓	☒	✓	☒					☒		☒	☒

MODELS			HOTFIT		TOE		TTF		TAM		INCLUSION / EXCLUSION CRITERIA			
Description			Human-Organization-Technology fit		Technology-Organization-Environment		Task Technology Fit		Technology Acceptance Model		Construct common to 3 or more models	Critical Characteristic	Relevant pre-adoption characteristic	Variable included in final analysis?
Construct	Dimensions	Variables	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration	Included in Model	Relevance to eModeration				
ENVIRONMENT		External communication	✓	✓	✓	✓	✓	✓	✓	✓	✓		☒	✓
		Readiness	✓	☒	✓	☒					☒		☒	☒
		Competitive Pressure	✓	☒	✓	☒					☒		☒	☒
NET BENEFITS	Practice	Task Performance	✓	✓			✓	✓	✓	✓	✓		☒	✓
		Productivity	✓	✓			✓	✓	✓	✓	✓		☒	✓
		Work volume	✓	✓					✓	✓	☒		✓	✓
		Morale	✓	✓			✓	✓	✓	✓	✓		☒	☒
		Job effects	✓	✓			✓	✓	✓	✓	✓			✓
	Decision Making Quality	Accuracy	✓	✓					✓	✓	☒	✓	✓	✓
		Time	✓	✓			✓	✓	✓	✓	✓		✓	✓
		Confidence	✓	✓			✓	✓	✓	✓	✓			✓
		Analysis	✓	✓					☒		☒			☒
		Participation	✓	☒					☒		☒		☒	☒
		Error reduction	✓	✓					☒		☒			☒
		Communication	✓	✓					☒		☒			☒
		Clinical outcome	✓	☒							☒		☒	☒

Chapter 4
Philosophical Perspectives and Research Methodology

4.1. Introduction

The previous chapter provided an analysis of four IS models typically used to predict user acceptance of technology. The HOT-Fit model was selected as a theoretical lens to frame the empirical research. The purpose of this study is to interrogate current moderation practices and the challenges and benefits thereof to inform requirements for an eModeration system. This chapter provides an overview of the methods employed in this study. Section 4.2 discusses the research methodology; section 4.3 illustrates the research flow; section 4.4 describes the ethical clearance procedures followed and section 4.5 discusses the possible research biases and limitations. Section 4.6 concludes this chapter.

4.2. Research Methodology

Researchers assume a philosophical stance towards the nature of knowledge which underlies the entire research process and governs the theoretical perspective adopted. The research paradigm is implicit in the research questions and dictates the choice of research design. The research design will in turn inform the choice of research methods employed (for example, questionnaires or interviews). The following sections describe the research paradigm, research design and research method employed in this study.

4.2.1. Research Paradigm

A research paradigm describes a researcher's perspective or set of shared beliefs about the world that she lives in and how problems are to be understood. The paradigm chosen informs the interpretation of the research data and expresses the

nature of enquiry along the dimensions of ontology, epistemology and methodology; thus providing a conceptual lens through which the researcher explores the methodological aspects of the research project (Rahi, 2017; Thomas, 2010). Paradigms in research therefore influence what should be studied, how it should be studied and how the resulting information should be interpreted based on the researcher's individual experiences. Additionally, the paradigm determines the research and data analysis methods that will be used (Kivunja & Kuyini, 2017; Rahi, 2017).

Pragmatism is one of the main paradigms that is used in IS research (Rahi, 2017). The pragmatist paradigm arose from the view that a single scientific method cannot construct a legitimate view of the real world. Research is viewed as a human experience based on the actions and beliefs of individual researchers and the pragmatist paradigm is a viable way of understanding human behaviour (Kivunja & Kuyini, 2017).

Pragmatism adopts a relational epistemology which views relationships in research as best determined by what the researcher considers as most appropriate to the study being undertaken and an ontology which promotes the view that every individual has her own unique reality. Pragmatism also subscribes to a value-laden axiology which promotes conducting research that provides benefits to people via a combination of qualitative and quantitative methods (Kivunja & Kuyini, 2017).

Knowledge comprises of rational assertions that arise from taking action and experiencing the outcomes of these actions (Morgan, 2014). Pragmatism highlights the significance of connecting principles and behaviours in an inquiry-based process of searching for knowledge. Pragmatism is thus particularly suitable for the current research as it is envisaged that the resulting body of knowledge can inform future practices and policies within schools and assessment bodies.

Typically associated with a combination of qualitative and quantitative research, pragmatism is an outcome-oriented method of inquiry based on action which iteratively leads to further action (Johnson & Onwuegbuzie, 2004). Pragmatism is therefore suitable for use in DSR (discussed in section 4.2.2). Additionally, pragmatism is a suitable research paradigm for diverse types of research. The current study involves

both DSR and quantitative as well as qualitative data collection and analysis; thus, pragmatism is especially pertinent to this study.

4.2.2. Research Design

Design Science Research (DSR) has been described as analytical techniques and perspectives for performing research in IS. As a field of research, DSR involves the analysis of how designed artefacts are used and how they perform with the intention of understanding, explaining and improving on their behaviour (Iivari & Venable, 2009). Considering this view and given the practical nature of IS, Hevner and Chatterjee (2010) maintain that DSR should be the research orientation adopted by IS researchers.

4.2.2.1. Applicability of DSR to IS Research

Gregor and Hevner (2013) and Goldkuhl et al. (2017) concur that DSR is an "important and legitimate Information Systems (IS)" research design (Gregor & Hevner, 2013, p. 337). DSR is not just "research about design", but "research through design" (Goldkuhl et al., 2017, p. 384). DSR facilitates the application of IS research to enhance how IS practitioners deal with the challenges they face, thus contributing to the applicability of IS research (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007).

Researchers, for instance Gregor and Hevner (2013); Peffers et al. (2007) and Roy, Kihoza, Suhonen, Vesisenaho and Tukiaianen (2014) concur that DSR is particularly pertinent to IS research as it is designed to create and evaluate IT artefacts which make significant contributions to solving problems within organizations thus extending both organizational as well as human capabilities. Peffers et al. (2007) further maintain that these artefacts should make a demonstrable contribution and that their development should culminate from a thorough search process drawing on prevailing information and theories.

As a design science, IS produces meta-artefacts rather than necessarily producing concrete IT applications. These meta-artefacts are part of the process to eventually developing the actual artefact (Hevner & Chatterjee, 2010). Other researchers, for instance Iivari (2015) highlight a similar distinction between what is referred to as general solution concepts or "meta-IT artefact" (p. 108) and specific concepts or "concrete IT applications" (p. 109).

Hevner and Chatterjee (2010, p. 46) proposed a framework within which DSR in IS research may be positioned as either “conceptual, descriptive or prescriptive,” as indicated in Figure 4-1. At the conceptual level, the focus is on “what things are out there”; the descriptive level focuses on “how things are out there” and prescriptive research is interested in “how things could be out there” and “how one can effectively achieve specified ends” (p. 46). Thus, the outcomes of DSR within the prescriptive level include recommendations and artefacts (Hevner & Chatterjee, 2010).

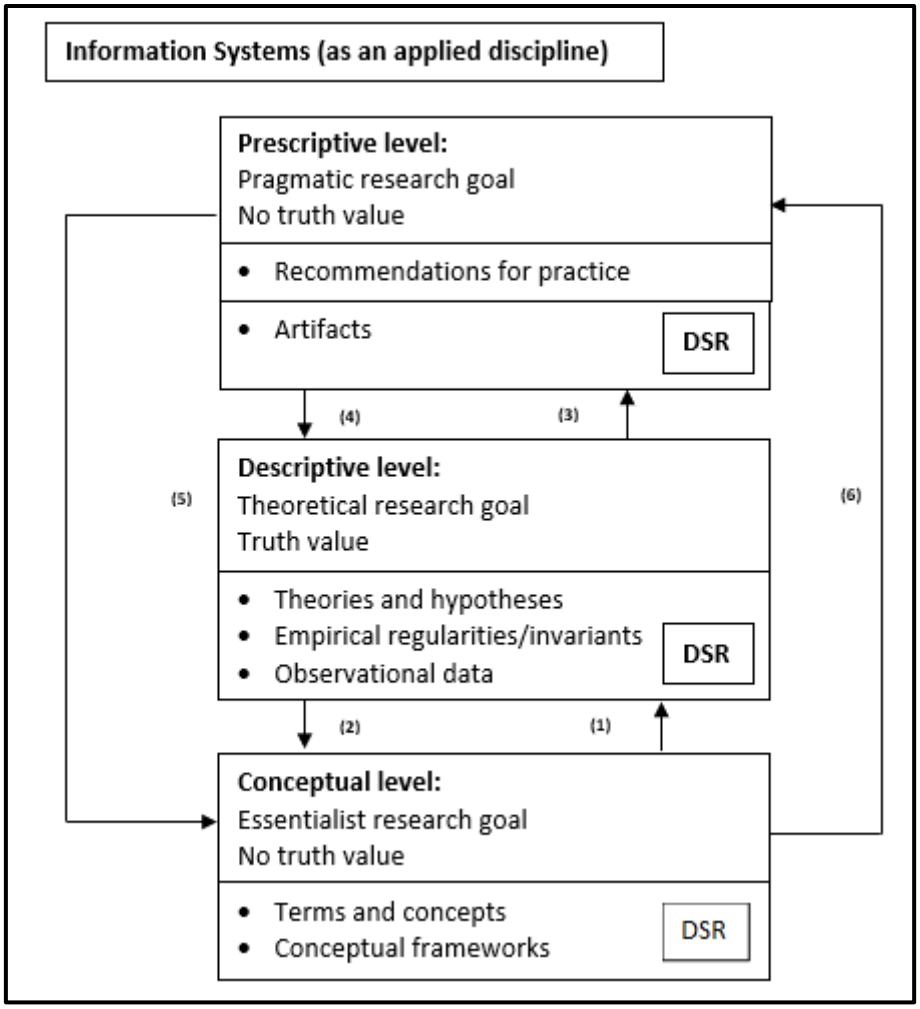


Figure 4-1: The Positioning of DSR in Levels of Research
(Hevner & Chatterjee, 2010)

Hevner and Chatterjee (2010) further maintain that, since the primary contribution of IS research is IT applications, it is logical that IS as a design science should be based on the rigorous creation of IT applications as artefacts.

However, categorizing the knowledge contribution of an artefact is a challenge in DSR due to factors like the nature of the artefact, the way in which the information is

published, who the information is published for and the prevailing knowledge of the subject matter. Additionally, the extent of knowledge contribution may also vary (Gregor and Hevner, 2013). The integration of design with research is a key feature of DSR (Goldkuhl et al., 2017). The crux of design science as a research approach within the IS field is thus the development of knowledge either to create new artefacts or to contribute to the improvement of existing artefacts which makes DSR particularly applicable to the current study (Goldkuhl et al., 2017).

4.2.2.2. Objectives of DSR

The central questions for design-science research are, “What utility does the new artefact provide?” and “What demonstrates that utility?” Evidence must thus be presented to address these questions. Simply stated, the aim of DSR is “utility” and the crux of design science is that contribution emerges from utility (Hevner, March, Park, & Ram, 2004, p. 80).

The objective of DSR is to create rigorously designed artefacts that serve human needs. Iivari and Venable (2009) describe DSR as an activity for building new, innovative artefacts which can provide a significant practical impact in certain knowledge areas and, in so doing, help to create a new reality rather than merely helping to understand the existing reality. This view is validated by Gregor and Hevner (2013) who maintain that although it is possible for artefacts to be developed incrementally or for partial theory building, it is still possible for such contributions to be significant and publishable because they are “new to the world” (Gregor & Hevner, 2013, p. 343). Examples of such artefacts, as identified in prior research by Hevner and Chatterjee (2010), may be concepts or conceptual frameworks in the form of models or methods.

The ultimate objective of a DSR process is the creation of a mental model for the features of the research output. A mental model is a small-scale model similar to the structure and reality of the situation that is represented. These models can be constructed from the researcher’s perception of current discourses and provide others with guidance of what to anticipate from DSR outputs (Peffers et al., 2007).

Subsequent research by Goldkuhl et al. (2017) contends that researchers should acknowledge theory as a fundamental output of DSR. Such theory could exist as

explicit design theory, abstract design knowledge or even take the form of design principles. The contributions of DSR could thus be theoretical or empirical. DSR is thus the most appropriate research design for the current study; the outcome of which is the development of requirements for the creation of an online digital moderation system which can be incorporated into the secondary school environment.

Goldkuhl et al. (2017, p. 386) propose a two layered approach to DSR as outlined in Figure 4-2.

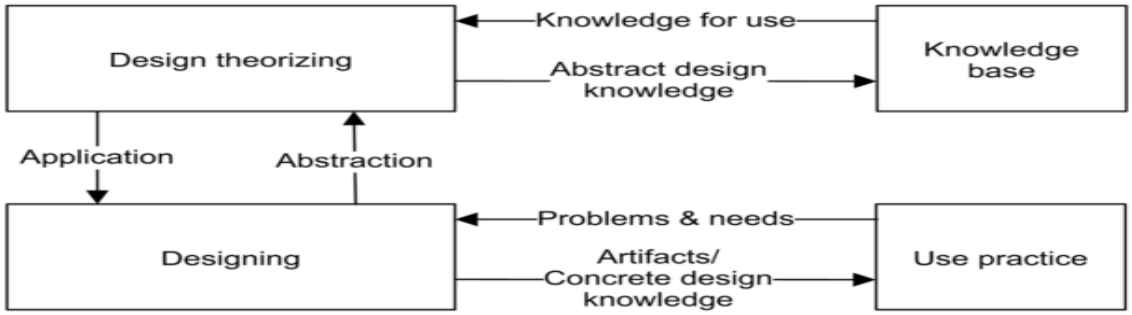


Figure 4-2: Two-Layered Approach to Design Science Research
(*Goldkuhl et al. 2017, p. 386*)

The design process focuses on the creation of artefacts as solutions to distinct problems and requirements within very specific contexts while the abstract layer represents the equivalent depiction of typical problems and explanations. Drawing on the previous studies and the four-cycle model of DSR proposed by Drechsler and Hevner (2016), an adapted model (cf. Figure 4-3) is proposed for the current study.

Van Aken (2004) concludes that the purpose of DSR in academic research is to develop scientific knowledge which supports the design of artefacts and emphasize its knowledge-orientation. As illustrated in Figure 4-3, the requirements for an eModeration system are influenced by the external and internal environments and informed by the knowledge base.

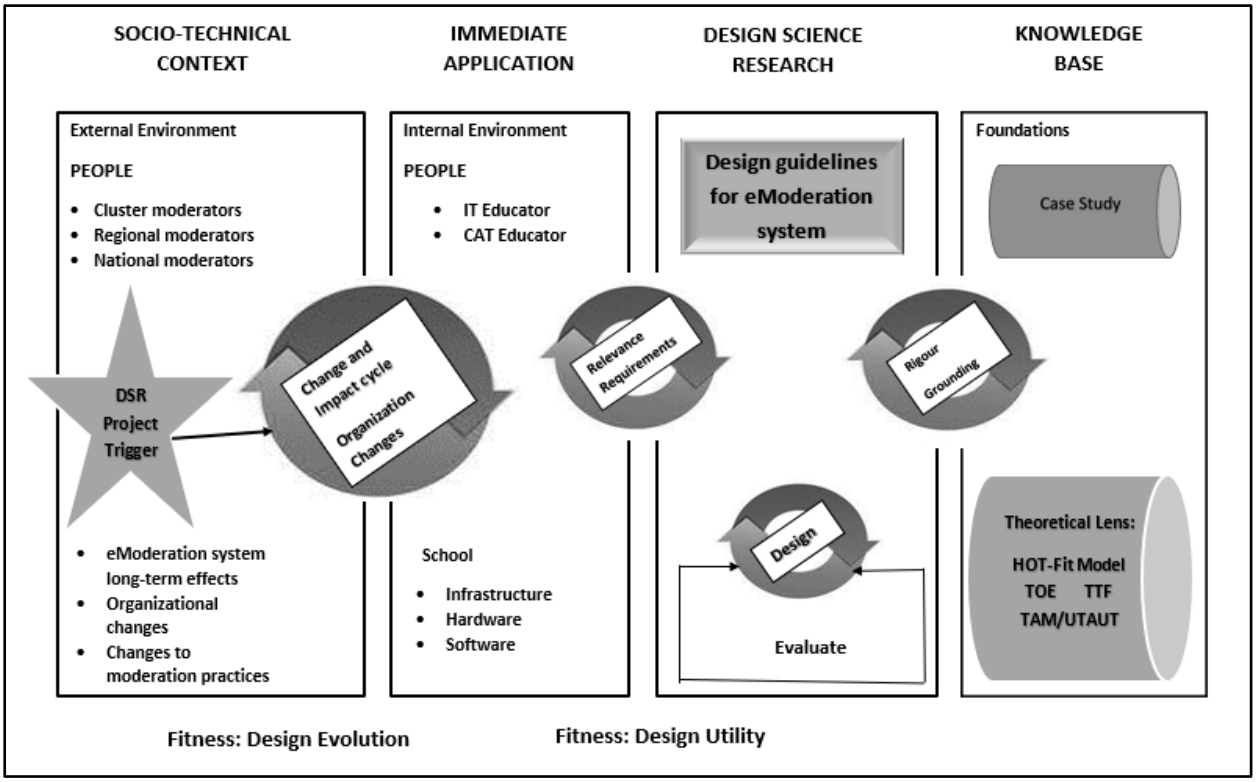


Figure 4-3: Four Cycle Model for an eModeration System
Adapted from: Drechsler and Hevner (2016)

A problem-centred approach underpins this study. Hence, the design process depicted in Figure 4-3 is framed within the six activities outlined in the design science research process (DSRP) model developed by Peffers et al. (2006) (cf. Figure 4-4).

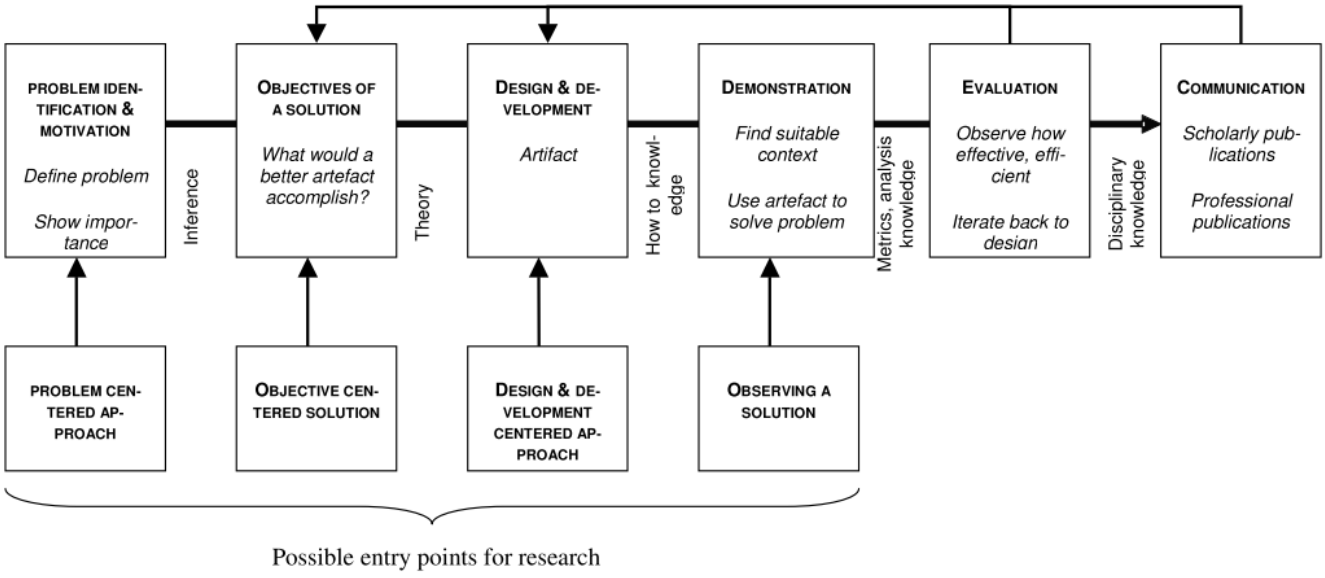
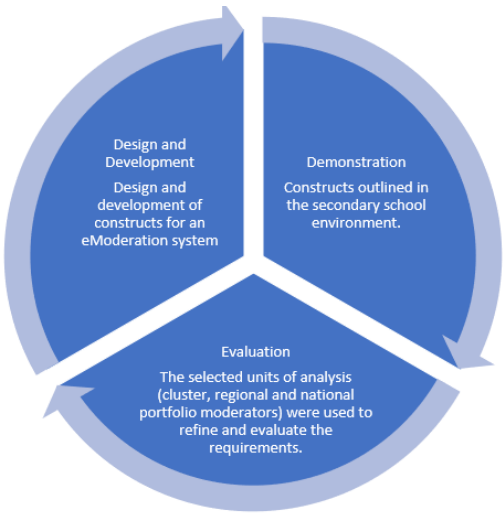


Figure 4-4: Design Science Research Process Model (*Peffers et al., 2006*)

A problem-centred approach is used as the entry point. The phases of the DSR process model and the corresponding phase of the research process of this study are depicted in Table 4-1.

Table 4-1: Phases of Dissertation Research Process

Phase	DSR	Dissertation Research Process	Implementation in eModeration context
Phase 1	**Problem identification and motivation**	The background to this study is introduced in this phase (cf. Chapter 1). The problem statement, purpose of the study and the research questions are articulated.	**Problem identification:** From personal experience as an IT teacher, cluster moderator and regional moderator, the lack of standardization in how students and teachers submit tasks for assessments and external moderation respectively, is a problem. **Motivation:** No evidence-based requirements could be found in the secondary school environment for the development of a digital moderation system. This study thus provides an opportunity to craft eModeration system requirements for this specific context based on existing theory and practice.
Phase 2	**Objectives of a solution**	A two-part literature review was conducted in this phase to inform the development of requirements for an eModeration system. • Part 1: current moderation practises, eModeration and the challenges and benefits of eModeration (cf. Chapter 2) • Part 2: Technology adoption models (cf. Chapter 3)	**Objectives:** To identify a set of pre-adoption eModeration requirements which would serve to streamline the moderation process and improve the efficiency of the eModeration process.

<table>
<tr><th>Phase</th><th>DSR</th><th>Dissertation Research Process</th><th>Implementation in eModeration context</th></tr>
<tr><td>Phase 3</td><td>Design and Development</td><td rowspan="3"> 
</td><td>The findings of Chapters 2 (literature review of moderation), 3 (literature review of technology adoption models) and 4 (research methodologies) were used to extract initial design requirements for an eModeration system.</td></tr>
<tr><td>Phase 4</td><td>Demonstration</td><td>Context: The secondary school environment.
Data collection and analysis was performed as part of the iterative refinement of the requirements.</td></tr>
<tr><td>Phase 5</td><td>Evaluation</td><td>Based on the findings and analysis of the data obtained from the streams of evidence presented, exclusion and inclusion criteria were applied to the constructs identified. Three broad categories were developed. The set of refined requirements for an eModeration system are presented in Chapter 5.</td></tr>
<tr><td>Phase 6</td><td>Communication</td><td>The refined requirements are communicated via:
The completed dissertation.
Scholarly articles submitted to two conference proceedings.</td><td>Refined requirements, discussion and conclusions are presented in Chapter 6. The literature review on technology adoption models relevant to eModeration has been accepted for publication at the ICTAS 2020 conference (cf. Appendix E). Requirements for an eModeration system has been accepted for publication at the I3E conference (cf. Appendix F).</td></tr>
</table>

Within academia, as illustrated in the discussion of the activities outlined in the DSRP model, DSR focuses on the knowledge used in designing solutions rather than the design-based act of creating the artefact (Peffers et al., 2007). Additionally, DSR promotes knowledge in the service of action. DSR thus aligns with pragmatism as the fundamental epistemological belief (Mckenney et al., 2007).

4.2.3. Research Method

The research method refers to the processes employed in selecting, collecting, organizing and analysing data. It is a method of enquiry progressing from the underlying hypotheses to the research design and data collection. Research methods can most commonly be classified as qualitative or quantitative. Qualitative and quantitative research methods refer to the way in which the data is collected and evaluated as well as the type of generalizations and representations resulting from the data (Thomas, 2010).

A case study is especially well-suited to offer concrete, context-dependent knowledge and lends itself well to capturing information on 'how', 'what' and 'why' questions (Crowe et al., 2011; Harrison, Birks, Franklin, & Mills, 2017). Additionally, case studies are well suited to studies of an exploratory or explanatory nature. A case study works particularly well for understanding processes since the researcher can get close to the participants in their local settings. Case study methods aid researchers in understanding the complexity of programs or policies, as well as their implementation and effects on participants (Salkind, 2010). Ramorola (2010) also indicates that a case study allows readers to understand abstract theories more clearly by presenting unique examples of real people in real contexts.

Drawing on the views expressed by Crowe et al. (2011); Flyvbjerg (2006); Harrison et al. (2017); Ramorola (2010) and Salkind (2010), this study employs a single exploratory case study research method. The case in this study focuses on the secondary school environment and the units of analysis are the moderators (cluster, regional and national).

Researchers, for instance Eisenhardt and Graebner (2007); Harrison et al. (2017); Verschuren (2003) and Yin (2013), concur that generalizability is a challenging aspect of case study research especially when only a few cases are studied. A key question facing researchers is how to generalize theory when the cases are not representative (Eisenhardt & Graebner, 2007; Yin, 2013, 2015).

Eisenhardt and Graebner (2007) further declare that many researchers erroneously assume that cases should be representative of a sample population. Thus, case

selection is a common challenge of building theory from cases (Elman, Gerring, & Mahoney, 2016). When generating theory, theoretical sampling is appropriate as the aim of the research is not to test the theory but rather to generate it. Thus, with theoretical sampling, cases are selected based on their suitability for enlightening and expanding links and logic amongst concepts (Eisenhardt & Graebner, 2007).

Baškarada (2014) maintains that case studies afford the researcher the opportunity of gaining an overall view of the research problem and may facilitate an understanding and explanation of the research problem. Salkind (2010) on the other hand explains that, while the case study approach can be used for exploratory purposes, it may also be used for descriptive or explanatory purposes; for instance, to describe a situation or to test why specific events occur.

Researchers for instance, Dresch et al. (2015); Eisenhardt and Graebner (2007); Harrison et al. (2017) and Morgan et al. (2016) concur that case studies can accommodate a diverse range of data sources like interviews, survey data, ethnographic data and observations.

Case study research can illustrate the accuracy of a process while creating opportunities for understanding the entities involved. The researcher must make certain that the information is merged to appreciate the complete case and not just the different elements of the case. Such convergence augments the results as the numerous elements of data are intertwined to encourage better understanding (Baxter and Jack, 2008). This strength of a case study is particularly germane to this study as the different perspectives of cluster, regional and national moderators provides an added dimension to the quality of the data and, by extension, the analysis thereof.

A criticism of case study research is that gathering data from several sources may lead to the gathering of enormous quantities of data requiring management and analysis leading to researchers finding themselves adrift in the data (Baxter & Jack, 2008). It is therefore challenging to describe the findings in a succinct manner. However, contrary to this view, Morgan et al. (2016) argue that the accumulation of information from several sources for each case enables triangulation of evidence which enhances the validity and completeness of the case study. The credibility of the research findings is strengthened; thus providing greater confidence in the findings.

Data collection and analysis are developed in an iterative process which allows for the development of theory substantiated by observable evidence (Kohlbacher, 2006). This potential for theory development makes a case study particularly pertinent to this study.

Yin (2013) maintains that a case study approach is a viable alternative to other research methods due to its ability to consider both the complexity as well as the contextual conditions of a given scenario. Yin (2013) further asserts that case study methods are especially relevant when evaluating complex initiatives for systems requiring the integration of service delivery as well as community development projects. The purpose of this study is to determine the requirements for the development of an online digital moderation system to enhance the effectiveness of the moderation process. This implies that a case study method is particularly pertinent to this study.

4.3. Research Flow

The research flow process described in this section is illustrated in Figure 4-5.

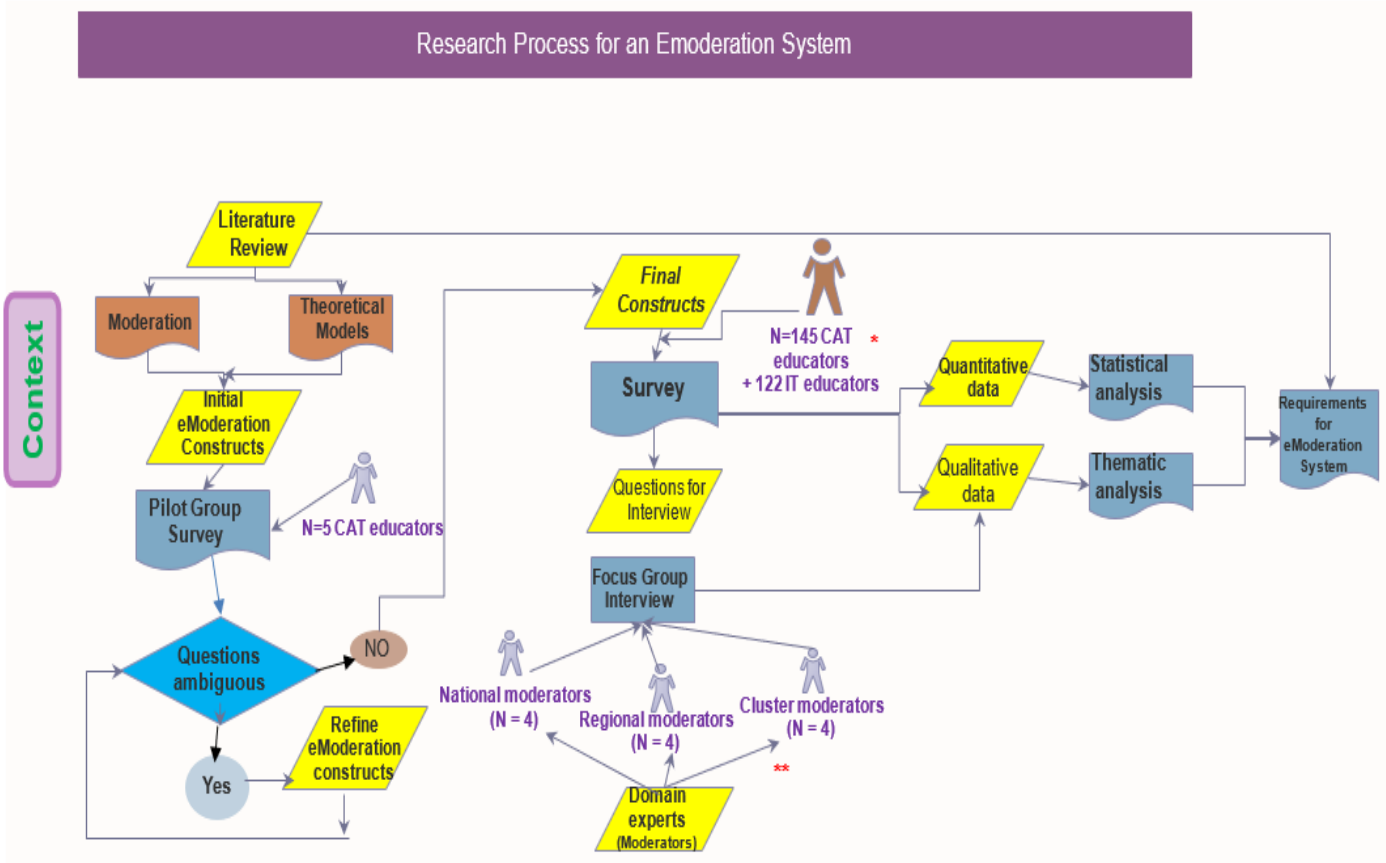


Figure 4-5: Research Flow Process

4.3.1. Research Instruments

In this study, data was collected via an online survey (cf. Appendix C_1) and a focus group interview. The survey was developed using Google forms and distributed via email. The questionnaire captured both qualitative as well as quantitative data. In addition to biographical information, the questionnaire (cf. Appendix C_1) contained multiple choice and customized Likert scale questions to determine the extent to which digital moderation processes are carried out for the moderation of IT and CAT portfolio tasks in the secondary school environment and the perceived requirements of an eModeration system.

The questionnaire was structured as follows:

- Section A: Biographical Information of Participant
- Section B: Current Moderation Practices
- Section C: Perceived Challenges of eModeration
- Section D: User Characteristics and Organizational Structure
- Section E: Technology characteristics
- Section F: General

In this study, questions 10 to 27 presented participants with a list of statements (Likert scale) and participants were instructed to respond to each statement (Likert item) in terms of their degree of agreement or disagreement. Questions 10 to 17 required participants to indicate frequencies, where a value of 1 equated to Never, 2 = Seldom, 3 = Sometimes, 4 = Often and 5 = Always; while questions 18 to 27 presented participants with a series of statements requiring a response in terms of their level of agreement or disagreement with the statement (A value of 1 being Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly Agree).

Section F (questions 28 to 31) consisted of general, open-ended questions requiring participants to express their opinions on the challenges and benefits of their current moderation practices together with their opinions on the perceived challenges, benefits and requirements of an eModeration system.

The rationale behind structuring the questionnaire so that the open-ended questions were asked at the end was to first provide an overview of eModeration based on the

assumption that teachers have not necessarily used an eModeration system. Whilst acknowledging that structuring the questionnaire in this way could influence teachers' responses and perhaps introduce some bias; it was deemed more feasible as participants could perhaps introduce factors that had not been covered in previous questions identifying pertinent constructs. For example, participants could provide additional benefits or challenges which had not already been identified by the researcher.

A preliminary analysis of the data obtained from the survey was used to inform the questions of the focus group interview (cf. Appendix C_2). Focus groups are facilitated discussions which use the group's interaction as a means of examining the research issue being explored. The use of group processes distinguishes focus group interviews from individual interviews and the data collected reflects the collective views of group members (Dilshad & Latif, 2013; Fossey, Harvey, Mcdermott, & Davidson, 2002; Rabiee, 2004). Focus group interviews explore the attitudes and perceptions of a homogeneous group of people focused on a given issue (Dilshad & Latif, 2013). A moderator leads the group through a series of carefully sequenced questions with the objective of gaining participants' insight on the topic in a non-threatening conversation. Focus groups are unique in that the aim is not to gain agreement but to accumulate a range of opinions and experiences. Focus groups use a purposeful sample comprised of information-rich participants. The homogeneity of the group promotes a greater sharing of insights resulting from a sense of cohesion (Dilshad & Latif, 2013; Krueger & Casey, 2015).

Baškarada (2014) and Dilshad and Latif (2013) maintain that focus group consultations can be used to depict data on the viewpoints of small collections of participants, ideally ranging from eight to twelve, to the research problem. Separate emails were sent out to 28 people who had indicated that they would be willing to participate in the focus group interview. These people were asked to complete a short survey indicating the most suitable date and time for them to attend the focus group interview.

4.3.2. Data Collection

The objective of information gathering is to acquire responses to the same issues from a substantial number of people to enable the scholar to depict, to correlate, to relate one quality to another and to demonstrate that certain features occur in certain classifications (Bell, 2005). The central emphasis is on fact-finding. A survey aims to acquire data from an archetypal selection of the community and, from that sample, report the findings as being typical of the community as a whole. Careful guidance is, however, required to verify that all questions have the same meaning for all participants. In this study, the data collection was implemented in two phases. The first phase involved the collection of quantitative and qualitative data via a survey. The second phase involved the collection of qualitative data via a focus group interview. The following section describes the specific techniques employed in gathering data for this study.

4.3.2.1. Survey

In an effort to source participants for the completion of the anonymous online survey, information letters (Appendix B_3) were distributed to CAT and IT teachers at the annual IEB Conference held in February. Permission to distribute these information letters was granted by the CEO of the IEB via email (cf. Appendix B_1). Delegates indicated whether they would be willing to complete the anonymous survey, participate in the focus group interview; participate in both the anonymous survey and the focus group interview or were unwilling to participate. Delegates were asked to provide their email addresses so that the link to the questionnaire could be sent out.

The survey was initially sent out to 5 CAT teachers as part of a pilot group survey. Two responses were obtained from this pilot group. These responses provided some insights on the questionnaire (cf. Section 5.2). The amended questionnaire was then distributed to participants from IEB schools via email using the unofficial email distribution lists catieb@yahoogroups.com and iebcompza@yahoogroups.com created by a teacher at an IEB school. This distribution list is available to all teachers at IEB private schools and all members who have voluntarily subscribed to this mailing list may freely access the details of other members of this group. Four reminders were sent out for people to complete the questionnaire.

4.3.2.2. Focus Group Interview

A preliminary analysis of the data obtained from the online participants was used to inform the questions of the focus group interview which formed the basis for the second phase of data collection. The focus group interview was audiotaped using two devices; a mobile phone as well as a Dictaphone to ensure reliability.

A focus group is a qualitative technique for data collection. Dilshad and Latif (2013) suggest that mini-focus groups may be used when the topic must be explored in greater depth and where participants have long, considerable experiences to share with other members of the group. The focus group interview was conducted with three cluster moderators and one national moderator. In the focus group, two of the participants had more than ten years of experience; one had four years of experience while the other had more than six years of teaching and moderation experience. Additionally, all participants were IT teachers who use ICTs on a regular basis and must, in the course of their jobs conduct moderation processes frequently.

4.3.3. Data Analysis

Although case studies are mostly based on qualitative data (words and descriptions); a case study can be a blend of qualitative and quantitative (numbers and measurements) data (Runeson and Höst, 2009). Quantitative research can be defined as empirical research into a human problem which is measured with numbers and analyzed using statistics. Qualitative research on the other hand is defined as an interpretive approach to the study of people, cases and processes in their natural environment to descriptively reveal the meaning that people ascribe to their experiences of the world. Qualitative research is neither based on a single methodology nor does it belong to a single discipline (Yilmaz, 2013).

In light of the above classifications of data, a focus group interview and questionnaires were deemed to be the most suitable methods of data collection so that the data could be triangulated to provide more pertinent results free from bias. Triangulation has been described as the combination of dissimilar methods in the study of the same phenomenon to enable corroboration of the data (Pansiri, 2005). The inference is that drawing the same conclusion from several different sources is stronger than drawing a conclusion from a single source (Runeson & Höst, 2009). The rationale is that the

strengths of the one method compensates for any deficiencies in the other and the combination of methodologies offers researchers the best of each method while overcoming any deficits in the other (Pansiri, 2005).

Triangulation provides richer details; fresh insights and opens new lines of enquiry through attention to contradictions in the data collected (Pansiri, 2005). In this study, a quantitative data analysis supplemented the qualitative data analysis. The gathering and investigation of quantitative data was integrated with the collection and analysis of qualitative data from a focus group interview with cluster and national moderators. The aim was to use the results of the analysis of the quantitative data to further interpret, confirm and enhance the findings from the qualitative data to resolve the research questions.

4.3.3.1. Quantitative Data Analysis

Prior to data analysis, the type of data must be considered to determine the most suitable scales of measurement. The purpose of the questionnaire was to determine educators' attitudes towards identified constructs for an eModeration system. Measuring a multi-layered and partially subjective concept such as the use of an ICT system necessitates the capturing of many characteristics which are not directly observable. Constructs can be characterized by an extensive range of different attributes (Krabbe, 2016). The questionnaire sought responses to user attitudes towards the eModeration process. The Likert scale, which is widely used for measuring attitudes like opinions and preferences, was thus deemed to be a suitable measure to use (Göb, McCollin, & Ramalhoto, 2007; Rinker, 2014).

Likert (1932, p. 7) maintains that the major problem with measuring attitudes is that "the number of attitudes which any given person possesses is almost infinite". However, since attitudes are "dispositions towards overt action", attitudes can generally be "clustered or linked together" (Likert, 1932, p. 9) and responses can move within a certain range of values. Thus, Likert scales allow quantitative analysis on attitudinal data. However, Gardner and Martin (2007) caution that the routine use of statistical methods suitable for continuous data to attitudinal data can result in significant inferential flaws. Therefore, the analysis of Likert scaled data, demands specialized statistical tools.

Before any form of analysis can be done, it is important to differentiate between a Likert scale and a Likert item as this differentiation informs the methods used for data analysis. Rinker (2014) maintains that a Likert item is a single item which, in and of itself, does not have the properties of the Likert scale and should not be used for analysis. The Likert scale, on the other hand, is the summation of a combination of multiple Likert items. Responses to individual items in the scale are added or averaged to produce an overall measurement or summary score making the response process cumulative (Krabbe, 2016; Rinker, 2014).

Göb et al. (2007) maintain that in methodological considerations it is generally recognised that scales measuring attitude are considered as ordinal when all items relate to a single common factor. The sum of these items should contain the important information contained in the individual items and each item should be uniformly related to the underlying attitude. Thus, the more favourable (or unfavourable) a respondent's attitude, the higher (or lower) her expected score for the item will be. A defining feature of a Likert scale is that it consists of many response categories having distinct cut-off points with linearity and equal intervals between these points being assumed (Gardner & Martin, 2007).

Thus, this scaling model involves a single type of object e.g. ease of use and a single type of response. The precise responses to the items are combined so that individuals with the most favourable attitudes will have the highest scores while individuals with the least favourable attitudes will have the lowest scores (Krabbe, 2016). The problem that arises is how the responses of each respondent can be combined in a way such that valid and reliable differences amongst participants can be represented.

Unfortunately, ways to analyse data measured using Likert scales are not widely available. Göb et al. (2007) maintains that there is no common standard that is accepted by the scientific community for the correct interpretation and analysis of Likert type data. The assumptions underpinning this measurement method are questioned; the core issue being that ordinal measures are subjective and provide little

predictive value[6]. Numbers reflecting the increasing quantity of the characteristic being measured are arbitrarily assigned as labels for response categories (Krabbe, 2016).

Joshi, Kale, Chandel and Pal (2015) assert that the methods of analysis used for Likert scale data is largely dependent on whether the variables used for the item response can be categorized into ordinal or interval scale data. Gardner and Martin (2007) classify Likert scaled data as ordinal rather than interval and recommend using rank based statistical procedures to analyse this data. Individual Likert items should thus be treated as ordinal categorical data.

An interval scale is used when a set of items for each participant are combined to create a single score (Likert scale). The mean and standard deviation are measures of central tendency and dispersion for an interval scale. Furthermore this data set can be statistically analysed by Pearson's correlation coefficient (r), Analysis of Variance (ANOVA) and regression analysis (Joshi et al., 2015; Rinker, 2014). However, if the data is to be analysed as separate items, the assigned scale will be ordinal. The recommended measures of central tendency and dispersion for ordinal data are the median (or the mode) and frequency (or range) rather than the mean. Thus, frequencies or percentages of responses in each category should be used to describe a summary of ordinal data (Rinker, 2014). An ordinal data set can further be statistically tested by non- parametric techniques such as Chi-square test, Kendall Tau B or C test (Chyung, Roberts, Swanson, & Hankinson, 2017; Joshi et al., 2015; Rinker, 2014). These tests were assessed for their applicability to the current study in Table 4-2.

In this study, items in the questionnaire were aggregated into a scale based on the constructs identified from the HOT-Fit Model. The recommended tests for this type of data were considered and evaluated for their suitability in this study (cf. Table 4-2). Due to the nature of the topic and the subsequent data collected, Pearson correlation coefficient was deemed suitable. None of the other tests considered was deemed suitable in the context of the current study as evidenced by the discussion in the

[6] Jeromy Anglim, Available from: (https://stats.stackexchange.com/users/183/jeromy-anglim), What are good basic statistics to use for ordinal data?, URL (version: 2011-03-31): https://stats.stackexchange.com/q/8995. Accessed: 14/08/2019

justification column of Table 4-2. Frequencies were therefore the only other measure used for further data analysis.

Table 4-2: Non-Parametric Tests Recommended for Likert Scales[7]

Type of Analysis	Main Use	Applicable to study?	Justification
1-sample sign test	"To estimate the median of a population and compare" this value "to a reference or target value." [8]	No	There are no target values.
1-sample Wilcoxon signed rank test (Hollingsworth, Collins, Smith, & Nelson, 2011)	Estimates the median value in a given population and compares it to a reference value. Assumption: data comes from a symmetric distribution.	No	Data is not symmetric and no reference value for comparison.
Friedman test	Tests for differences between populations with ordinal, dependent variables. Can also be used for continuous data if the one-way ANOVA with repeated measures is inappropriate.	No	Initially data was filtered by role. However, no significant differences were found between those who responded in their role as moderators as opposed to those who responded in their capacities as educators. The sample size was also reduced by filtering the data. Hence, the data was captured for only one sample.
Goodman Kruska's Gamma	Test for association of ranked variables.	No	No ranked variables. Data was captured per construct rather than variable.
Kruskal-Wallis test	Used to determine "if two or more medians are different." Uses "ranks of the data points" rather than the actual data points for the calculations. Used for 3 or more samples.	No	There is no relationship between the medians of the different constructs. Only one sample.
Mann-Kendall Trend Test	"Looks for trends in time-series data."	No	Data was not collected over different periods of time.
Mann-Whitney test	Compares the differences between two independent sets when dependent	No	Only one group was surveyed. Data from focus group interviews was purely

[7] Available from: https://www.statisticshowto.datasciencecentral.com/parametric-and-non-parametric-data/; By Stephanie | January 20, 2014 [Accessed: 02/08/2019]
[8] Available from: https://www.statisticshowto.datasciencecentral.com/parametric-and-non-parametric-data/; By Stephanie | January 20, 2014 [Accessed: 02/08/2019]

Type of Analysis	Main Use	Applicable to study?	Justification
	variables are either ordinal or continuous.		qualitative and no quantitative values could be assigned.
Mood's Median test	Used when there are two independent samples.	No	Only one sample.
Spearman Rank Correlation	To find correlations between two sets of data.	Yes	"Determines the strength and direction of the relationship between two variables."

The Likert scale questions included in the questionnaire were analysed using statistical frequencies. The internal reliability or consistency of the measuring instrument was analysed using the Cronbach Alpha (cf. Section 5.2).

4.3.3.2. Qualitative Data Analysis

The qualitative data was analysed thematically. A theme is a consistent, meaningful pattern in the data and captures important aspects about the data in relation to the research question (Clarke & Braun, 2013). Thematic analysis is a theoretically flexible analytic method for categorising and analysing patterns in qualitative data. Thematic analysis is suitable for various theoretical perspectives and is useful because it works with a wide range of research questions and can be used to analyse different sources of data like transcripts of focus group interviews. Additionally, thematic analysis can be used either with large or small sets of data and can be applied to generate analyses that are either data-driven or theory-driven (Clarke & Braun, 2013).

For this study, key words or thoughts that were repeatedly expressed by the participants during the focus group interview were encoded to identify general themes and patterns that emerged from the raw data. QDA Miner Lite[9] was used to encode and analyse the qualitative data. The data was then decoded and triangulated with the quantitative data to provide more pertinent results free from bias; thus, ensuring the credibility of the results.

[9] Downloaded from https://provalisresearch.com/products/qualitative-data-analysis-software/freeware/. At this stage there was no access to Atlas.ti V. 8

4.3.4. Sample Size

There are 122 IEB schools offering IT as a subject and 145 schools offering CAT as a subject. The questionnaire was sent to all educators subscribed to the IT and CAT mailing lists. As indicated by the research flow process illustrated in Figure 4-5, the questionnaire was distributed to 122 IT teachers and 145 CAT teachers at schools affiliated to the IEB. Additionally, emails were sent to 28 IT and CAT teachers who had previously indicated that they were willing to participate in the focus group interview (cf. Appendix B_3). These teachers were also asked to recommend other moderators who would be willing to participate.

In Figure 4-5, the * and ** are explained below:

* the survey was distributed to 122 IT educators and 145 CAT educators – only 61 of these educators responded.

** it was initially envisaged that the focus group interview would comprise of four cluster moderators, four regional moderators and four national moderators. The reality was that one national moderator and three cluster moderators participated in the focus group interview.

4.4. Ethical Clearance Procedures

Research is a natural extension of humans' desire to understand and improve the world we live in with significant advances having been made in human understanding as a result of research involving humans (Tri-Council-Policy-Statement, 2014). A fundamental premise is that research can benefit society. To maximize this benefit, researchers must have academic freedom which includes freedom of enquiry, the right to disseminate the results of that inquiry, freedom to challenge conservative thought, freedom to voice opinions and freedom from institutional censorship (Tri-Council-Policy-Statement, 2014). However, with academic freedom comes the responsibility of ensuring that research involving people meets certain scientific and ethical standards that respect and protect the participants. Thus, the researcher's commitment to the advancement of knowledge also demands the responsibility of honest and thoughtful enquiry, rigorous analysis, dedication to the dissemination of research results and compliance to professional standards (Tri-Council-Policy-Statement, 2014). The following sections describe the ethical clearance procedures in

the collection of the data and how validity, reliability and fairness were ensured in this study.

4.4.1. Ethical Clearance: Data Collection

Although a research study is established on trust between the researcher and the participant, clear actions must be taken to avoid difficulties. Participants and establishments must overtly consent to participate in the case study. Such agreements should preferably be handled through a document or contract between the researcher and the individual participant (Runeson and Höst, 2009).

To this end, approval was sought from the IEB to conduct the study at private schools affiliated to the IEB (see Appendix B_1). The difficulty was that teachers are employed by schools rather than the IEB. The CEO of the IEB thus consented for the study to be carried out at private secondary schools affiliated to the IEB with the proviso that individual principals also sign permission for educators in their employment to participate in the focus group interview (cf. Appendix B_2).

Application was made to the UNISA Ethical Clearance Board who granted ethical clearance valid for a period of three years (see Appendix A).

In this study, there were no risks or benefits for the participants. However, measures were taken to ensure the anonymity of participants. Participants of the online survey were assured of anonymity using the online cover letter provided by UNISA. Additionally, the questionnaires that were disseminated had a cover page indicating the purpose of the study as well as assurances of how the data would be used. Email addresses were collected, with full disclosure, for the sole purpose of identifying regional and national portfolio moderators who could further be contacted for participation in the focus group interview. The data collected from the online survey was downloaded to a password protected spreadsheet to facilitate the data analysis, while still protecting the anonymity of the participants. Once participants were contacted for the focus group interview, the column containing email addresses in the spreadsheet was hidden and not referred to thereafter. None of the other demographic information collected required the disclosure of personal details of the individuals concerned.

Once participants of the focus group interview volunteered to participate, the individual principals were contacted to grant permission for these individuals to participate. All participants of the focus group interview were provided with information letters indicating that participation was entirely voluntary and that participants had the autonomy to decline participation at any stage (cf. Appendix B_4). During the focus group interview, participants were assured that they could opt out of the study at any given time.

After the research has been completed, the confidentiality of all records still need to be maintained. All documents will be password protected to ensure such confidentiality. Additionally, all documents stored on Google Drive and the local hard drive will be deleted.

4.4.2. Validity, Reliability and Fairness

The validity of a study denotes the degree to which the conclusions are accurate and remain unbiased by the investigator's opinion (Runeson & Höst, 2009). Yin (1981) maintains that once the data has been appraised, and a preliminary case study account has been constructed, the accurate sections of the case studies should be revised by the key participants. Such a review should be seen as a minimum process for validating the collected data. Even if the informants dispute the interpretations of the case study, they should not discover that the rudimentary details have been misinterpreted. Participants should additionally find that the facts and understandings are balanced. Thus, the report should accurately reflect the different viewpoints of the participants.

Using participants to review the case is a way of minimizing bias (Crowe et al., 2011; Yin, 1981). Runeson and Höst (2009) concur that providing feedback to participants is essential for long-term confidence and the validity of the study. Presenting participants with an analysis maintains participants' trust in the research and strengthens the validity of the study (Runeson & Höst, 2009).

Several researchers for instance, Baškarada (2014); Crowe et al. (2011) and Rowley, (2000) assert that case study conclusions are more likely to be reliable and credible if they are based on diverse sources of information as several provenance of information enable data triangulation. Examining the consistency of data across various sources

is a form of verification; while multiple sources of evidence provide various measures of the same concept, which supports data validation. The choice of applicable cases; triangulation and the exploration for contradictory evidence are fundamental characteristics of case studies (Baškarada, 2014). The use of both questionnaires and focus groups interviews in this study thus enhances data validity.

Clarifying significant prejudices and how one will deal with these prejudices is an important facet of preserving impartiality in research development (Yeh & Inman, 2007). A related challenge with this particular study, is subjectivity. The researcher is part of the culture and must ensure that the facts correctly represent the participants' reality rather than the reality of the researcher. It was therefore imperative for the researcher to plan focus group questions well and not to interject any form of bias. One possible way of doing this was to adopt what Yeh and Inman (2007, p. 387) refer to as a "naive interviewer" stance. In the current study, the researcher allowed participants to speak without interruption and did not interject any additional comments.

Given (2013) describes fairness as the extent to which different constructions and value structures are dealt with and valued during the process of inquiry and its presentation while the Canadian Tri-Council policy statement (2014) defines fairness as considering all people with the same respect and concern.

Participation in research should be based on inclusion criteria that are justified by the research question (Ethical Conduct for Research Involving Humans; 2014). Inequity is created when specific groups are indiscriminately excluded from research or excluded for reasons unrelated to the research question. In this study, to ensure fairness, no teacher was precluded from participating based on ethnicity or gender. Although exclusionary criteria were used based on the role of the individual in the moderation process and the subject being assessed, all participation was voluntary and based on availability. No participant was therefore unfairly prejudiced. All educators who indicated that they would be willing to participate were given the opportunity to anonymously suggest an alternate date, time and/or venue so that nobody was unfairly prejudiced.

It is also necessary to determine the trustworthiness and authenticity of qualitative data. To this end, the following elements of trustworthiness were ensured:

1. Credibility refers to the degree of certainty that can be placed in the findings of the research. The following credibility strategies were used to establish the rigour of the focus group interview:

    - Peer debriefing: Feedback was sought from the supervisor so that insights based on the analysis of the data could be tested. The findings were presented to a select few peers whose comments were sought during argumentation workshops organized by the supervisors.

    - Data triangulation was used by making use of two different research instruments. An online questionnaire was distributed to IT and CAT educators in the employ of IEB affiliated secondary schools. A focus group interview was thereafter conducted to obtain corroborating evidence. This strategy allowed for the integrity of responses obtained to be cross-examined, thus reducing bias. Additionally, this process allows for individual viewpoints to be verified against others thus allowing the researcher to construct a rich picture of attitudes and behaviours of a range of different people.

    - Member checks were used to include the voices of participants in the analysis as well as the interpretation of the data collected. This strategy eliminates researcher bias. The analysed and interpreted data was made available to participants so that they could determine if the researcher's interpretation correlated with the ideas that they intended to convey. Participants were invited to suggest changes if they were unhappy with the researcher's interpretation or if they felt that their views were misreported.

    - Negative Case Analysis: Where the emerging data contradicted expectations, these were reported, and plausible alternative explanations were provided to improve the rigour of the study.

    - Purposive sampling was used for the focus group interview. Such sampling helps the researcher to focus on participants who are knowledgeable of the issue under investigation. Purposive sampling allows decisions to be made about the category of participants thus ensuring more in-depth findings.

2. Transferability was facilitated by providing a thick description of the setting within which the study was carried out and by purposeful sampling. Information on the number of moderators who participated in the study, constraints to the type of people who contributed to the data, the data collection methods used, and the number of data collection phases were discussed so that other researchers may assess the extent to which the findings may hold true in other settings.

3. Dependability was ensured by providing sections describing the research design and its execution; describing how data was gathered and an evaluation of the effectiveness of the undertaken inquiry.

4. Confirmability was addressed by triangulation thus ensuring that the findings indicated the participants' experiences and ideas rather than those of the researcher.

5. Authenticity was ensured by using the participant's own words to further explain the researcher's interpretations. A range of voices including dissenting views were included (Fossey et al., 2002).

6. Adequacy: The researcher must put together the data, analysis and findings in such away that the reader is able to validate the adequacy of the findings. All raw data that was collected was saved on a password protected machine in suitably named folders. The date on which the data was collected was recorded so that an audit trail was created to confirm the data analysis and interpretations. Referential adequacy was tested by reviewing the raw data and comparing it to the developed themes to ensure that all conclusions are firmly corroborated by the data (Nowell, Norris, White, & Moules, 2017).

The use of qualitative research methods in IS has triggered the need for criteria to evaluate the legitimacy of qualitative research (Pozzebon, 2002). In IS, research is regarded as interpretivist if one presumes that social constructions of shared meanings shape our knowledge of reality. Interpretive research focuses on human sense making. Phenomena are thus understood by the meanings that people ascribe to them. Interpretive methods of research in IS aim to develop an understanding of the context of IS and how the IS influences and is influenced by the context within which it functions (Klein & Myers, 1999).

Klein and Myers (1999) advocate a set of principles (cf. Table 4-3) for improving the validity of studies grounded in an interpretive position. These principles are largely based on hermeneutics and, since not all research is based on hermeneutics, the researcher is encouraged to exercise his/her judgement in deciding which of the principles are applicable to a given research context.

Table 4-3: Principles for Improving Validity (Klein & Myers, 1999, p. 78)

Principle	Foundation	Applicability to this study
"The Fundamental Principle of the Hermeneutic Circle"	The fundamental principle is that our preconceptions about the interrelationships between different parts of a whole inform our understanding of the whole that each interrelated part forms. The fundamental idea of human understanding is the foundational principle that the other principles build on.	Common thread that the other principles build on.
"The Principle of Contextualization"	Requires a critical reflection of the background of the social and historical setting of the research.	Achieved by conducting an extensive literature review of the moderation processes established at tertiary institutions in other countries as well as those employed at both tertiary and secondary educational institutions in SA to provide a context for the investigation.
"The Principle of Interaction between the researcher and the subjects"	Requires a reflection of "how the research data was socially constructed" between the researcher and the participants.	The questions included in the survey were initially informed by the researcher's familiarity with the moderation of assessments (the fundamental principle of the hermeneutic cycle) and the information obtained about moderation processes from the literature review (principle of contextualization). These principles informed the questions comprising Sections B, C and D of the questionnaire. Responses to the questions further informed the structuring of the questions for the focus group interview (see question 5).

Principle	Foundation	Applicability to this study
"The Principle of Abstraction and Generalization"	"It is important that theoretical abstractions and generalizations should be carefully related to the study details" as collected by the researcher. "Theory plays a crucial role in interpretive research" enabling the researcher "to view the world in a certain way." Four types of generalizations identified from interpretive case studies are discussed below:	The technology adoption models were compared in great detail (cf. Table 3-2) and inclusion and exclusion criteria were applied based on findings from the literature and participant responses to both the survey and the focus group interview. The constructs identified informed the theoretical insights into eliciting the requirements for an eModeration system.
	1. The development of concepts.	1. Constructs elicited from existing technology acceptance models.
	2. The generation of theory.	2. Exclusion and inclusion criteria.
	3. The drawing of specific implications.	3. Conceptual model (cf. Figure 2-2).
	4. The contribution of rich insight.	4. Final requirements for an eModeration system (cf. Figure 5-4).
"The Principle of Dialogical Reasoning"	Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and the actual findings. This principle requires the researcher to confront his or her "preconceptions that guided the original research design" with the data that emerged through the research process.	The data was analysed using statistical methods. Software was used to determine themes that emerged from the data collected. Actual percentages were reported on based on the raw data.
"The Principle of Multiple Interpretations"	Requires that the researcher documents multiple viewpoints along with the reasons for them. The principle of multiple interpretations is of heuristic value as it leads to probing beneath the surface.	Different narratives were reported on by providing quotes from participants and contradictory viewpoints were reported on. The researcher also used the hermeneutic principle to ascribe meanings to the contradictions.

Principle	Foundation	Applicability to this study
"The Principle of Suspicion"	Requires the researcher to be sensitive to possible bias in the narratives of participants.	An integrated analysis of the viewpoints of participants of the survey and focus group was conducted. The responses were presented using both qualitative as well as quantitative analytic techniques so that the results could be coherently presented.

4.5. Research Bias and Limitations

There is possible research bias due to the researcher being part of the community of participants. The researcher is intimately familiar with current moderation processes thus presenting the difficulty of ensuring that researcher bias is not evident in the reporting.

The results of this study could be limited by the small sample size. The community of participants is very small and there was no way of ensuring that all teachers involved in the teaching of IT and CAT would fill out the questionnaire. While many people at the IEB conference at which information sheets were disseminated (cf. Appendix B_4) indicated that they would be available for focus group interviews, some of the educators do not reside in the same province as the researcher. Arranging a suitable time for the focus group interview also proved to be problematic as some schools have three terms while others have four terms.

Additionally, the number of hits where eModeration was listed as a key search term elicited results mainly on the moderation of online discussion groups (cf. Table 2-1). The only pertinent research was that of Van Staden (2010, 2015, 2017). There were thus scant research articles to draw on.

The questionnaire is not a standardized questionnaire because there are no readily available pre-adoption models. The questionnaire is thus a researcher-designed instrument.

4.6. Conclusion

This chapter has outlined the research paradigm, research design and research method used in the study, including procedures, participants, data collection tools,

data collection and analysis methods. Additionally, the process followed to obtain ethical clearance was discussed together with the methods employed to ensure the validity, reliability and trustworthiness of the data collection instruments. The research flow process was illustrated in Figure 4-5. The research method for this study was a case study analysed through qualitative and quantitative methods. The units of analysis were cluster moderators, regional moderators and national moderators. This chapter also described the stages involved in the design and development processes of this research. The following chapter will discuss the detailed analysis of the data that was collected via the survey and focus group interview.

Chapter 5
Data Analysis and Results

5.1. Introduction

The previous chapter detailed the research methodology employed in this study. A discussion of the research instruments was followed by the methods of determining the validity and reliability of the research instruments. This chapter presents the results and analysis of the findings with a view to providing requirements for an efficient eModeration system. This chapter culminates with a conceptual model indicating the identified categories and criteria necessary for an efficient eModeration system.

5.2. Assessment of the Measurement Instrument

With the exception of the question measuring the *availability* construct which was adapted from Goodhue, Klein and March (2000); Goodhue and Thompson (1995); McGill (2009) and Zhou, Lu and Wang (2010) and modified to the eModeration context, the questionnaire was a self-developed instrument. It was therefore necessary to validate the internal consistency of the items in the measuring instrument.

A pre-test of the questionnaire was performed using a pilot group of five CAT teachers to check for internal consistency, contextual relevance and ease of understanding. Two of the five educators contacted, responded. An analysis of the responses indicated that these participants had left a few of the questions unanswered. The questionnaire was thereafter modified to ensure that all questions were mandatory. There were no additional modifications to the questionnaire as no additional comments were forthcoming from these educators. It was thus assumed that the questionnaire (cf. Appendix C_1) was contextually relevant and easy to understand.

Internal consistency reliability refers to the “degree of consistency between different items of the same construct” (Pelz, 2019). If a multiple-item construct measure is administered, the extent to which participants rate those items in a similar manner is a reflection of the internal consistency of that construct (HR-Statistics, 2016; Pelz, 2019). While other measures are available, the Cronbach Alpha (CA) is the most commonly used measure for reliability (Gadermann, Guhn, & Zumbo, 2012). The interpretation of CA values as identified by HR-Statistics (2016) is depicted in Table 5-1.

Table 5-1: Interpretation of Cronbach Alpha

CA Value	Interpretation
>0.8	Good reliability
>=0.6 and <= 0.8	Acceptable reliability
<0.6	Unacceptable reliability

In this study, the internal consistency of each construct (on the final questionnaire) was assessed by computing the Cronbach’s Alpha. These measurement scales are summarized in Table 5-2.

Table 5-2: Measurement of Internal Consistency

Question Number	15	16	17	18	19	20	21	22	23	24	25	26	27
Construct	**Inf**	**Cos**	**Pex**	**Pro**	**Qua**	**EnF**	**SE**	**Com**	**Etv**	**Ava**	**Eff**	**TR**	**EU**
No of items	5	4	3	3	3	4	3	3	3	3	4	3	3
Sum of item variances	5,8	6,0	2,4	4,0	3,5	4,2	1,6	1,8	1,4	2,0	1,0	0,9	1,0
Variance of total scores	17,3	15,3	4,4	8,1	6,9	9,4	4,5	2,3	3,2	7,1	6,2	5,1	5,1
Cronbach's Alpha	0,83	0,81	0,67	0,76	0,75	0,74	0,96	0,35	0,83	0.82	0.90	0.87	0.80

Key:

Inf	Infrastructure		**Com**	Compatibility
Cos	Cost		**Etv**	Effectiveness
Pex	Personal Experience		**Ava**	Availability
Pro	Productivity		**Eff**	Efficiency
Qua	Quality		**TR**	Task Requirements
EnF	Encouraging Factors		**EU**	Ease of Use
SE	Self-Efficacy			

As indicated in Table 5-2, the lowest value of Cronbach's alpha was 0.35 for the construct of *compatibility*. The *compatibility* construct (cf. question 22, Appendix C_1) required participants to indicate how important it was to be able to access an eModeration system from different devices (laptop, PC and mobile device) i.e. the compatibility of the system with these three different devices. The results were thus dependent on participants' personal preferences. The CA value of 0.32 (cf. Table 5-2) indicates that the results for this construct are not reliable. This construct was therefore omitted from the final analysis.

As evidenced by the data (cf. Table 5-2), a CA greater than 0.8 was obtained for the *infrastructure*, *cost*, *self-efficacy*, *effectiveness*, *availability, task requirements* and *ease of use* constructs. A CA score > 0.8 indicates that the items in each construct are closely related to each other, producing good reliability scores for these scales. As depicted in Table 5-2 acceptable (cf. Table 5-1) CA values (>=0.6) were found for the *personal experience*, *productivity*, *quality* and *encouraging factors* constructs.

A correlation coefficient is a measure of the strength and direction of a linear relationship between variables. Table 5-3 provides an approximate guide for how the strength of the relationship between two variables can be interpreted based on the absolute value of the coefficient (HR-Statistics, 2016).

Table 5-3: Strength of Linear Relationship between Variables

STRENGTH OF CORRELATION	INTERPRETATION
±1.00	perfect correlation
±0.80	strong correlation
±0.50	moderate correlation
±0.20	weak correlation
±0	no correlation

The mean values for each construct were calculated so that the resulting continuous data could be analysed using correlation coefficients. For this study, the Pearson correlation coefficient was calculated to determine the relationships between the different constructs. Correlation matrices were generated to determine the strength of the relationships. The correlation coefficients are depicted in Appendix D (cf. Table D-1). As indicated by the correlation coefficients, there is a positive relationship (i.e.

the values for one variable increase as the values for the other variable increase) between the following constructs:

i. ease of use and efficiency (0.416)
ii. ease of use and task requirements (0.441)

There was a negative (i.e. the values for one variable increase as the values for the other variable decrease) significant relationship between:

iii. efficiency and personal experience (-0.389)

The strength of the relationships for i. and ii. were moderate while the strength of the relationship for iii. was weak (cf. Appendix D,). The weak relationship for iii would suggest that more experienced people have higher expectations of the system. The moderate relationship for i and ii suggests that systems which are easier to use will require less time and effort resulting in greater productivity in tasks carried out. Additional implications are discussed in section 5.4.3 and are structured around the context of existing theories of technology acceptance (summarized in Table 5-27).

Furthermore, there were no significant relationships for:

iv. personal experience vs ease of use
v. self-efficacy vs ease of use
vi. availability vs efficiency

Therefore, no further statistical analysis was performed on this data.

5.3. Findings

The Likert scale, which is characterized as an ordinal scale, is generally used to measure attitudes. Chyung et al. (2017) maintain that, with ordinal data one should use median or mode, rather than the mean, as the measure of central tendency. Additionally, a summary of ordinal data should be described with frequencies or percentages of responses in each category. This section therefore reports on the key findings using frequencies. The findings from the quantitative data are first presented (survey), followed by the findings from the qualitative data (obtained from the survey as well as the focus group interview).

5.3.1. Findings from Quantitative Data

The link to the survey was distributed to a total of 267 IT and CAT teachers (cf. Figure 4-5). Section A of the questionnaire required participants to provide biographical data. Table 5-4 indicates the demographics of the participants (N = 61). Notably, 53.2% of the survey participants (N = 61) answered in the capacity of IT educator while 24.2% filled in the questionnaire in their capacities as CAT teachers; 3.3% answered in the capacity of cluster moderators; 4.9% as regional moderators and 6.6% in their capacities as national moderators. Other participants (1.4 %) filled in their designations as head of academics, head of school etc. This data is represented as *other* in Table 5-4.

As evidenced by the data in Table 5-4, most of the participants (80%) have more than 10 years of teaching experience and are over 30 years old. All (100%) of the survey participants teach at private schools affiliated with the IEB.

Table 5-4: Demographics of Participants

ROLE	IT Educator	53,20%
	CAT educator	24,20%
	CAT and IT educator	6,4%
	Cluster moderator	3,30%
	Regional moderator	4,90%
	National moderator	6,60%
	Other	1,4%
Technology Experience	< 1 year	3,30%
	1 - 5 years	8,30%
	6 - 10 years	8,30%
	> 10 years	80%
Age	25 - 34	21,30%
	35 - 44	27,90%
	45 - 54	29,50%
	55 +	21,30%

The responses to questions 10 to 27 of the questionnaire are now presented and discussed. ***Note: in this analysis, the frequency reported for always is based on always and often; agreed is based on strongly agree and agree; disagreed is based on strongly disagree and disagree and never is based on never and seldom.*** The analysis of the responses to these questions form the basis for the extrapolation of the requirements for an eModeration system. The data bars indicate

the frequency of responses, which is also represented numerically. The colour is simply for aesthetic value and does not denote anything of significance.

Considering the participants' experience in using different software (cf. Table 5-5), most of the participants (98%) always use email. An important finding is that 26% always use an eModeration system and 41% of the participants indicated that they do not use an eModeration system.

Table 5-5: Software Experience

Software Experience: I use the following applications in my job.					
	Never	Seldom	Sometimes	Often	Always
Email	0%	0%	2%	5%	93%
Virtual Learning Environments	12%	20%	27%	18%	23%
Mobile Learning	8%	15%	25%	30%	23%
eModeration Systems	23%	18%	33%	18%	8%

Section B of the questionnaire required participants to answer four questions based on their current moderation practices.

Considering learner submission of tasks to the teacher for assessment purposes (cf. Table 5-6), 10% of the participants indicated that tasks are submitted solely in a digital format while 5% of the participants submit solely paper-based tasks. The results indicate that over 40% of tasks are regularly submitted in both digital as well as paper format.

Table 5-6: Format of Learner Submissions of Tasks for Assessment

Learners submit tasks for assessment in the following format					
	Never	Seldom	Sometimes	Often	Always
All paper	17%	22%	31%	24%	5%
Mostly paper based and some digital	12%	28%	18%	30%	12%
Some paper but mostly digital	8%	25%	20%	35%	12%
All digital	29%	12%	20%	29%	10%

Considering the format of task submissions to an external moderator (cf. Table 5-7), 30% of the participants indicated that submission of assessed tasks to an external moderator is often or always done as a hard copy while 58% indicated that submissions are most often digital.

Table 5-7: Format of Task Submissions to an External Moderator

Tasks are submitted for external moderation in the following format					
	Never	Seldom	Sometimes	Often	Always
All paper	37%	18%	16%	14%	16%
Mostly paper based and some digital	32%	14%	21%	23%	11%
Some paper but mostly digital	30%	20%	18%	23%	8%
All digital	29%	8%	5%	27%	31%

Considering the *turn-around time* of receiving feedback from the moderator when moderation is paper-based (cf. Table 5-8), 32% of the participants indicated that the turnaround time for paper-based moderation is a week while 47% indicated that it never takes a week to receive feedback from the moderator. More than half of the participants (72%) indicated that it never takes a month or more to receive feedback while 43% of the participants indicated that *turn-around time* is more than a week.

Table 5-8: Turn-Around Time of Manual Moderation

The turn-around time of receiving feedback from the external moderator when moderation is done manually i.e. paper-based moderation is:					
	Never	Seldom	Sometimes	Often	Always
An hour or less	87%	11%	0%	0%	2%
Several hours	72%	19%	6%	4%	0%
A day	60%	9%	20%	7%	4%
A week	38%	9%	21%	30%	2%
More than a week	26%	10%	21%	33%	10%
A month or more	51%	21%	11%	8%	9%

Considering the applications used for the submission of tasks to an external moderator (cf. Table 5-9), Google Drive is the most frequently used application (68%) for the submissions of tasks to an external moderator. Word processors and emails were frequently used applications with 50% of the participants using these applications often or always. The least used applications were Intranets with 91% of the participants indicating that they never use Intranets while 73% of the participants never use PDFs with annotations.

Table 5-9: Applications Used to Submit Tasks for External Moderation

I use the following applications to submit portfolio tasks for external moderation					
	Never	Seldom	Sometimes	Often	Always
Google Drive	10%	7%	15%	29%	39%
Email	22%	11%	18%	35%	15%
Intranets	85%	6%	6%	2%	2%
Dropbox	55%	8%	23%	9%	6%
Word processor with tracked changes	21%	13%	16%	30%	20%
PDF with annotations	62%	13%	13%	7%	4%

Section C of the questionnaire required participants to provide information on the perceived challenges of eModeration. Participants were required to provide responses to five questions structured around the extent to which the following aspects hamper the digital moderation process: *infrastructure and resources*, the *cost* of eModeration, participants' *personal experiences* on engaging with an eModeration system, the effect of using an eModeration system on *productivity* and the *quality* of file submissions.

Considering *infrastructure and resources* (cf. Table 5-10), over 40% of the participants (based on *always* and *often*) believed that inadequate infrastructure; the speed of the Internet connection and access to relevant hardware are limiting factors which hamper the eModeration process.

Table 5-10: Infrastructure and Resources

Infrastructure and resources					
	Never	Seldom	Sometimes	Often	Always
Inadequate infrastructure e.g. network, internet access	15%	18%	25%	34%	8%
Access to relevant hardware e.g. scanners, printers	13%	23%	23%	28%	13%
Access to appropriate software tools	10%	23%	30%	25%	12%
Speed of Internet connection	10%	18%	26%	30%	16%

Considering the *cost* of the eModeration process (cf. Table 5-11), more than 60% (based on never and seldom) of the participants believed that additional hardware and software did not have to be purchased while more than 50% believed that using an eModeration system would incur additional costs in terms of security measures and Internet connectivity. It is notable that 15% of the participants believed that software with annotation tools would need to be purchased.

Table 5-11: Cost of eModeration

Cost					
	Never	Seldom	Sometimes	Often	Always
Additional hardware needs to be purchased to submit tasks for moderation e.g. scanners and storage media	36%	30%	16%	15%	3%
Additional software with annotation tools needs to be purchased	39%	28%	18%	13%	2%
Cost of an Internet connection	36%	18%	21%	16%	8%
Cost of additional security measures	23%	30%	23%	13%	10%

Considering *personal experience* (cf. Table 5-12), more than 70% of the participants were positive in terms of making the time available to learn to use a new system. Most of the participants (over 60%) do not believe that anxiety or a sense of displacement are factors hampering their use of an eModeration system.

Table 5-12: Personal Experience

Personal Experience: To what extent do the following contribute to you not engaging with a digital moderation process					
	Never	Seldom	Sometimes	Often	Always
Anxiety in using unfamiliar digital moderation technology	68%	19%	10%	3%	0%
A sense of displacement due to a lack of visual cues	56%	21%	16%	3%	3%
I do not have the time to learn to engage with a new system	70%	15%	12%	3%	0%

Considering *productivity* (cf. Table 5-13) most participants (more than 70%) disagreed that organizing and uploading digital material would be time consuming; while 51% believed that having to scan documents before uploading would be time consuming.

Table 5-13: Productivity

Productivity					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
I believe that it will be time consuming to organize digital material into categories	34%	46%	11%	7%	2%
I believe that it will be time consuming to upload digital material	39%	38%	10%	10%	3%
I believe that it will be time consuming to scan all documents before uploading portfolios	15%	16%	18%	25%	26%

Considering the *quality* of file submissions (cf. Table 5-14), more than 50% of the participants agreed that the quality of the scanned documents, differing file formats and the availability of relevant tools can hamper the eModeration process.

Table 5-14: Quality of File Submissions

Quality of file submissions					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Poor quality of scanned documents can hamper the eModeration process	8%	15%	13%	48%	16%
Differing file formats may result in files being difficult to read	3%	25%	16%	46%	10%
Availability of relevant annotation tools may make it difficult to view the assessor's and/or moderator's annotations	2%	23%	20%	46%	10%

Section D of the questionnaire posed two questions on user characteristics and the structure of the organization.

Considering *user characteristics* and *organizational structure* (cf. Table 5-15) most participants indicated that training, professional support, changes to institutional practices and colleagues being in favour of the use of an eModeration system (based on *agree* and *strongly agree*) would encourage them to submit portfolios for

moderation in a digital format. Notably, although a large number of participants supported the need for training on the use of an eModeration system (76%), most participants (80%) regarded professional support as more important.

Table 5-15: User Characteristics and Organizational Structure

Encouraging Factors: The following factors will encourage me to digitally submit portfolios for moderation					
	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
Training on the use of an eModeration system	7%	2%	16%	48%	28%
Professional support	7%	0%	13%	49%	31%
Mandatory changes to institution practices	5%	2%	16%	49%	28%
Colleagues are in favour of the use of such a system	7%	8%	21%	48%	16%

Considering *self-efficacy* (cf. Table 5-16), more than 90% of the participants were confident that they possessed the necessary skills to easily be able to access and use an eModeration system. Notably 97% (based on *agree* and *strongly agree*) were confident that they would be able to access candidates' work via an eModeration system. This finding is hardly surprising when one considers the demographics of the population for this study (cf. Table 5-4). It is noteworthy that 41% of this population (cf. Table 5-5) indicated that they have little or no experience in using an eModeration system (based on *never* and *seldom*).

Table 5-16: Perceived Self Efficacy

Perceived Self Efficacy					
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
I have the necessary skills to use an eModeration system easily	2%	2%	5%	26%	66%
I have the technical skills to access an eModeration system	2%	2%	3%	36%	57%
I feel confident that I will be able to use an eModeration system to access candidates' moderated work	0%	2%	2%	32%	65%

Section E of the questionnaire posed questions around the technology required for the tasks to be carried out. The following section describes the findings from section E of the questionnaire.

Considering *effectiveness* (cf. Table 5-17), most of the participants (over 70%) agreed that the use of an eModeration system should increase the accuracy of the moderation process. Notably 94% of the participants (based on *agree* and *strongly agree*) indicated that an eModeration system should enable moderation without the need for hard copies of portfolios of evidence. Eliminating the unnecessary use of paper is a recurrent theme in the findings from the questionnaire as well as the focus group.

Table 5-17: Effectiveness

Effectiveness: To what extent do you agree with each of the following statements on using a standard, usable eModeration system?					
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
Using an eModeration system should enhance my ability to moderate portfolio submissions	0%	0%	11%	48%	41%
Using an eModeration system should increase my accuracy when moderating portfolios	0%	3%	18%	46%	33%
An eModeration system should enable me to moderate without the need to access hard copies of portfolio tasks	0%	0%	7%	46%	48%

Considering the *availability* of an eModeration system (cf. Table 5-18), there was a large degree of agreement on when, where and how the system and the necessary information should be available with 97% of the participants (based on *agree* and *strongly agree*) indicating that an eModeration system should be available at any time and from anywhere (95%). Most of the participants (80%) also agreed that information should be available in real time.

Table 5-18: Availability

Availability					
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
I would need to access the eModeration system at any time	2%	2%	0%	42%	55%
I would need to access the eModeration system from anywhere	2%	2%	2%	37%	58%
I would need to acquire moderation information in real time	2%	7%	12%	43%	37%

Considering *efficiency* (cf. Table 5-19), more than 80% of the participants agreed that an eModeration system should generally improve the efficiency of the eModeration process as well as enhance individual productivity.

Table 5-19: Efficiency

Efficiency: The use of an eModeration system should:					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
decrease the time needed to complete the moderation process	0%	5%	10%	40%	45%
increase the output for the same amount of effort	0%	7%	13%	35%	45%
allow me to to get information about portfolios quickly and easily when I need it	0%	2%	3%	43%	52%
improve the speed at which moderation processes are completed	0%	5%	12%	32%	52%

Considering *task requirements* (cf. Table 5-20), it is notable that none of the participants disagreed on the importance and need for being able to easily download and upload portfolios, easily communicate feedback and easily maintain records for different schools. The identified requirements i.e. easily upload and download portfolios, easily communicate feedback and easily maintain records for different schools are thus vital for carrying out the eModeration process.

Table 5-20: Task Requirements

Task Requirements: An eModeration system should					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
allow me to easily upload and download student portfolios	0%	0%	2%	38%	60%
allow me to easily communicate feedback	0%	0%	2%	33%	65%
allow me to easily maintain records for different schools	0%	0%	5%	42%	53%

Considering *perceived ease of use* (cf. Table 5-21), more than 90% of the participants agreed that the interaction with the system should be clear and understandable; should not require much mental effort and that the system should be easy to use.

Table 5-21: Perceived Ease of Use

Perceived ease of use:The following factors will affect my acceptance of an eModeration system					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
My interaction with the eModeration system should be clear and understandable	0%	0%	2%	38%	60%
Interaction with the eModeration system should not require a lot of mental effort	0%	2%	8%	48%	42%
The eModeration system should be easy to use	0%	0%	2%	33%	65%

5.3.2. Quantitative Data Analysis

Of the total number of participants in the survey, two of the participants had filled in the survey in the role of cluster moderators, three as regional moderators and four as national moderators. The data obtained from the surveys was initially filtered by the role of the participant in the moderation process in the hope that more pertinent data would be obtained to answer the research questions based on the role of the respondent. The construct of *task requirements* (cf. Table 5-22 and Table 5-23) was isolated to determine if there was a difference. From the statistics obtained, it was determined that there was a marginal difference between the processes carried out by moderators as opposed to those who identified as educators as evidenced by Table 5-22 and Table 5-23. Most participants, i.e. 100% of the teachers (cf. Table 5-23) and 98% of the moderators (cf. Table 5-22) agreed that an eModeration system should allow for the easy uploading and downloading of student portfolios.

Table 5-22: Results Filtered by Moderator

An eModeration system should allow me to	easily upload and download student portfolios		easily communicate feedback		easily maintain records for different schools	
Strongly disagree	0	0%	0	0%	0	0%
Disagree	0	0%	0	0%	0	0%
Neutral	1	2%	1	2%	3	5%
Agree	23	38%	20	33%	25	42%
Strongly agree	36	60%	39	65%	32	53%

Table 5-23: Results Filtered by Teacher

An eModeration system should allow me to:	easily upload and download student portfolios		easily communicate feedback		easily maintain records for different schools	
Strongly disagree	0	0%	0	0	0	0%
Disagree	0	0%	0	0	0	0%
Neutral	0	0%	0	0	1	11%
Agree	4	44%	3	33%	4	44%
Strongly agree	5	56%	6	67%	4	44%

A possible explanation for the negligible difference in percentages between both roles could be that every educator at some point functions or carries out duties in both these roles. Since filtering the data by role reduced the sample size and there was no significant difference in the findings, the decision was made to analyse all the survey data as one sample instead. Additionally, a fewer number of people responded as moderators (14.8%) as opposed to the number who answered as teachers (83.8%). Therefore, these results don't really form a basis for comparison. Additionally, some participants (as evidenced by the numbers) did not answer this question.

As indicated in Table 5-6, 29% of submissions is entirely paper-based. The results indicate that student submissions to the teacher are to a large extent paper based (42% cf. Table 5-6) with 39% of the participants (cf. Table 5-6) indicating that student submissions are all digital. There is a difference of 10% (cf. Table 5-6) between all paper and all digital student submissions with paper submissions being the larger value. However, there is a larger difference (18%) between how teachers submit portfolios with 58% often or always submitting all portfolios digitally (cf. Table 5-7) whilst 30% often or always make paper submissions (cf. Table 5-7). A possible reason for this anomaly is that teachers are scanning in the student submissions which would account for the difference in larger paper-based submissions from students to teachers as opposed to the digital submissions from the teacher to the moderator.

A related issue of the submission of portfolios for external moderation is therefore that of scanning written documents; discussed in Section 5.3.4 which provides an analysis of the qualitative findings. Regression analysis was carried out on perceived *self-efficacy* and *ease of use* and no significant relationship could be found (cf. Appendix D; Figure D-1).

5.3.3. Findings from Qualitative Data

Qualitative data was gathered from the survey as well as the focus group interview. The following section first discusses the findings from the qualitative data gathered from the responses to the questionnaire. This discussion is followed by the qualitative findings of the data gathered from the focus group interview.

5.3.3.1. Questionnaire Findings

Section F of the questionnaire invited participants to include additional comments around the following:

- The challenges and benefits of their current moderation practices.
- The perceived challenges of an eModeration system.
- The perceived benefits of an eModeration system.
- The requirements of an eModeration system.

This section was not mandatory. Participants had therefore not articulated their views in complete sentences and had not necessarily filled in a response. The responses were imported into Atlas.ti Version 8[10]. A word cloud was generated to determine the frequency of words in the data set. Those words which appeared most frequently were then used to encode the data set.

a) Challenges of Current Moderation Practices

The responses indicate that the greatest challenge of current moderation practices is that it is time consuming to scan portfolios before uploading these documents digitally. Another factor that was mentioned frequently is the huge amounts of paper being wasted when portfolios are manually moderated. A related challenge of paper-based moderation is that of "*inconsistent record-keeping*" and the fear of losing paper-based evidence of moderation (cf. Table 5-24).

In addition to the costs of paper, printing and other consumables, additional costs are incurred when portfolios need to be couriered or posted to the moderator. This is especially the case for schools that are "*out of town*."

[10] Licence provided by UNISA

One participant indicated that pdf files are difficult as well as time-consuming to annotate.

Participants' responses to the benefits of current moderation practices were mostly positive for those who use some form of digital moderation practice. The most frequent response was that Google Drive or Google docs are used for moderation processes. These participants agreed that it is very easy and effortless to use Google Drive.

Participants also indicated that feedback is timely and that eModeration is especially convenient when the school is in a rural area. A related benefit is that eModeration cuts down on the costs of transporting or posting portfolios to an external moderator.

The most common challenge that participants highlighted, specifically with regards to eModeration was that of Internet connectivity. Connectivity comprised of two aspects i.e. the availability of the connection and the speed of the connection. A coding group (Connection) was thus created for these two aspects.

Table 5-24 illustrates the challenges that were most frequently mentioned by participants to the questionnaire. As evidenced by the data in this table, the challenges identified are: differing file formats, access to the necessary resources e.g. scanners, a knowledge of the system, versioning problems and the amount of time required for learning how to use the system as well as the time consumed in scanning the necessary documents for upload. One respondent also mentioned annotation: *"Annotation of content."* However, it is not evident if the reference was to the availability of these tools or the knowledge required to use these tools.

Although some participants indicated using a digital moderation process as evidenced by the following:

> *"I have been using an emoderation system for the past 3 years and will never go back to a paper based system again."*

Other participants answered as follows:

> *"I have only used Google Docs and am Will be honest to say I do not know what an eModeration system is."*
>
> *"I never had to submit my students' portfolio work for moderation using an eModeration system."*

A noteworthy finding is, therefore, that there is currently no dedicated eModeration system in place in.

Table 5-24: Challenges of an eModeration System

Code		Quotation
Connection Availability	Connection	*"As long as the school has a decent Internet connection, they should not have a problem uploading large documents."* *"System downtime could be a major setback for eModeration."* *"Internet down time at schools are a common occurrence."*
Connection Speed		*"Internet speeds would be the biggest challenge I think."*
File formats		*"Format of the documents might be a problem, teachers should be encouraged to save most documents in pdf format."*
Access to resources		*"Some people not having access to resources to submit files electronically. Especially handwritten exams that needs to be scanned."*
Knowledge of system		*"Becoming familiar with the system while doing all the other work."* *"Lack of teacher knowledge leading to messed up uploads and messy file structures."*
Versioning problems		*"Too many changes of one document resulting in many similar copies -tracking."*
Resistance to change		*"Not sure if everyone will be eager to learn the new system."* *"Learning a new system will be challenging for older teachers."*
No dedicated eModeration system		*"I never had to submit my students' portfolio work for moderation using an eModeration system."* *"I have only used Google Docs and am Will be honest to say I do not know what an eModeration system is."*
Time consuming		*"Making all the work available is time consuming."* *"some documents need to be scanned which can be time consuming."*
Tracking changes		*"Tracking of changes becomes tedious."* *"Too many changes of one document resulting in many similar copies -tracking."*

b) Perceived Benefits of an eModeration System

Using the data generated from QDA Miner Lite (cf. Figure 5-1 and Table 5-26), participants of the survey acknowledged that the greatest benefit of the eModeration process is that it is easier, feedback is fast, and it is much cheaper than having to courier portfolios to an external moderator. Additionally, participants indicated that the process is much faster for the moderator who does not need to sift through huge amounts of paper. Participants also mentioned using Google Drive and other Google products both to moderate as well as to upload their portfolios. All participants who indicated the use of Google Drive as the preferred method of submitting portfolios for

external moderation qualified this choice by indicating that uploading files is a very easy process.

c) The Requirements of an eModeration System

Table 5-25 summarizes the requirements for an eModeration system. The coding group *connection* is repeated in Table 5-25 because *connection* was mentioned as both a challenge of, as well as a requirement for an eModeration system. The coding group used for *connection* in Table 5-25 is thus used in the same context as discussed in section a) on the challenges of eModeration.

Table 5-25: Summarized Requirements for an eModeration System

Code		**Quotation**
Connection Availability	Connection	*“A good internet connection and a secure drop site. “* *“Internet access to load files”.*
Connection Speed		*“Fast connection speed.”*
Additional resources		*"Equipment. Good quality scanner which can handle bulk scanning.”*
Attitude		*“A positive attitude towards the use of this technology.”* *“Willingness to give it a try.”*
Availability of system		*“Being always available.”*
Annotation		*“annotation that will allow for different moderation styles.”*
Communication		*“it should make communication easier.”*
Ease of use		*“An easy to use interface with standardised organisation for files and folders.”* *“It must simplify the process not complicate it.”*
Flexibility		*“Flexibility so one can moderate one section only, or start at the back.”*
Responsiveness		*“The system needs to be responsive and not have huge amounts of latency.”*
Security		*“There should be sufficient security to ensure that the portfolios can only be seen by the school and relevant moderator.”* *“Security - papers may not leak. It may not be tampered with”*
Timely feedback		*“It should save me time. It should also give you feedback as to whether the other person is actively involved in the moderation process.”* *“prompt feedback.”*
Training		*“Training people to do it as a lot of people don't want to as they are not comfortable with the process. "* *“Training for teachers who are not comfortable with the system.”*

While *compatibility* was mentioned, the context is unclear as participants did not articulate their views in full sentences. Additionally, participants mentioned *Internet bandwidth, multiple access* and *reliability* but did not expand on these aspects.

5.3.3.2. Focus Group Findings

The focus group interview was structured around the following themes which emerged from the responses to the questionnaire:

1. Current moderation practices
2. Challenges of manual moderation
3. Challenges of eModeration
4. eModeration vs Manual moderation
5. Requirements for an efficient eModeration system

Using the outlined themes, various categories and subthemes were identified. The transcript of participants' responses was loaded into QDA Miner Lite and the various subthemes were highlighted as indicated in Figure 5-1.

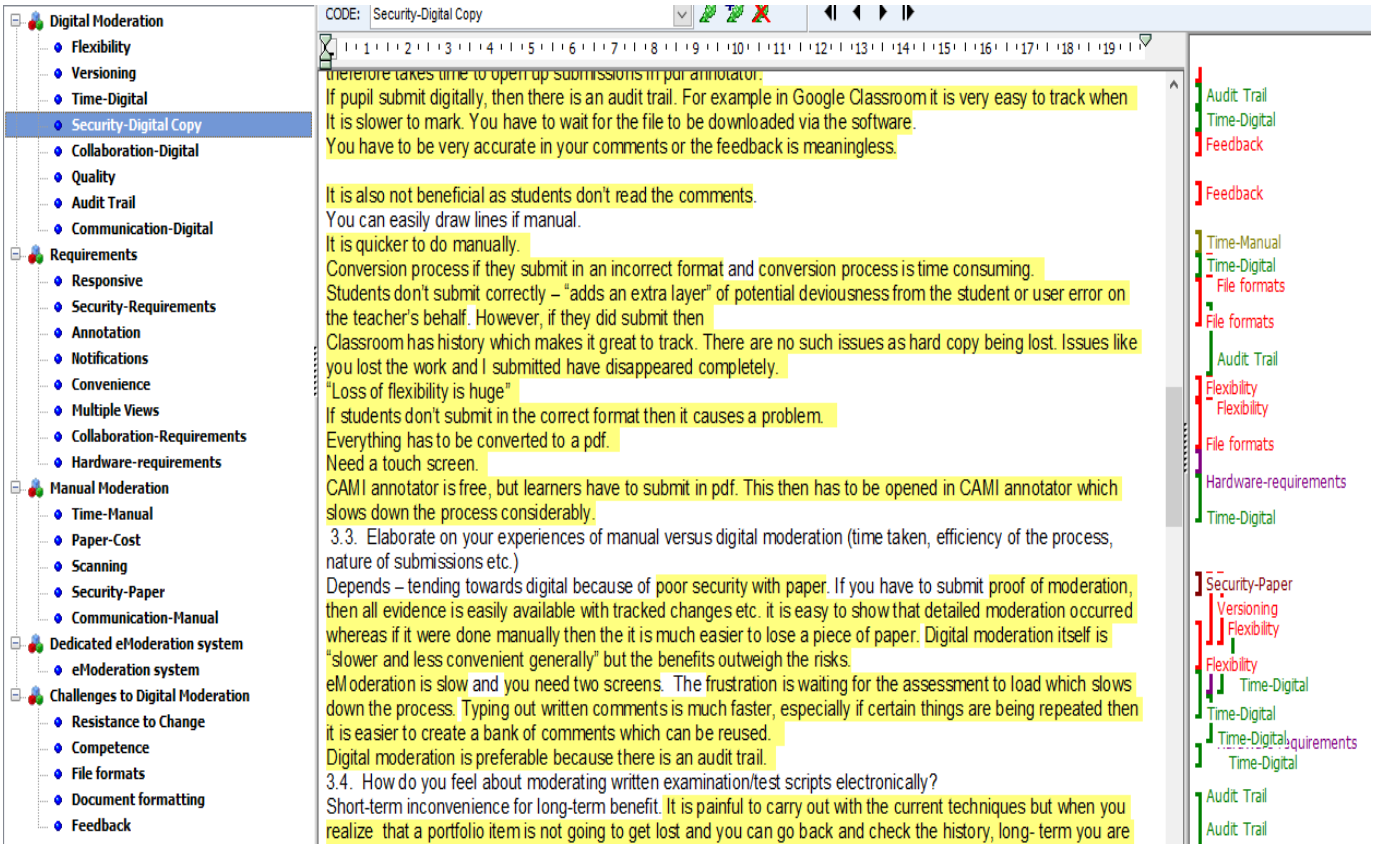


Figure 5-1: Themes Captured in QDAMinerLite

The important findings for each theme are summarized in Table 5-26.

Table 5-26: Noteworthy Data per Theme

THEME	SUMMARIZED DATA
Current moderation processes	turn-around time; more difficult to keep track of hard copies; physical waste of resources, security; slow and inflexible.
Challenges of manual moderation	easier to lose hard copies; physical waste of resources, many drafts must be done on paper.
Challenges of eModeration	resistance to change, competence, file formats, document formatting and the time taken both for the feedback process. Takes longer to download each file. Need more than one screen.
eModeration vs Manual Moderation	easier to track, view and review changes on a digital version than on hard copies; the eModeration process takes about 2 to 3 times longer than manual moderation.
Benefits of eModeration	easier to contact the moderator; it is much cheaper than having to courier portfolios to an external moderator; the process is much faster for the moderator who does not need to sift through huge amounts of paper.
Requirements for an efficient eModeration system	more than one screen; multiple views showing revision histories; easy to use and advanced annotation software; voice over to allow the moderator to leave a comment; a call button so that the moderator and assessor can communicate

5.3.4. Qualitative Data Analysis

During the focus group discussion, a recurrent theme on the submission of portfolios for external moderation was that of scanning written documents. Depending on which assessment is being sent through to the moderator the process may also be "*difficult.*" If major projects of learners are being submitted "*it is not an issue*" as submissions from learners are digital. However, participant D indicated that "*written assessments pose a problem*" as each page of each student's written documents needs to be scanned, which is time consuming. Participant C, however, was the lone dissenting voice stating (with regards to the scanning in of documents): "*I find it easy*." Participant C further indicated that after every written assessment has been completed, it is scanned and organized in folders. When the moderator calls for the documents these can then be easily uploaded. While the consensus was that the scanning of documents is an issue due to the time taken for the process, participants acknowledged that since teachers are preparing students for a written final examination, "t*he pen and paper connection*" for these assessments is important (Participant D).

While acknowledging that written assessments are important for student preparation, the issue of security pertaining to written assessments cannot be minimised. Focus group participants concurred that security is the largest challenge posed by paper-based moderation. A qualitative analysis of the data indicates that security in the context of paper-based moderation was mentioned most frequently as indicated in the frequency chart (cf. Figure 5-2).

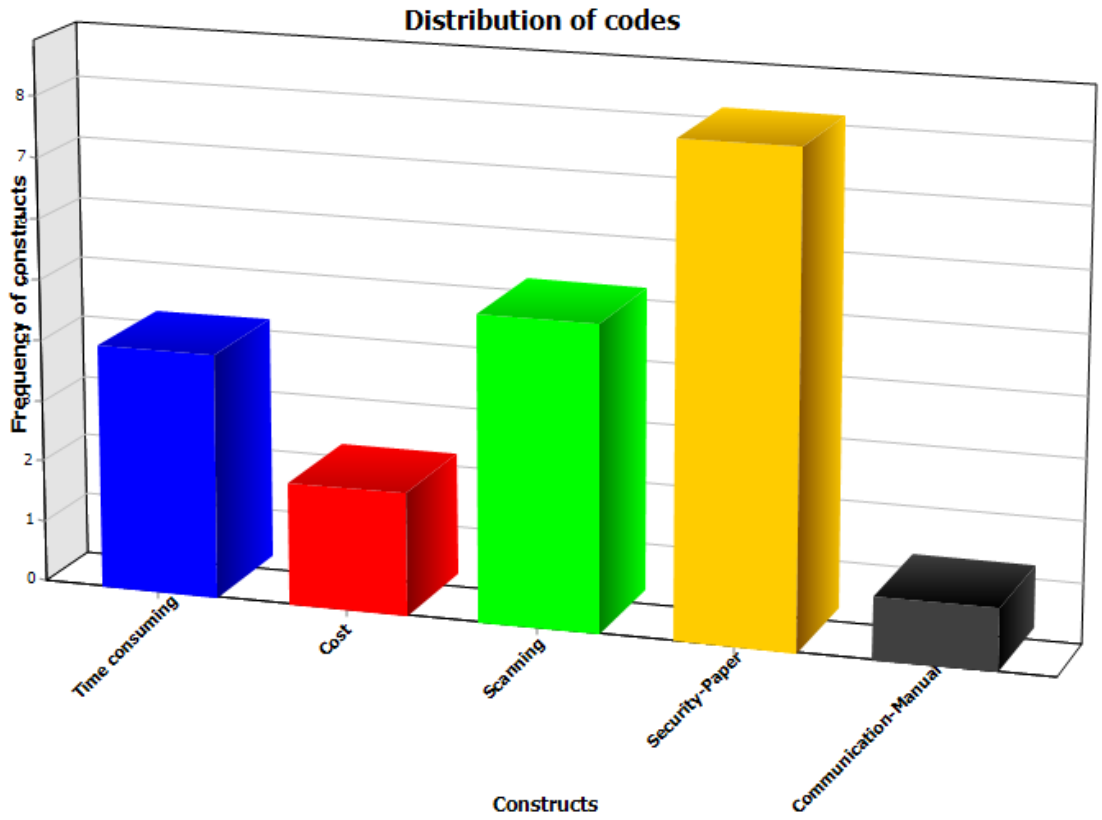


Figure 5-2: Challenges of Manual Moderation

Related challenges to that of scanning in paper documents are the cost of additional resources like scanners and other consumables, the time consumed and the impact on the environment.

5.4. Analysis: Integration of Quantitative and Qualitative Data

This section provides an integrated analysis of the data with evidence being synthesized from the literature review, the survey and the focus group interview. The research questions posed in chapter one are structured around the evidence obtained

from the literature review, the responses obtained from the survey and the responses to the focus group interview questions.

5.4.1. RQ1: What are the current processes in the moderation of the secondary school's IT and CAT SBA assessments at grade 12 level?

The first research question sought to determine what the current processes in the moderation of IT and CAT portfolios are. Research question one was decomposed into two questions to be discussed as follows:

5.4.1.1. How are portfolios (in what format) submitted for external moderation?

While 58% of the educators indicated that most portfolio submissions are done digitally, only 20% indicated that they sometimes use an eModeration system. A large percentage (68%) of the survey participants indicated the use of Google Drive for the submission of portfolios to an external moderator.

Focus group participants were invited to expand on these findings. All focus group participants agreed that there is "*no ideal eModeration system in place*." Despite participant C indicating that "*Cisco has one, but you have to be a member and it is expensive*"; there was general consensus that the participants were "*not aware of any off the market solutions*". The question of why participants believed that Google Drive was a popular application for the submission of portfolios elicited the responses: "*Collaboration and can see the version history. Everything is colour coded so you can easily see what edits were made. It is part of the documentation system that you can see all the versioning, so you don't have to add a separate section to do the version history*". Participants levelled the criticism that email "*does lead to versioning errors*". Having personally used Google Drive; it is apparent that ease of use and the convenience of ubiquitous access makes it extremely convenient to create folders which can very easily be shared.

While 58% of the participants in this study indicated that most portfolio submissions to an external moderator are done digitally and 30% indicated that all portfolio submissions are done via hard copy only, there is no evidence to suggest that the actual moderation process is extensively paper-based. This study was conducted with teachers in secondary schools. This study therefore neither confirms nor denies Van Staden's (2017) findings in the tertiary education sector that paper-based moderation

is still extensively used at academic institutes in SA. An important finding is that there is little evidence of custom designed eModeration systems.

5.4.1.2. What technologies (if any) are used for SBA portfolio moderation processes in IT and CAT?

Google Drive, word processors and emails are the most frequently used applications for the submissions of tasks to an external moderator. Focus group participants indicated that Google Drive is preferred to other applications because it allows for better collaboration. A great advantage to the use of Google Drive over emails is that it is easy to differentiate between the various versions of a document. Participants agreed that versioning errors is a common disadvantage of the use of emails. It is noteworthy that participants indicated that an eModeration system is not used and that they were not aware of any eModeration system in the secondary school environment.

5.4.2. RQ2: What are the perceived challenges and benefits of eModeration?

The second research question sought to determine what the perceived challenges and benefits of eModeration are. To this end, the constructs of *productivity, time and quality of file submissions* amongst others, were identified from the extant literature to measure the perceived challenges and benefits.

5.4.2.1. Challenges

More than 50% of survey participants agreed that the poor quality of scanned documents, differing file formats and the availability of relevant annotation tools hampers the eModeration process. These findings were further corroborated by the participants at the focus group interview. Participants indicated that when tasks are submitted for moderation "t*he moderator is opening the document in a format different from that which was sent. Different software views the document in different formats. This poses a challenge and can then cause issues with missing aspects etc*." Additionally, due to differing formats and styles, the moderator must change the layout. The "*focus then becomes about the actual formatting of the document rather than the standardization*" which could lead to "*inaccuracies and the moderator wasting time on the actual formatting of the paper*." A related issue is that "*students don't submit in the right format. It therefore takes time to open up submissions in pdf annotator*."

One of the main aspects that focus group participants highlighted was the waste of paper when printing out student tasks for external moderation. Participant C indicated that paper-based moderation "*is a physical waste of resources*" which corresponds to the findings of Van Staden et al. (2017) that digital moderation reduces the use of consumables like paper, toner, etc. Additional responses from the questionnaire indicate a high degree of frequency of statements like "*An awful lot of paper is wasted.*" The reoccurring focus by participants that there is a huge amount of paper wastage indicates the intensity of their concern as well as the prevalence of wastage of resources and the impact on the environment as evidenced by the comments "*can't teach green computing if you don't walk the talk*" and "*you have to print hard copies which I find to be costly, damaging to the environment and time consuming.*"

Van Staden (2017) further maintains that an electronic moderation system requires additional technology like scanners thus increasing the initial costs of an eModeration system. 51% of the participants concur with this assertion and further extend these findings. More than half of the participants indicated that utilizing an eModeration system incurs the additional cost of an Internet connection (67%) and additional security measures (70%). It can therefore be concluded that the majority of educators believe that security is a critical factor. Additionally, the belief that additional costs would be incurred for an Internet connection indicates the extent to which educators believe that a good Internet connection is invaluable and a necessity in the eModeration process.

The ICT infrastructure necessary to develop digital portfolios has been identified as a particular challenge of eModeration systems by Greatorex (2004) and Fatimah et al. (2007). A good computer network capable of high-speed uploading and downloading of projects is essential as any instability in the network can create challenges for the uploading of projects. Additionally, Lynch (2014) stresses the importance of having appropriate access to the schools' network systems. Over 60% of the survey participants believe that inadequate infrastructure; the speed of the Internet connection and access to relevant hardware are limiting factors which hamper the eModeration process. These findings are further corroborated by the focus group interviewees who also pointed out that the Internet connection hampers the process by slowing down the downloading of files as evidenced by participant B's response: "*the frustration is waiting for the assessment to load which slows down the process*."

Greatorex (2004) asserts that making comparative judgements of students' work and the ability to make a holistic judgement of individual student's work is a critical aspect of the moderating process. Greatorex (2004) has further identified technological limitations as a factor that could hamper the implementation of eModeration systems. Focus group participants concur with this finding, indicating: "*At this stage technology is failing the process.*" Although all participants are from private schools, the assumption that all schools are equally resourced cannot be made with any measure of certainty. Hence, the available resources at individual schools play a significant role in the efficacy of the eModeration process. It would therefore be a reasonable assumption that the lack of adequate resources could be a serious limiting factor in the digital moderation process.

Participants A and B stated that "*Having to highlight on a pdf or add a comment box to annotate a pdf requires the person moderating to be trained on the technology."* Additionally, participant C indicated that "*A challenge is that people are resistant to being trained on a new technology.*" These statements confirm the findings of Adie (2011), AlphaPlus (2014) and ABC-Awards (2014) that an assessor's approach to the online standardization process may be hampered by discomfort with the use of the technology and the additional skills necessary to interact with an eModeration system.

Furthermore, Lynch (2014) stressed the importance of teachers involved in eModeration being confident in the use of the technology and having confidence in the processes involved. Contrary to these literature findings and the comments made by participants at the focus group interview; the survey participants were largely positive about making the necessary time available to learn to use a new system and largely disagreed that anxiety or a sense of displacement were factors hampering their use of an eModeration system. Whereas the literature reviewed generalized the challenges to all categories of educators, the survey and focus group in this study specifically isolated IT and CAT educators. I therefore believe that a huge factor in this apparent contradiction between the findings of this study and the literature reviewed is that the participants are all IT and CAT teachers whose professions require a certain measure of prowess in the use of digital resources. It is therefore not surprising that these individuals would either be proficient or would possess the necessary motivation to learn how to use unfamiliar technology.

5.4.2.2. Benefits

Participants of the focus group as well the survey highlighted the following benefits of eModeration:

- All evidence of moderation is easily available with tracked changes. It is therefore easy to show that detailed moderation occurred whereas if it were done manually, then it is much easier to lose a piece of paper.
- Typing out written comments is much faster, especially if certain things are being repeated. It is easier to create a bank of comments which can be reused.
- Quality is better using digital moderation.
- eModeration eliminates the possibility of mistakes occurring as digital moderation does not require the 2-step process of indicating on paper that something must be changed and then going to the computer and making those changes. With eModeration it is easy to determine if the change has been made. On the other hand, some changes are simply not made with paper-based moderation and there is no reliable way of ensuring that errors do not occur.
- Timely feedback as indicated by a participant: "*As we are in the rural parts of the country eModeration has made a huge difference in getting timely feedback especially with the poor postal service in our area*."

The benefits of eModeration are directly related to the disadvantages of paper-based moderation. It is therefore necessary to consider the benefits in terms of the disadvantages of paper-based moderation which is summarized in the following discussion.

Focus group participants highlighted three problems of paper-based moderation. Firstly, paper-based moderation was regarded as being inefficient. Secondly, it was regarded as a waste of resources as participant C indicated: "*It is a physical waste of resources*." The third aspect is that of the security of written assessments. AlphaPlus (2014) and Van Staden (2010; 2017) assert that the online moderation process limits the loss of moderation reports and marked scripts which are conventionally posted or couriered. Participants concurred with AlphaPlus (2014); Van Staden (2010) and Van Staden et al. (2017) indicating that physical copies can easily be misplaced leading to security issues around the confidentiality of the assessment. Additionally, if one

misplaces a learner's work then there is no evidence of submission which creates the added problem of the reliability of the assessment. The entire purpose of moderation is the quality assurance of assessment standards. Such a task would not be possible if one cannot provide proof of the assessment.

An additional challenge of paper-based moderation is the turnaround time required. The document must be submitted to the moderator. One must then wait for feedback. Many drafts must be done which involves having to rewrite information. eModeration, on the other hand, reduces the "*time of couriering moderation documents and having to wait for the results to be delivered. With digital moderation, as soon as the submit button is clicked, all parties concerned receive notification*." Additionally, the possibility of creating a "*comment bank*" and reusing these comments cuts down the amount of work and is more time efficient.

Contrary to the assertion that electronic development and storage of evidence results in greater flexibility, convenience and accessibility (ABC-Awards, 2014), participant A indicated that the "*loss of flexibility is huge with digital moderation*." However, upon further interrogation, it was determined that this view was being opined on current moderation practices as evidenced by the statement "*the way in which it is currently being done is slow and inflexible*." This result is not surprising given that there is no standard, usable dedicated eModeration system in place.

5.4.3. RQ3: What are the perceived requirements for an eModeration system?

Based on the results from the survey and focus group interview, the most important requirements for an eModeration system can be summarized as the need for multiple views, easy to use annotation tools, effective communication, security, availability and flexibility.

Johnson and Greatorex (2008) contend that judgements are impaired when moderators must scroll up and down and manage different pages in documents. Searching through different portfolio pieces of the same candidate presents difficulties with searching through more than one piece of evidence at the same time. Moderators also experienced difficulties when trying to view and compare more than one candidate's work as well as viewing the marking grid simultaneously. Responses from the focus group interview strongly confirms the above findings with interviewees

mentioning multiple views and having "*more than one screen*" so that "*all relevant documents can be viewed side by side*" with great frequency as shown by the frequency of hardware requirements and multiple views in Figure 5-3.

Additionally, participants indicated that "*these views should also show revision histories*" and that it would be useful to have "*one document with all changes made right from the first version*."

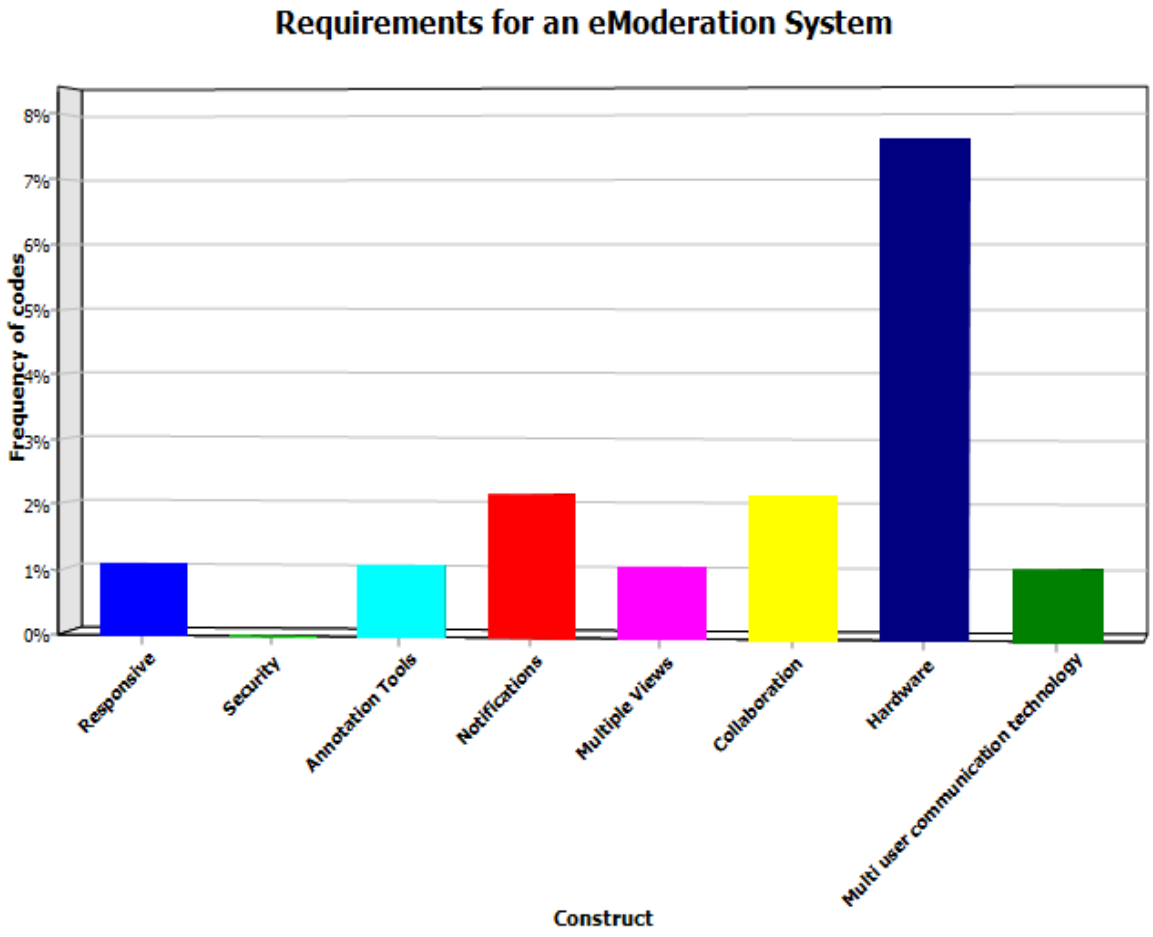


Figure 5-3: Requirements for an eModeration System

Several studies, notably that of Adie (2011) and Greatorex (2004), indicate that an annotation tool is invaluable in developing a shared perspective of standards when moderation is done digitally. These tools are used to focus attention on the annotated evidence of the accomplishment of a particular standard (Adie, 2011). Additionally, Johnson and Greatorex (2008) indicate that annotation practices using computing technology could be hampered by the limited accessibility of tools. The process thus becomes less reliable and increases the cognitive demands made on the educator.

Consistent with these findings, the focus group participants indicated that an eModeration system should include "*top tier*" annotation software which should be easy to use. This sentiment is echoed by responses to the questionnaire. For instance, one respondent indicated that "*Annotation has to be quick and simple to use.*" Participant A further elaborated by indicating that "*there has to be an improvement from a handwriting point of view*."

Data from the focus group interview as well as the survey confirms Van Staden's (2010) findings that moderators prefer to use an eModeration system rather than a paper-based system. For instance, participant A indicated that he is "*tending towards digital because of poor security with paper*" while participant B indicated that "*digital moderation is preferable because there is an audit trail*" and a survey respondent stated, "*I prefer sending a digital portfolio for moderation that (sic) making endless copies for each student file*." Additionally, participant A believed that digital moderation itself is "*slower and less convenient generally*" but the benefits outweigh the risks.

Berger (2011) and Van Staden (2017) identify security as an important requirement, with each user having his or her own space together with email and discussion facilities. The privacy and confidentiality of each school's work must be guaranteed, while all access to a student's private space should be denied. This theme recurs in the data extracted from the survey. Of the 51 people who provided additional comments to the questions on benefits of an eModeration system and the requirements for an eModeration system, 19.92% of the participants made specific mention of security. The statements "*Security - papers may not leak. It may not be tampered with*" and "*Security for the documents using a per session key of suitable length that changes for each session*" are representative of statements made by these participants.

Contrary to the results from the literature reviewed and the responses from the survey, and despite security being a recurrent theme during the discussion on manual versus digital moderation (which led to the categorization of security as a requirement), it was surprising that security was not overtly mentioned when participants of the focus group were specifically asked to elaborate on the requirements for an eModeration system as indicated by the frequency chart in Figure 5-3.

A possible explanation for this contradiction is that while security is a huge issue from the organization's perspective; from the participant's perspective security is not necessarily an issue that directly impacts her use of the system. It seems reasonable therefore to conclude that users would focus on aspects that affect them directly as evidenced by the frequency of hardware requirements in Figure 5-3. This evidence supports the theories of Venkatesh and Davis (2000), Goodhue (1998), Dishaw and Strong (1999) which were discussed in Section 3.3. (cf. Chapter 3) and form the theoretical basis for this study. The fit between the human and technology aspects of these theories are summarized in Table 5-27.

Additionally, a statistical analysis of the data (cf. Appendix D) indicates a moderate relationship between task requirements and ease of use and efficiency and ease of use which supports the assumption that users would perceive ease of use as an important factor in the requirements for an eModeration system.

Table 5-27: Summarized Theoretical Models

MODEL	FIT BETWEEN HUMAN AND TECHNOLOGY
TAM	Venkatesh and Davis (2000) maintain that users will not readily accept a system, irrespective of how efficient the system is, if they cannot immediately identify tangible benefits in their job performance as a direct result of utilizing the system.
TTF	Goodhue (1998) contends that an IT system will be used if, and only if, the functionality available supports or fits the activities of the user. Any system not offering sufficient support will therefore, by extension, not be utilized.
Integrated TAM and TTF	Dishaw and Strong (1999) recommend a combined model incorporating beliefs of IT and the fit between technology and task characteristics. The integrated model (cf. Figure 3-3) suggests that users' beliefs regarding the usefulness and ease of use of technology are affected by both technology and task characteristics, their resulting fit and the users' experience thereof.
TOE	The TOE framework is an integrated framework which considers "technological, environmental and organizational factors influencing ICT adoption" (Ramdani et al., 2013, p.737). It offers a complete, guiding theoretical basis for ICT adoption.
HOT-Fit	Technology acceptance has three facets i.e. the user, the technologies and the organizational contexts which cumulatively affect the net benefits of using an IS. The human and organizational factors are as important in system effectiveness as technical issues are. Thus, human, organizational and technical elements should have a mutual alignment to ensure successful implementation (Yusof et al., 2008).

The focus of the requirements for an eModeration system therefore seems to be on the convenience and flexibility of use rather than on those aspects which are essential. However, participants not overtly mentioning security as a requirement does not in any way detract from security being a critical requirement in the context of this study. During the initial selection of constructs from the technology acceptance models under consideration, security was one of the constructs that was recognized as being a critical component. Despite none of the questions of the questionnaire or the focus group being structured around security, the lack of security within the context of paper-based moderation was repeatedly discussed. It can therefore be concluded that security is an essential requirement for an eModeration system.

Additional requirements, which were not evident in the literature reviewed were phrased as follows by focus group participants:

- *"Should allow for a voice over so that it is easy for the moderator to leave a comment."*
- *"Have a call button for both the assessor and the moderator to "meet" instead of back and forth communication i.e. multi-user communication technology."*

In conclusion: the most important requirements for an eModeration system are that the system should: be "*super responsive*"; have "*top-tier annotation tools*"; have multiple views showing revision histories; be flexible and easy to use; enable the moderator to provide a "*voice*" comment and include multi-user communication technology.

5.4.4. RQ 4: How can the perceived challenges and benefits translate into requirements for an eModeration system to be employed for the moderation of grade 12 IT and CAT portfolio tasks?

In determining the criteria to be used for the requirements for an efficient eModeration system, the broad categories of User Requirements (UR); Task Requirements (TR) and System Requirements (SR) were identified as a basis to provide a structure for further discussion (cf. Figure 5-4).

Based on the findings and the experience of the participants, it was deemed more useful to replace the original dimension of *attitude* by *self-efficacy* as a construct. *Accuracy* was replaced by *audit trail* as this was the context in which participants

viewed the accurate keeping of records. An *audit trail* was mentioned at a frequency of 12.1% at the focus group interview. Although *ease of learning* and *confidence* were specifically mentioned as challenges in the literature reviewed, the demographic information provided by participants indicated a sample of skilled users, experienced in the use of technological resources (cf. Table 5-4). *Confidence* was therefore removed, and *self-efficacy* was retained and assumed to encompass *confidence*. Additionally, the survey results indicate that 70% of the participants believed that they do have the capacity to learn to use a new system. *Ease of learning* was thus removed.

The categorization of *flexibility* was based on the notion of the system being able to support as many different file formats as possible. Not only is it necessary to support paperless work, but other formats as well, for instance videos are file formats that should also be supported (Berger, 2011).

In determining the final dimensions, based on the findings and the context in which participants described different constructs, *productivity* and *work volume* were merged into one variable (*Productivity*) as the amount of work being completed indicates the level of productivity. *Job effects* and *time consumed* were merged into *Time* as the amount of time spent on a task has an effect on the completion of the task.

When initially devising the survey instrument, core critical technological characteristics and constructs that were not context specific were identified and left out of the survey because their inclusion needed no confirmation. After the analysis, the critical technological constructs were added to the Final Requirements table (cf. Table 5-28). External communication and communication were omitted from the initial analysis (cf. Table 3-2) due to the context specific manner in which they were defined in the extant literature. However, three context specific items (voice over button, multi-user communication technology and notifications) arising from the focus group interview were later included in the requirements table (cf. Table 6-2).

The identified dimensions (cf. Table 5-28) were then analysed further. If the item was present in 2 or more streams of evidence (literature review, focus group or survey); or if it is a core, critical construct or was statistically significant (frequency>50% for quantitative data or frequency>3 for qualitative data) then it was included in the final requirements using the formula: =OR(E3=$N$12;F3=$N$12;G3=$N$12). The formula was modified for the three additional rows to include the items which participants at

the focus group interview specifically identified as necessary requirements for an efficient eModeration system.

The values under the “Include in final requirements” column were then used to determine which criteria to use in the drawing up of the final requirements (cf. Table 5-28). These criteria were further categorised under UR, SR or TR. As indicated in Table 5-28, there was some overlap. For instance, file formats was categorised as both SR and TR. Hence, the overlap between UR and TR and the overlap between TR and SR. Additionally, user characteristics inform UR therefore it was deemed necessary to include a separate dimension for user characteristics.

The extrapolated constructs indicated in Figure 5-4 indicate the requisite items for the requirements of an efficient eModeration system.

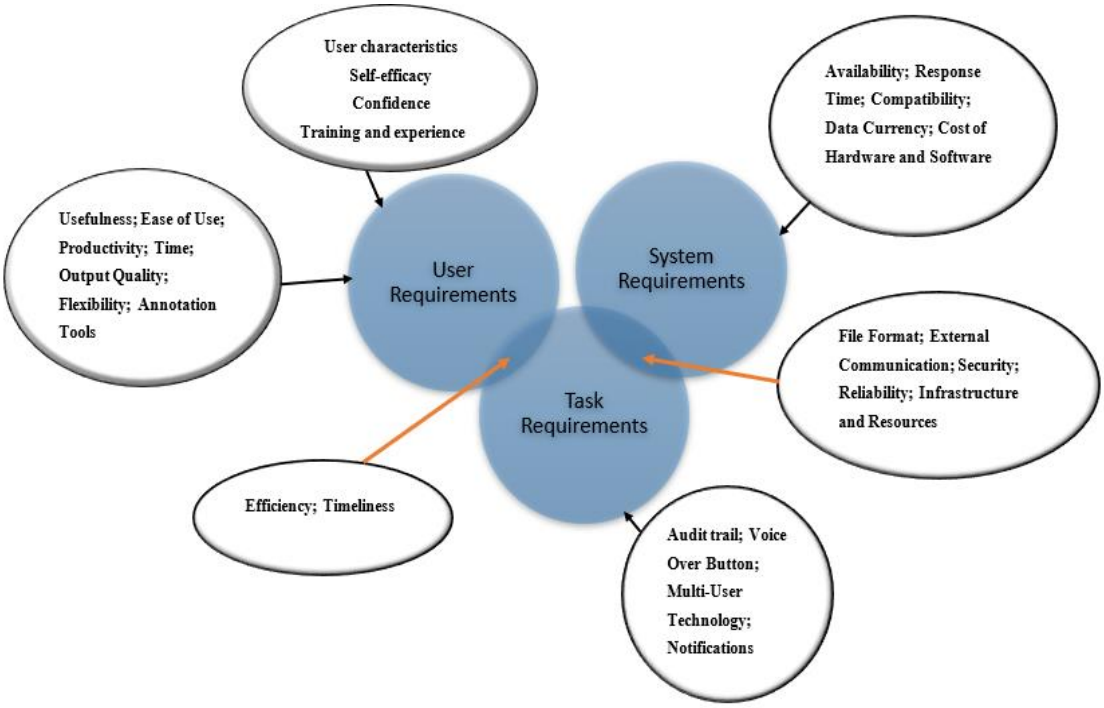


Figure 5-4: Conceptual Model – Requirements for an eModeration System

Table 5-28: Final Requirements

	STREAMS OF EVIDENCE			INCLUSION / EXCLUSION CRITERIA						CONSTRUCT		
Dimension	Literature	Survey	Focus Group	TWO OR MORE STREAMS OF EVIDENCE?	Statistical significance >= 50	Frequency >= 3	Core critical system requirement	Specific to eModeration Context	Include in final requirements?	User Requirements (UR)	System Requirements (SR)	Task Requirements (TR)
Ease of Use	✓	✓	✓	✓	✓				TRUE	✓		
Ease of learning	✓			☒					FALSE	✓		
Availability	✓	✓	✓	✓	✓		✓		TRUE		✓	
Response time	✓	✓	✓	✓	✓		✓		TRUE		✓	
Compatibility	✓	✓	✓	✓	✓		✓		TRUE		✓	
Usefulness	✓	✓	✓	✓	✓				TRUE	✓		
File Format	✓	✓	✓	✓	✓	✓	✓		TRUE		✓	✓
Self-efficacy	✓	✓	✓	✓	✓				TRUE	✓		
Training and experience	✓	✓	✓	✓	✓				TRUE	✓		
External communication	✓	✓	✓	✓	✓	✓	✓		TRUE		✓	✓
Task Performance	✓	✓	✓	✓	✓		✓		TRUE			✓
Productivity	✓	✓	✓	✓	✓				TRUE	✓		
Work volume	✓	✓		✓					TRUE	✓		
Job effects	✓	✓	✓	✓	✓	✓			TRUE	✓		
Time consumed	✓	✓	✓	✓	✓	✓			TRUE	✓		
Confidence	✓	✓	✓	✓	✓				TRUE	✓		
Security	✓		✓	✓		✓	✓		TRUE		✓	✓

	STREAMS OF EVIDENCE			INCLUSION / EXCLUSION CRITERIA						CONSTRUCT		
Dimension	Literature	Survey	Focus Group	TWO OR MORE STREAMS OF EVIDENCE?	Statistical significance >= 50	Frequency >= 3	Core critical system requirement	Specific to eModeration Context	Include in requirements?	User Requirements (UR)	System Requirements (SR)	Task Requirements (TR)
Reliability	✓			☒			✓		TRUE		✓	✓
Data accuracy	✓		✓	✓	✓		✓		TRUE			✓
Data currency	✓	✓		✓	✓		✓		TRUE		✓	
Ouput Quality	✓	✓		✓	✓		✓		TRUE	✓		
Efficiency	✓	✓	✓	✓	✓		✓		TRUE	✓		✓
Timeliness	✓	✓		✓	✓		✓		TRUE	✓		✓
Audit trail	✓			☒		✓			TRUE			✓
Infrastructure and resources	✓	✓	✓	✓	✓	✓			TRUE		✓	✓
Cost of hardware and software	✓	✓	✓	✓	✓	✓			TRUE		✓	
Reluctance to change	✓		✓	✓		✓			TRUE	✓		
Quality of file submissions	✓	✓	✓	✓					TRUE	✓		
Anxiety	✓	✓		✓					TRUE	✓		
Voice over button			✓	☒				✓	TRUE			✓
Multi-user communication technology			✓	☒				✓	TRUE			✓
Notifications			✓	☒				✓	TRUE			✓
Flexibility	✓		✓	✓		✓	✓		TRUE	✓		
Annotation software	✓	✓	✓	✓		✓		✓	TRUE			

5.5. Conclusion

This chapter reported the findings from the survey and the focus group interview. The findings were analysed based on the responses and the existing literature. An important finding in this chapter is that there are no “dedicated” eModeration systems currently in use in the secondary school environment for the moderation of IT and CAT SBA portfolio tasks as evidenced by the comments of the focus group interviewees. Participants expressed their views on a manual vs digital moderation system and all participants (100%) agreed that they would choose to use an eModeration system. The most important requirements elicited are: security, easy to use annotation tools, multiple views, notifications, adequate infrastructure and an efficient, easy to use system. Additional requirements gleaned from the focus group interview, which the prevailing literature does not include, are: a voice over facility for the moderator to leave a comment and multi-user communication technology. The following chapter discusses the key contributions, limitations and future studies.

Chapter 6

Conclusions and Contributions

6.1. Introduction

The purpose of this chapter is to summarize and explain the key findings of this study by considering how the research questions posed in chapter one were addressed. The purpose of this study was to interrogate current moderation processes, the perceived challenges and benefits of eModeration and the requirements for an eModeration system to inform requirements for an efficient eModeration system.

The first objective, as presented in Chapter one (cf. section 1.2.2) was to review the existing literature on the current practices followed in the digital moderation of SBA portfolio tasks in the secondary school environment. The second objective was to review and interrogate the extant literature on the challenges and benefits of eModeration. The third objective was to review and interrogate the extant literature on the technologies used for the moderation of portfolios. The fourth objective was to investigate technology acceptance models with a view to developing requirements for an efficient eModeration system. The last objective was to investigate the current moderation practices and the perceived challenges and benefits of eModeration to inform the development of requirements for an efficient eModeration system.

6.2. Research Overview

The rationale for this study was that despite the growing importance of digitization in all aspects of teaching and learning, no evidence-based requirements could be found for the development of a digital moderation system for IT and CAT portfolio tasks in the secondary school environment. The literature review consisted of two distinct components. The first part explored the purpose of moderation, the processes and methods employed in moderation, and the nature of eModeration with particular emphasis on the challenges, benefits and requirements thereof. The second portion

of the literature review explored how key characteristics of technology acceptance models relate to an eModeration system.

This study specifically investigated how IT and CAT teachers undertake moderation processes. The literature review highlighted the challenges and benefits of an eModeration system and recognized certain crucial requirements specifically with regards to how ICTs could enhance the process. The challenges, benefits and requirements identified from the extant literature combined with the technology adoption constructs relevant to eModeration formed the basis for the structure of the survey and the focus group interview that was conducted.

Based on the background and rationale for this study, the problem statement identified in chapter one was: *Within the South African secondary school environment there are no evidence-based requirements for developing a digital moderation system to efficiently manage the moderation of IT and CAT SBA tasks at grade 12* (cf. section 1.2).

The overarching research question was formulated as: *What are the requirements for an efficient eModeration system for IT and CAT SBA assessments at grade 12 level in SA?* (cf. section 1.2.1). The following section presents each sub-research question and provides evidence of where each question was addressed. A brief description of the findings is also presented.

6.3. How the Research Questions were Answered

Table 6-1 depicts the research activity used to explore each research question and the most important research outcome(s) for each research question.

Table 6-1: Research Outcomes

Research Question	Research Activity	Research Outcome	Section
1. What are the current processes in the moderation of the secondary school's IT and CAT SBA assessments at grade 12 level?	Literature review Survey Focus group	Questionnaire items based on the requirements identified.	Appendix C-1 Section 5.3.3.1 Section 5.3.3.2
1.1. How are portfolios (in what format) submitted for external moderation?	Survey Focus group	Questionnaire items based on the literature review.	Section 5.4.1.1
1.2. What technologies (if any) are used for SBA portfolio moderation processes in IT and CAT?	Survey Focus group	Questionnaire items **Significant Finding:** there is no dedicated eModeration system in place.	Section 5.4.1.2
2. What are the perceived challenges and benefits of eModeration?	Literature review Survey Focus group	Questionnaire items	Sections: 2.5; 2.6; 5.4.2.1; 5.4.2.2
3. What are the perceived requirements for an eModeration system?	Literature review Findings and data analysis	Requirements cf. Table 5-28:	Section 2.7 Section 5.3.3
4. How can the perceived challenges and benefits translate into requirements for an eModeration system to be employed for the moderation of grade 12 IT and CAT portfolio tasks?	Findings and data analysis	Conceptual model of eModeration requirements	Section 5.4.4 Figure 5-4

6.4. Reflection on the Key Findings

6.4.1. Current Moderation Processes

Currently more than half of the IT and CAT teachers (63%) submit portfolios to an external moderator digitally whilst 45% make solely paper submissions (cf. Table 5-7). Written assessments are scanned and saved in folders which can then be easily uploaded when a moderator requires them. Most teachers either use Google Drive or emails for the submission and/or the moderation of portfolios. The most important finding is that there is no *dedicated* eModeration system currently in use.

6.4.2. Challenges of eModeration

The main challenges hampering the eModeration process can be grouped under the following themes: differing file formats, the poor quality of scanned documents, the availability and cost of additional resources, infrastructure, technological limitations, skills necessary and the availability of relevant annotation tools. These challenges are now explained in more detail.

Due to differing formats and styles, the moderator must change the layout of the document which could lead to inaccuracies as well as wasting time on the formatting of the paper. Additionally, when students do not submit in the correct file format; it takes up valuable time opening submissions using the correct software. A related challenge is that of poor-quality, scanned documents. There is a need for the moderator to convert to a more readable format. The issue of having to scan in documents presents and links to the other challenges namely cost, need for additional resources, skills necessary and resistance to change.

To enable the scanning in of portfolio tasks, electronic moderation systems also require additional technology like scanners thus increasing the initial costs of an eModeration system (ABC-Awards, 2014; Van Staden et al., 2017). Other costs that are also incurred arise from the need for an Internet connection and additional security measures.

The ICT infrastructure necessary to develop digital portfolios, inadequate access to the schools' network systems and not having a good computer network capable of

high-speed uploading and downloading of projects can create challenges for the uploading of projects (Fatimah et al., 2007; Greatorex, 2004; Lynch, 2014). Technological limitations is therefore a factor hampering the implementation of eModeration systems (Greatorex, 2004).

Teachers' confidence in the use of the technology involved in eModeration is also a challenge (Lynch, 2014). The additional skills necessary to interact with an eModeration system and discomfort in the use of technology may hamper an assessor's approach to the online standardization process.

A related factor is the availability of, and the skills necessary to annotate digital submissions. Annotation practices using computing technology could be hampered by the limited accessibility of tools. The process thus becomes less reliable and increases the cognitive demands made on the educator (Johnson and Greatorex; 2008).

A lack of adequate resources is a serious limiting factor in digital moderation. These resources could be in the form of hardware or the requisite software. A recurring hardware related factor that was mentioned at the focus group interview was that of the need for multiple screens, which is echoed in the literature reviewed. According to Johnson and Greatorex (2008), judgements are impaired when moderators must scroll up and down and manage different pages in documents. Searching through different portfolio pieces of the same candidate presents difficulties with searching through more than one piece of evidence at the same time.

Based on the findings of this study, these and other challenges are prioritized and summarized under the headings of environment, user and system in Figure 6-1.

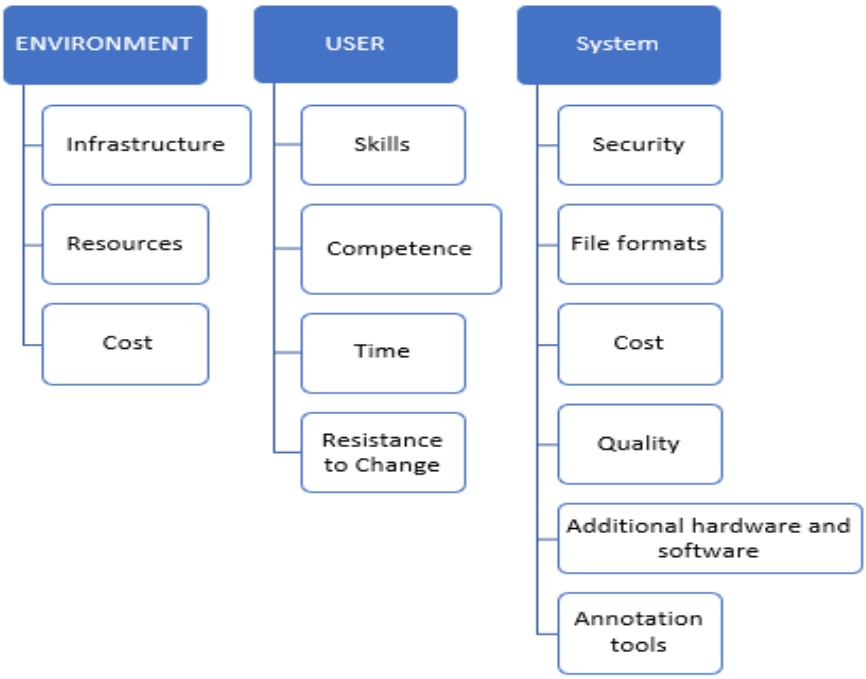


Figure 6-1: Challenges of eModeration

6.4.3. Benefits of eModeration

With digital moderation, as soon as the submit button is clicked, all parties concerned receive notification that the files have been uploaded. Thus, neither moderators nor assessors need to waste any time. Additionally, the possibility of creating a comment bank and reusing these comments cuts down the amount of work and is more time efficient. Digital moderation provides the added benefit of reducing the use of consumables like paper, toner, etc. Additional benefits are:

- All evidence of proof of moderation is easily available with tracked changes.
- Typing out written comments is much faster, especially if certain things are being repeated. It is easier to create a bank of comments which can be reused.
- Quality is better using digital moderation.
- eModeration eliminates the possibility of mistakes occurring. With eModeration it is easy to determine if the change has been made. On the other hand, some changes are simply not made with paper-based moderation and there is no reliable way of ensuring that errors do not occur.

A prioritized list of the most important benefits of an eModeration system is summarized under the headings of environment, user and system in Figure 6-2:

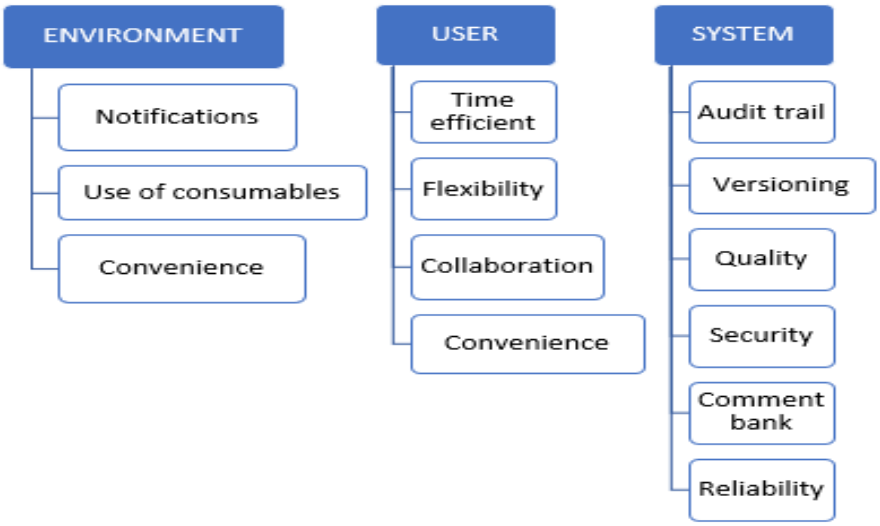


Figure 6-2: Benefits of eModeration

6.4.4. Perceived Requirements for an eModeration System

Current literature indicates that an annotation tool is invaluable in developing a shared perspective of standards when moderation is done digitally. These tools are used to focus attention on the annotated evidence of the accomplishment of a particular standard (Adie, 2011; Greatorex, 2004). In addition to the core critical requirements of a functional system, the most important requirements for an eModeration system, based on the data gathered from the survey and focus group, are that the system should be responsive; have annotation tools; provide multiple views showing revision histories; be flexible and easy to use; enable the moderator to provide verbal comments and include multi-user communication technology as illustrated in Table 6-2.

Table 6-2: Requirements for an eModeration System

Category	Requirement	Explanation
ENVIRONMENT	Adequate hardware	Multiple screens, good quality scanners which can handle bulk scanning and printers are necessary.
	Adequate software	Availability of easy to use and advanced annotation tools.
	Adequate infrastructure	A stable computer network capable of high speed uploading and downloading of projects is essential as instability can create challenges for eModeration.
	Availability	The availability of the internet connection is important to users as downtime could be a major setback for eModeration.
	Compatibility	The system should be able to support different file formats.
USER	Flexibility	Users should be able to move back and forth and moderate documents in any order.
	Ease of use	Easy to use system to simplify the moderation process.
SYSTEM REQUIREMENTS	Notifications	All parties should receive notifications when tasks are submitted for moderation and when the moderation has been completed.
	Responsive	The system should allow for timeous feedback.
	Security	Privacy and confidentiality of each student's and school's work must be ensured.
	Annotation tools	Annotation tools provide a shared perspective of standards.
	Multiple views	Necessary to view and manage different pages of each student's assessments.
	Collaboration tools	The system should allow assessors and moderators to collaborate.
	Reliability	All documents should be securely stored and easily retrieved when required.
	Audit trail	It is necessary to have a revision history so that changes can be tracked.
	Timeliness	An eModeration system should allow for timely feedback.
	Voice over button	A button should be provided to allow the moderator to leave a comment.
	Convenience	The eModeration system should allow the user to access the system at any time and from anywhere.
	Multi-user communication technology	A call button so that the moderator and assessor can communicate.

The findings of the literature review, the focus group interview and the online survey were triangulated to determine the dimensions that are essential to an efficient eModeration system. These dimensions were represented in Table 5-28. Each dimension was further classified into the categories of User Requirements, Task Requirements and System Requirements (cf. Figure 5-4).

6.5. Contextualization of the Findings

The HOT-Fit model formed the basis for the development of the conceptual model presented in Figure 5-4. The HOT-Fit model could therefore possibly be adapted for the context of an eModeration system. However, more research will need to be done to contextualize the HOT-Fit model specifically for the eModeration context.

The most significant finding of this study is that there is no dedicated eModeration system currently in place in the secondary school environment. This study therefore presents a unique perspective from existing studies framed around technology adoption models in that the requirements presented have been derived solely from participants' experiences of the challenges and the benefits arising from current moderation practices.

During this study, additional research (depicted in Table 6-3) was conducted to determine if new studies pertaining to the eModeration context have been conducted and/or new findings have emerged specifically in the use of post-adoption models in a pre-adoption context. As evidenced by the summary in Table 6-3, none of the recent studies (conducted in 2018 and 2019) have added any pertinent information either to the eModeration context or to the requirements for a pre-adoption system as reported in this study.

Table 6-3: Concurrent Research

Study Title	Research Focus	Findings/Similarity to Current Study	Study Context
Using Google Docs to Enhance the Teacher Work Sample: Building e-Portfolios for Learning and Practice (Gugino, 2018)	The compiling of online digital portfolios.	Instantaneous feedback, Portability, Cost-effective, Collaboration.	Tertiary institution.

Study Title	Research Focus	Findings/Similarity to Current Study	Study Context
Challenges and supports towards the integration of ePortfolios in education. Lessons to be learned from Ireland (Poole et al., 2018)	Exploring the opportunities and challenges of integrating ePortfolios in Irish post-primary education.	Requires adequate teaching resources, stable infrastructure, internet access, teacher skills, confidence, hardware and software resources, availability.	Primary school education. Specific to the Irish context.
Examining the effects of social influence in pre-adoption phase and initial post-adoption phase in the healthcare context (Lu, Cui, Tong, & Wang, 2019)	Pre and post adoption user acceptance of a healthcare system.	Resistance to change, rewards, sanctions and informational influence affect physicians' acceptance in the pre-adoption phase of a healthcare system.	Adoption of ICT systems in the healthcare sector.

This study therefore makes a unique and timely contribution in presenting eModeration requirements which is still lacking in literature.

6.6. Limitations

The limitations of this study relate to the availability of pertinent literature specifically on eModeration, the absence of a dedicated eModeration system and both the sample size as well as the sample population (cf. Table 1-2) as discussed below.

As indicated in chapter two (literature review) the number of hits obtained when eModeration was used as a search key was limited to the procedure of moderating online discussion groups. The only pertinent research in the South African context was that of Van Staden (2010); Van Staden (2017); Van Staden et al. (2017) and Van Staden et al. (2015). There was therefore not much published research on eModeration specifically within the secondary school environment as defined within this study.

Additionally, as evidenced by the findings from the qualitative data (cf. Table 6-1), there is no dedicated eModeration system in place. Hence, mostly post-adoption models had to be relied on to analyze pre-adoption criteria.

To increase the sample size, an attempt was made to include teachers from public schools. Applications were filled in for each provincial department of education to acquire the necessary permission. However, no reply was forthcoming from either the Gauteng or KZN Departments of Education. The sample size was thus very limited. Despite the questionnaire and the link for the completion of the questionnaire being sent out several times, only 61 people responded. The data cannot therefore be generalized because of the small sample size.

An invitation to the focus group interview was sent out to twenty-eight individuals. Despite six people indicating their intention to attend, only four people eventually attended the focus group interview; which fell far short of the recommended 8 to 12 people (Baškarada, 2014). Additionally, although it was initially envisaged that participants for the focus group interview would comprise of four cluster moderators, four regional moderators and four national moderators (cf. Figure 4-4), the reality was that there were only three cluster moderators and one national moderator.

A pilot group survey was initially conducted to establish if there were any ambiguities in the questionnaire with the intention of refining the research instrument. The survey was sent out to five CAT teachers. Only two of the teachers responded. The low response rate to the pilot study was an unforeseen limitation given the positive response to the study when it was first introduced at the IEB Conference.

6.7. Key Contributions

6.7.1. Theoretical Contributions

The first important theoretical contribution of this study is the set of initial constructs elicited from a comparison of the constructs identified in the four technology adoption models under consideration (cf. Table 3-2). The constructs and dimensions, as presented in Table 5-28, identified for an eModeration system were extracted from two streams of literature.

- Stream one reviewed the existing literature on moderation processes and identified the challenges and benefits of an eModeration system and the

requirements for an eModeration system (cf. Sections 2.4, 2.5, 2.6, 2.7 and 2.8 and Figure 2-2). The abstracted information from the literature was refined through the DSR process to extrapolate the final proposed requirements for an eModeration system.

- Stream two reviewed literature on technology adoption/acceptance models (cf. Section 1.2.3 for the definitions and differences between adoption and acceptance). A comparison of the four different technology acceptance models namely Hot-FIT, TOE, TAM and TTF elicited initial constructs to define the constructs for a pre-adoption eModeration system (cf. Table 3-2).

DSR projects make different types of research contributions based on their level of problem maturity and solution maturity (Gregor & Hevner, 2013) as depicted in Figure 6-3.

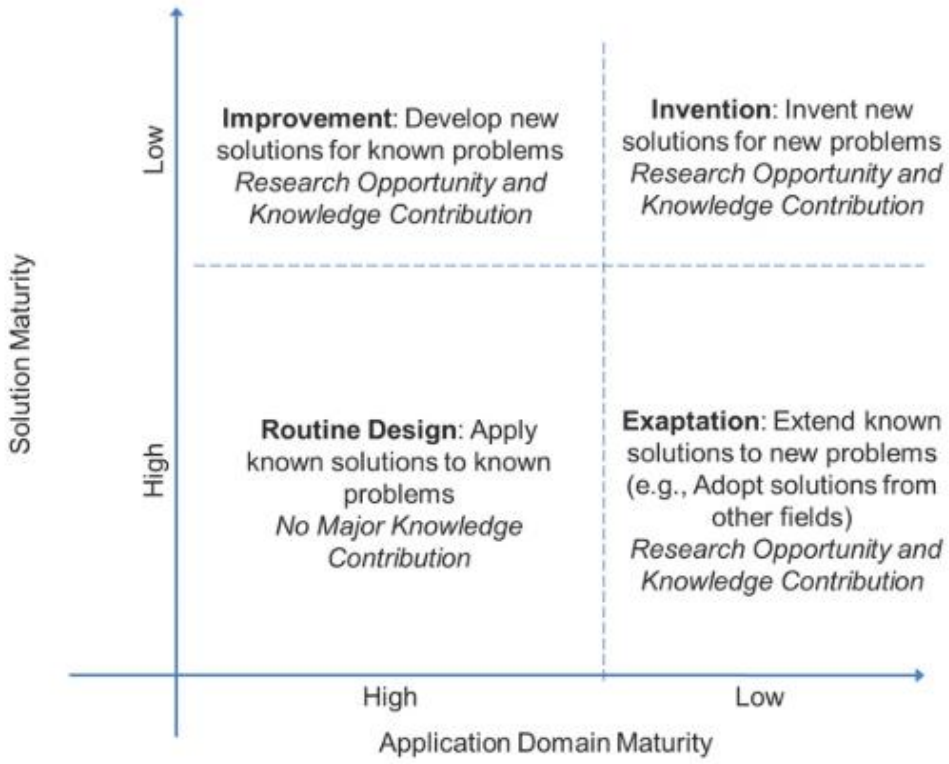


Figure 6-3: DSR Knowledge Contribution Framework
(Gregor & Hevner, 2013, p. 345)

Given that no evidence based requirements could be found for the requirements of an eModeration system, the conceptual model outlining the categories of User Requirements, System Requirements and Task Requirements can be considered as

a new solution for a known problem. Considering that no useful solution artifacts exist, the theoretical contribution of this study can thus be situated in the improvement quadrant as the goal of DSR in the improvement quadrant is to create more efficient solutions for a known application context. The second significant contribution of this study therefore, is the final evidence-based requirements (cf. Figure 5-4) realized from an analysis of the various streams of evidence explored.

It can be concluded that the main research question has been addressed as follows - the requirements for an efficient eModeration system can be categorized as:

- User Requirements (UR): aspects that affect users directly and personally. These are requirements which users will focus on.
- Task Requirements (TR): refer to those aspects of the system that are essential specifically for a user to complete the eModeration process.
- System Requirements (SR): core system characteristics which are essential for the efficient functioning of an eModeration system.

The requirements were structured under the categories of UR, TR and SR and this categorization was presented as a conceptual model (cf. Figure 5-4) to make the requirements more accessible.

6.7.2. Practical Contribution

Existing technology adoption models formed the basis for constructing a questionnaire (cf. Appendix C-1), which was grounded in literature, for a customized context. Most of the existing technology acceptance models are post-adoption models. This study explicitly focused on the pre-adoption attitudes of potential users of an eModeration system. Thus, the derived questionnaire, focused on pre-adoption attributes, is a novel contribution of this study. The requirements are a contribution which can be used by software developers to develop an eModeration system.

6.8. Future Research

This study provides a valuable contribution by proposing the requirements for an efficient eModeration system for secondary schools. However, the sample participants were restricted to educators in the private school environment. Hence, further research

must be conducted to establish the efficacy of an eModeration system in the public-school domain.

Furthermore, only IT and CAT educators were approached to answer the survey. This research therefore serves as a basis for future research initiatives into an eModeration system that could be used in subjects other than IT and CAT and in schools other than private schools affiliated to the IEB.

6.9. Personal Reflection

Prior to conducting this research, I was unaware of the rigour and formal structure required of academic writing. Besides adding new knowledge, the completion of this dissertation has refined my skills and compelled me to pay more attention to the finer details and the rigour of academic writing. Not only did I need to develop my skill at finding and using relevant academic literature but, more importantly, I needed to do so in a manner that brought out “my voice.”

The completion of this dissertation has developed transferable skills like communicating my research to different audiences; developing my grasp of statistical techniques; enhancing my analysis of qualitative and quantitative data and writing with a clear sense of purpose and cohesiveness. I have learnt the importance of accurately and objectively stating facts and figures.

Additionally, the completion of this study has enhanced my personal qualities and approach to becoming an effective researcher. Completing this research has made me more mindful of the broader impact of my research findings and the ethical implications involved in such an endeavour.

Bibliography

ABC-Awards. (2014). eModeration Guide. Retrieved March 22, 2018, from http://www.abcawards.co.uk/wp-content/uploads/2014/09/eModeration-Guide.pdf

Adie, L. (2009). Changing assessment practices : The case for online moderation. *International Educational Research Conference*, (December 2008), 1–15. Retrieved from http://eprints.qut.edu.au/%0AAdie,

Adie, L. (2011). An investigation into online moderation. *Assessment Matters*, *3*, 5–27. Retrieved from http://search.informit.com.au/documentSummary;dn=515662774994571;res=IELHSS

Adie, L. (2012). The development of teacher assessment identity through participation in online moderation. *Assessment in Education : Principles, Policy and Practice*. https://doi.org/http://dx.doi.org/10.1080/0969594X.2011.650150

Adie, L., & Klenowski, V. (2016). Teacher Judgment and the Challenges of Moderation. *Encyclopedia of Educational Philosophy and Theory*, 1–7.

Adie, L., Lloyd, M., & Beutel, D. (2013). Identifying discourses of moderation in higher education. *Assessment and Evaluation in Higher Education*, *38*(8), 968–977. https://doi.org/10.1080/02602938.2013.769200

Ain, N., Kaur, K., & Waheed, M. (2015). The influence of learning value on learning management system use: An extension of UTAUT2. *Information Development*, 0266666915597546-. https://doi.org/10.1177/0266666915597546

AlphaPlus. (2014). *Standardisation methods, mark schemes, and their impact on marking reliability*.

Awa, H. O., Ukoha, O., Emecheta, B. C., Harcourt, P., & Harcourt, P. (2016). Using T-O-E theoretical framework to study the adoption of ERP solution. *Cogent Business & Management*, *3*(1196571), 1–23. https://doi.org/10.1080/23311975.2016.1196571

Babaheidari, S., & Svensson, L. (2014). Managing the Digitalization of Schools : an exploratory study of school principals ' and IT managers ' perceptions about ICT adoption and usefulness. *E-Learn 2014*, (October), 106–113. https://doi.org/10.13140/2.1.4707.8083

Barab, S., & Squire, K. (2004). Design-Based Research: Putting a Stake in the Ground. *The Journal of the Learning Sciences*, *13*(1), 1–14. https://doi.org/10.1016/j.yjmcc.2009.07.018

Baškarada, S. (2014). Qualitative Case Study Guidelines. *The Qualitative Report*, *19*, 1–18. Retrieved from http://www.nova.edu/ssss/QR/QR19/baskarada24.pdf

Baxter, P., & Jack, S. (2008). Qualitative Case Study Methodology : Study Design and Implementation for Novice Researchers. *The Qualitative Report*, *13*(4), 544–559.

Behrend, T. S., Wiebe, E. N., London, J. E., & Johnson, E. C. (2011). Cloud computing adoption and usage in community colleges. *Behaviour and Information Technology*, *30*(2), 231–240. https://doi.org/10.1080/0144929X.2010.489118

Bell, J. (2005). Doing your research project A guide for first-time researchers in education, health and social science. In *Doing your research project A guide for first-time researchers in education, health and social science.* (4th ed.). https://doi.org/10.1017/CBO9781107415324.004

Berger, D. (2011). *Supporting Tool for Moderation in the Grading Process of Summative Assessments.* Graz University of Technology.

Beutel, D., Adie, L., & Lloyd, M. (2014). Moderation in higher education: Four discourses. *HERDSA Annual International Conference*, *37*, 20–27. Brisbane.

Beutel, D., Adie, L., & Lloyd, M. (2017). *Teaching in Higher Education Assessment moderation in an Australian context : processes , practices , and challenges*. *2517*. https://doi.org/10.1080/13562517.2016.1213232

Biddle, C., & Schafft, K. A. (2015). Axiology and Anomaly in the Practice of Mixed Methods Work: Pragmatism, Valuation, and the Transformative Paradigm. *Journal of Mixed Methods Research*, *9*(4), 320–334. https://doi.org/10.1177/1558689814533157

Bloxham, S. (2009). Marking and moderation in the UK: False assumptions and wasted resources. *Assessment and Evaluation in Higher Education*, *34*(2), 209–220. https://doi.org/10.1080/02602930801955978

Bloxham, S., Hughes, C., & Adie, L. (2016). What's the point of moderation? A discussion of the purposes achieved through contemporary moderation practices. *Assessment and Evaluation in Higher Education*, *41*(4), 638–653. https://doi.org/10.1080/02602938.2015.1039932

Borgman, H. P., Bahli, B., Schewski, F., & Heier, H. (2013). Cloudrise : Exploring Cloud Computing Adoption and Governance With the TOE Framework. *46th Hawaii International Conference on System Sciences*, 4425–4435. https://doi.org/10.1109/HICSS.2013.132

Botha, A., Herselman, M., & Ford, M. (2014). Gamification beyond Badges. *IST-Africa 2014*, *12*(1), 1–10. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6880651

Centre-for-Learning-and-Development. (2012). Moderation of Assessment in Higher Education : A Literature Review. Retrieved August 21, 2017, from Centre for Learning and Development website: https://intranet.ecu.edu.au/__data/assets/pdf_file/0019/504253/Moderation-of-assessment-in-higher-education-A-literature-review.pdf

Chamberlain, S., & Taylor, R. (2011). Online or face-to-face? An experimental study of examiner training. *British Journal of Educational Technology*, *42*(4), 665–675. https://doi.org/10.1111/j.1467-8535.2010.01062.x

Chyung, S. Y. Y., Roberts, K., Swanson, I., & Hankinson, A. (2017). Evidence-Based Survey Design: The Use of a Midpoint on the Likert Scale. *Performance Improvement*, *56*(10),

15–23. https://doi.org/10.1002/pfi.21727

Clarke, V., & Braun, V. (2013). Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. *The Psychologist*, *26*(2), 120–123. Retrieved from http://eprints.uwe.ac.uk/21155%5Cnhttp://www.thepsychologist.org.uk/archive/archive_home.cfm?volumeID=26&editionID=222&Article

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology*, *11*(1), 1–9. https://doi.org/10.1186/1471-2288-11-100

Darling-Hammond, L. (2010). *Performance Counts: Assessment Systems That Support High-Quality Learning*. Retrieved from http://eric.ed.gov/?id=ED543057

Davis, R., & Wong, D. (2007). Conceptualizing and Measuring the Optimal Experience of the eLearning Environment. *Decision Sciences Journal of Innovative Education*, *5*(1), 97–126. https://doi.org/10.1111/j.1540-4609.2007.00129.x

De Villiers, M. R., & Harpur, P. A. (2013). Design-based research – the educational technology variant of design research: Illustrated by the design of an m-learning environment. *SAICSIT '13*, 252–261.

Denscombe, M. (2008). Communities of Practice A Research Paradigm for the Mixed Methods Approach. *Journal of Mixed Methods Research*, *2*(3), 270–283.

Department-for-Education-and-Child-Development. (2016). *Moderation matters A guide to leading collaborative moderation in schools* (pp. 1–21). pp. 1–21.

Dew, D. (2011). In: Encyclopedia of Survey Research Methods. In P. Lavrakas (Ed.), *Encyclopedia of Survey Research Methods* (p. 134). Thousand Oaks: SAGE Publications, Inc.

Dilshad, R. M., & Latif, M. I. (2013). Focus Group Interview as a Tool for Qualitative Research: An Analysis. *Pakistan Journal of Social Sciences (PJSS)*, *33*(1), 191–198.

Dishaw, M. T., & Strong, D. M. (1999). Extending the technology acceptance model with task-technology fit constructs. *Information & Management*, *36*, 9–21.

Drechsler, A., & Hevner, A. (2016). A four-cycle model of IS design science research: capturing the dynamic nature of IS artifact design. *Breakthroughs and Emerging Insights from Ongoing Design Science: Research-in-Progress Papers and Poster Presentations from the 11th International Conference on Design Science in Information Systems and Technology (DESRIST)*, 1–8. Retrieved from https://cora.ucc.ie/handle/10468/2560

Dresch, A., Lacerda, D. P., & Miguel, P. A. C. (2015). A Distinctive analysis of Case Study, Action Research and Design Science Research. *Review of Business Management*, *17*(56), 1116–1133. https://doi.org/10.7819/rbgn.v17i56.2069

Earle, L. (2006). Assessment of Learning Assessment of learning. In *Rethinking classroom assessment with purpose in mind* (pp. 1–67). https://doi.org/10.4135/9781446214695

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: opportunities and challenges diverse. *Academy of Management Journal*, *50*(1), 25–32. https://doi.org/10.1002/job.

Ellis, T., & Levy, Y. (2006). A Systems Approach to Conduct an Effective Literature Review in Support of Information Systems Research. *Informing Science Journal*, *9*, 181–212.

Elman, C., Gerring, J., & Mahoney, J. (2016). Case Study Research : Putting the Quant Into the Qual. *Sociological*, *45*(3), 375–391. https://doi.org/10.1177/0049124116644273

Erlirianto, L. M., Ali, A. H. N., & Herdiyanti, A. (2015). The Implementation of the Human, Organization, and Technology–Fit (HOT – Fit) Framework to evaluate the Electronic Medical Record (EMR) System in a Hospital. *Procedia Computer Science*, *72*, 580–587. https://doi.org/10.1016/j.procs.2015.12.166

Ethical Conduct for Research Involving Humans. (2014).

Fatimah, S., Yassin, M., Mohamad, N. S., & Yamat, H. (2007). Developing W-Portfolio Culture in Computer. *Proceedings of the EPortfolio 2007 Conference. October, 17-19*, 327–332. Maastricht, The Netherlands.

Feilzer, M. (2010). Doing Mixed Methods Research Pragmatically: Implications for the Rediscovery of Pragmatism as a Research Paradigm. *Journal of Mixed Methods Research*, *4*(6), 6–16. https://doi.org/10.1177/1558689809349691

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, *12*(2), 219–245. https://doi.org/10.1177/1077800405284363.CITATIONS

Fossey, E., Harvey, C., Mcdermott, F., & Davidson, L. (2002). Understanding and evaluating qualitative research. *Australian and New Zealand Journal of Psychiatry*, *36*, 717–732.

Gadermann, A. M., Guhn, M., & Zumbo, B. D. (2012). Estimating ordinal reliability for Likert-type and ordinal item response data: A conceptual, empirical, and practical guide. *Practical Assessment, Research & Evaluation*, *17*(3), 1–13.

Gangwar, H., Date, H., & Ramaswamy, R. (2015). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. *Journal of Enterprise Information Management*, *28*(1), 107–130. https://doi.org/10.1108/JEIM-08-2013-0065

Gardner, H. J., & Martin, M. A. (2007). Analyzing Ordinal Scales in Studies of Virtual Environments: Likert or Lump It! *Presence: Teleoperators and Virtual Environments*, *16*(4), 439–446. https://doi.org/10.1162/pres.16.4.439

Given, L. M. (2013). The SAGE Encyclopedia of Qualitative Research Methods Constructivism. *SAGE Research Methods*, 116–121. https://doi.org/10.4135/9781412963909

Göb, R., McCollin, C., & Ramalhoto, M. F. (2007). Ordinal methodology in the analysis of likert scales. *Quality and Quantity*, *41*(5), 601–626. https://doi.org/10.1007/s11135-007-9089-z

Goldkuhl, G., Ågerfalk, P., & Sjostrom, J. (2017). A Design Science Approach to Information Systems Education. In A. Maedche (Ed.), *DESRIST* (pp. 383–397). https://doi.org/10.1007/978-3-319-59144-5

Goodhue, D. L. (1998). Development and Measurement Validity of a Task-Technology Fit Instrument for User Evaluations of Information Systems. *Decision Sciences*, *29*(I), 105–138.

Goodhue, D. L., Klein, B. D., & March, S. T. (2000). User evaluations of IS as surrogates for

objective performance. *Information and Management*, *38*, 87–101.

Goodhue, D. L., & Thompson, R. L. (1995). Task-Technology Fit and Individual Performance. *MIS Quarterly*, *19*(2), 213. https://doi.org/10.2307/249689

Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, *26*(2), 91–108. https://doi.org/10.1111/j.1471-1842.2009.00848.x

Greatorex, J. (2004). Moderated e-portfolio project evaluation. In *Evaluation and Validation Assessment Directorate*. Cambridge.

Gregor, S., & Hevner, A. R. (2013). Positioning and Presenting Design Science Research For Maximum Impact. *MIS Quarterly*, *37*(2), 337–355. https://doi.org/10.2753/MIS0742-1222240302

Gregory, J., & Salmon, G. (2013). Professional development for online university teaching. *Distance Education*, *34*(3), 256–270. https://doi.org/10.1080/01587919.2013.835771

Gugino, J. (2018). Using Google Docs to Enhance the Teacher Work Sample: Building e-Portfolios for Learning and Practice. *Journal of Special Education Technology*, *33*(1), 54–65. https://doi.org/10.1177/0162643417729135

Hall, J. N. (2013). Pragmatism, Evidence, and Mixed Methods Evaluation. *New Directions for Evaluation*, *138*(June 2013), 15–26. https://doi.org/10.1002/ev.20054

Harpe, B. De, Mason, T., Wong, I., Harrisson, F., Sprynskyj, D., & Douglas, C. (2009). *Integrating digital technologies into student assessment and feedback : how easy is it ?* (2004).

Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case study research: Foundations and methodological orientations. *Forum: Qualitative Social Research*, *18*(1), 1–17.

Hassan, N. R., & Lowry, P. B. (2015). Seeking middle-range theories in information systems research. *International Conference on Information Systems*, (November), 1–26.

Hevner, A., & Chatterjee, S. (2010). Twelve Theses on Design Science Research in Information Systems. In *Design Research in Information Systems* (Vol. 22, pp. 43–62). https://doi.org/10.1007/978-1-4419-5653-8

Hevner, A., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Systems Research. *MIS Quarterly*, *28*(1), 75–105. https://doi.org/10.2307/25148625

Hollingsworth, R. G., Collins, T. P., Smith, V. E., & Nelson, S. C. (2011). Simple statistics for Correlating survey responses. *Journal of Extension*, *49*(5), 9–12.

Hoyos, J., & Cano, L. (2016). E-moderating and E-tivities : The Implementation of a Workshop to Develop Online Teaching Skills in In-service Teachers. *Profile*, *18*(1), 97–114.

HR-Statistics. (2016). *Statistical Analysis reporting template for quantitative researchers* (No. 1).

Iivari, J. (2015). Distinguishing and contrasting two strategies for design science research. *European Journal of Information Systems*, *24*(1), 107–115. https://doi.org/10.1057/ejis.2013.35

Iivari, J., & Venable, J. R. (2009). Action research and design science research - Seemingly

similar but decisively dissimilar. *ECIS 2009 Proceedings*.

Independent-Examinations-Board. (2015). *IEB Manual for the Moderation of School Based Assessment for the National Senior Certificate Examination*. (September), 1–30.

Irick, M. L. (2008). Task-Technology Fit and Information Systems Effectiveness. *Journal of Knowledge Management Practice*, *9*(3).

Jeffrey, D. A. (2015). *Testing the Technology Acceptance Model 3 (TAM 3) with the Inclusion of Change Fatigue and Overload, in the Context of Faculty from Seventh-day Adventist Universities : A Revised Model*. Andrews University.

Jesson, J., & Lacey, F. (2006). How to do (or not to do) a critical literature review. *Pharmacy Education*, *6*(2), 139–148. https://doi.org/10.1080/15602210600616218

Johnson, M., & Greatorex, J. (2008). Judging Text Presented on Screen : implications for validity. *E–Learning*, *5*(1), 40–50. https://doi.org/10.2304/elea.2008.5.1.40

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research : A Research Paradigm Whose Time Has Come. *Jstor*, *33*(7), 14–26. https://doi.org/10.3102/0013189X033007014

Joshi, A., Kale, S., Chandel, S., & Pal, D. (2015). Likert Scale: Explored and Explained. *British Journal of Applied Science & Technology*, *7*(4), 396–403. https://doi.org/10.9734/bjast/2015/14975

Kivunja, C., & Kuyini, A. B. (2017). Understanding and Applying Research Paradigms in Educational Contexts. *International Journal of Higher Education*, *6*(5), 26–41. https://doi.org/10.5430/ijhe.v6n5p26

Klein, H. K., & Myers, M. D. (1999). A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems. *MIS Quarterly: Management Information Systems*, *23*(1), 67–93. https://doi.org/10.2307/249410

Klenowski, V., & Wyatt-Smith, C. (2010). Standards, teacher judgement and moderation in contexts of national curriculum and assessment reform. *Assessment Matters*, Vol. 2, pp. 107–131. Retrieved from http://eprints.qut.edu.au/37642/

Kohlbacher, F. (2006). The Use of Qualitative Content Analysis in Case Study Research. *Forum : Qualitative Social Research*, *7*(1), 1–37.

Krabbe, P. F. M. (2016). Constructs and Scales. In *The Measurement of Health and Health Status* (pp. 67–89). https://doi.org/10.1016/b978-0-12-801504-9.00005-2

Krueger, R. A., & Casey, M. A. (2015). Focus Group Interviewing. In *Handbook of Practical Program Evaluation: Fourth Edition* (pp. 506–534). https://doi.org/10.1002/9781119171386.ch20

Kuzich, S., Groves, R., Hare, S. O., & Pelliccione, L. (2010). Building team capacity : sustaining quality in assessment and moderation practices in a fully online unit. *ATN Assessment Conference 2010*. Sydney.

Lai, P. C. (2017). The Literatue Review of Technology Adoption Models and Theories for the Novelty Technology. *Journal of Information Systems and Technology Management*, *14*(1), 21–38. https://doi.org/10.4301/S1807-17752017000100002

Likert, R. (1932). A techniqe for the measurement of attitudes. *Archives of Psychology*,

22(140), 5–55.

Lu, Z., Cui, T., Tong, Y., & Wang, W. (2019). Examining the effects of social influence in pre-adoption phase and initial post-adoption phase in the healthcare context. *Information & Management*, (August), 1–11. https://doi.org/10.1016/j.im.2019.103195

Lynch, G. (2014). GCSE ICT E-Moderation Pilot Case Study. Retrieved April 25, 2017, from the e-Assessment Association website: http://www.e-assessment.com/category/resources/case-studies/page/3/

Maxwell, G. (2002). *Moderation of Teacher Judgments in Student Assessment*.

McGill, D. (2009). *Task-Technology Fit Assessment of an Expertise Transfer system* (Air Force Institue of Technology). https://doi.org/10.1109/te.1962.4322266

Mckenney, S., Nieveen, N., & van den Akker, J. (2007). Design Research from a Curriculum Perspective. In J. van den Akker, K. Gravemeijer, S. Mckenney, & N. Nieveen (Eds.), *Educational Design Research* (pp. 110–143). London: Routledge.

Mills, J., Bonner, A., & Francis, K. (2006). The development of constructivist grounded theory. *International Journal of Qualitative Methods*, *5*(1), 1–10.

Milne, J., Heinrich, E., & Morrison, D. (2008). Technological support for assignment assessment: A New Zealand higher education survey. *Australasian Journal of Educational Technology*, *24*(5), 487–504.

Moran, M., Hawkes, M., & Gayar, O. El. (2010). Tablet Personal Computer Integration in Higher Education: Applying the Unified Theory of Acceptance and Use Technology Model to Understand Supporting Factors. *Journal of Educational Computing Research*, *42*(1), 79–101. https://doi.org/10.2190/EC.42.1.d

Morgan, D. L. (2014). Pragmatism as a Paradigm for Social Research. *Qualitative Inquiry*, *20*(8), 1045–1053. https://doi.org/10.1177/1077800413513733

Morgan, Pullon, S., Macdonald, L., Mckinlay, E., & Gray, B. (2016). Case Study Observational Research : A Framework for Conducting Case Study Research Where Observation Data Are the Focus. In *Qualitative Health Research* (pp. 1–9).

Muslimin, I., Hadi, S. P., & Nugroho, E. (2017). An Evaluation Model Using Perceived User Technology Organization Fit Variable for Evaluating the Success of Information Systems. *Scientific Journal of Informatics*, *4*(2), 86–94. https://doi.org/10.15294/sji.v4i2.12012

New-Zealand-Qualifications-Authority. (2016a). Digital Assessment : digital moderation. Retrieved November 13, 2017, from http://www.nzqa.govt.nz/assets/Uploads/Factsheet-DAT-Digital-Moderation-September-2016.pdf

New-Zealand-Qualifications-Authority. (2016b). Digital Assessment Requirements for Post-Moderation. Retrieved April 26, 2018, from ServiceIQ website: http://www.serviceiq.org.nz/assets/Attachments/QA-Documents/SIQ-GUIDE-QA-PostModDigitalAssessment-Ed3-Aug16.pdf

New-Zealand-Qualifications-Authority. (2016c). Digital Moderation Consultation Outcomes. Retrieved April 28, 2018, from http://www.nzqa.govt.nz/assets/About-us/Future-State/Digital-Moderation-Consultation-Outcomes.pdf

New-Zealand-Qualifications-Authority. (2016d). *Digital Moderation Discussion Paper*.

Wellington.

Nieveen, N., & Van Den Akker, J. (2007). Design Research from a Curriculum Perspective. In T. Plomp & N. Nieveen (Eds.), *An Introduction to Educational Design Research* (3rd ed., pp. 110–143). London: Routledge.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods*, *16*(1), 1–13. https://doi.org/10.1177/1609406917733847

Pansiri, J. (2005). Pragmatism : A methodological approach to researching strategic alliances in tourism. *Tourism and Hospitality Planning and Development*, *2*(3), 191–206. https://doi.org/10.1080/14790530500399333

Parbhoo, J. (2011). *The implementation of moderation of assessment policy at a school and district: A case study*. University of Cape Town.

Paré, G., Trudel, M.-C., Jaana, M., & Kitsiou, S. (2015). Synthesizing information systems knowledge: A typology of literature reviews. *Information & Management*, *52*(2), 183–199. https://doi.org/10.1016/j.im.2014.08.008

Peersman, G. (2014). Overview: Data Collection and Analysis Methods in Impact Evaluation. *Methodological Briefs: Impact Evaluation*, (10), 21. Retrieved from http://devinfolive.info/impact_evaluation/ie/img/downloads/Data_collection_and_Analysis_ENG.pdf

Peffers, K, Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems*, *24*(3), 45–78. https://doi.org/10.2753/MIS0742-1222240302

Peffers, Ken, Tuunanen, T., Gengler, C. E., Rossi, M., Hui, W., Virtanen, V., & Bragge, J. (2006). The Design Science Research Process: A Model for Producing and Presenting Information Systems Research. *Proceedings of Design Research in Information Systems and Technology DESRIST'06*, 83–106. https://doi.org/10.2753/MIS0742-1222240302

Pelz, B. (2019). Chapter 7 Scale Reliability and Validity. In *Research Methods for the Social Sciences*. Retrieved from https://courses.lumenlearning.com/suny-hccc-research-methods/chapter/chapter-7-scale-reliability-and-validity/

Poole, P., Brown, M., McNamara, G., O'Hara, J., O'Brien, S., & Burns, D. (2018). Challenges and supports towards the integration of ePortfolios in education. Lessons to be learned from Ireland. *Heliyon*, *4*(11), 1–23. https://doi.org/10.1016/j.heliyon.2018.e00899

Pozzebon, M. (2002). Critical Interpretaive Research: Examining Criteria as a Key Component in Building a Research Tradition. *Critical Perspectives on International Business*, *3*(July), 276–292.

Pynoo, B., Devolder, P., Tondeur, J., Van Braak, J., Duyck, W., & Duyck, P. (2011). Predicting secondary school teachers' acceptance and use of a digital learning environment: A cross-sectional study. *Computers in Human Behavior*, *27*(1), 568–575. https://doi.org/10.1016/j.chb.2010.10.005

Rabiee, F. (2004). Focus-group interview and data analysis. *Proceedings of the Nutrition Society*, *63*, 655–660. https://doi.org/10.1079/pns2004399

Rahi, S. (2017). Research Design and Methods: A Systematic Review of Research Paradigms,

Sampling Issues and Instruments Development. *International Journal of Economics & Management Sciences*, *06*(02). https://doi.org/10.4172/2162-6359.1000403

Raikes, N., Greatorex, J., & Shaw, S. (2004). From Paper to Screen: some issues on the way. *International Association of Educational Assessment Conference*, (June).

Rajamany, V., Van Staden, C., & Van Biljon, J. (2020). *eModeration Requirements: A Case Study in Private Secondary Schools in South Africa*.

Ramdani, B., Chevers, D., & Williams, D. (2013). SMEs ' adoption of enterprise applications A Technology-organization-environment model. *Journal of Small Business and Enterprise Development*, *20*(4), 735–753. https://doi.org/10.1108/JSBED-12-2011-0035

Ramorola, M. Z. (2010). *A Study of Effective Technology Integration Into Teaching and Learning: a Case Study*.

Renaud, K., & Van Biljon, J. (2008). Predicting technology acceptance and adoption by the elderly. *Proceedings of the 2008 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists on IT Research in Developing Countries Riding the Wave of Technology - SAICSIT '08*, (October), 210–219. https://doi.org/10.1145/1456659.1456684

Rienties, B., Giesbers, B., Lygo-Baker, S., Ma, H. W. S., & Rees, R. (2016). Why some teachers easily learn to use a new virtual learning environment: a technology acceptance perspective. *Interactive Learning Environments*, *24*(3), 539–552. https://doi.org/10.1080/10494820.2014.881394

Rinker, T. (2014). On the Treatment of Likert Data.

Rowley, J. (2000). Using Case Studies in Research. *Management Research News*, *25*(1), 16–27.

Roy, A., Kihoza, P., Suhonen, J., Vesisenaho, M., & Tukiainen, M. (2014). Promoting proper education for sustainability : An exploratory study of ICT enhanced Problem Based Learning in a developing country. *International Journal of Education and Development Using Information and Communication Technology*, *10*(1), 70–90.

Runeson, P., & Höst, M. (2009). Guidelines for conducting and reporting case study research in software engineering. *Empirical Software Engineering*, *14*(2), 131–164. https://doi.org/10.1007/s10664-008-9102-8

Salkind, N. (2010). Case Study. In *Encyclopedia of Research Design* (pp. 116–120). https://doi.org/10.4135/9781412961288

Salmon, G. (2004a). E-tivities: The key to active online learning. In *Computers & Education* (Vol. 42, pp. 425–426). https://doi.org/10.1016/j.compedu.2003.10.001

Salmon, G. (2004b). What is e-moderating! In *E-moderating: The Key to Teaching and Learning Online* (2nd ed., pp. 1–48). https://doi.org/10.15713/ins.mmj.3

SAQA. (2015). National Policy and Criteria for Designing and Implementing. *Saqa*, *1*, 26.

Schulz, R., Isabwe, G. M., & Reichert, F. (2015). Investigating Teachers Motivation to Use ICT Tools in Higher Education. *2015 Internet Technologies and Applications (ITA)*, (September), 62–67. https://doi.org/10.1109/ITechA.2015.7317371

Singh, T. (2004). *School - Based Assessment: the interface between Continuous Assessment*

(CASS) and the external summative examination at Grade 12 level with special focus on Mathematics and Science. University of Pretoria.

Sorenson, A., & Gill, L. (2015). Digital Assessment Transformation: Internal Assessment and Moderation. Retrieved August 21, 2017, from http://www.nzqa.govt.nz/about-us/publications/newsletters-and-circulars/assessment-matters/digital-assessment-transformation-internal-assessment-and-moderation/

South-African-Qualifications- Authority. (2001). *Criteria and guidelines for assessment of NQF registered unit standards and qualifications*. Retrieved from www.saqa.org.za/docs/critguide/assessment/ch02.pdfSimilar

Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. *Procedia Manufacturing*, *22*, 960–967. https://doi.org/10.1016/j.promfg.2018.03.137

Tariq, A., & Akter, S. (2011). An Assessment of M-Health in Developing Countries Using Task Technology Fit Model. *Americas Conference on Information Systems*, 1–12. Detroit: USA: Association for Information Systems.

Thomas, P. . (2010). *Towards developing a web-based blended learning environment at the University of Botswana* (University of South Africa). https://doi.org/10.1515/9783110215519.82

Tjahjono, B., Fakun, D., Greenough, R., & Kay, J. (2001). Evaluation of A Manufacturing Task Support System Using The Task-Technology Fit Model Task-Technology Fit Instrument. *Proceedings of the 12th Annual Conference of the Production and Operations Management Society*, (April). Orlando FL.

Tri-Council-Policy-Statement. (2014). Ethical Conduct for Research Involving Humans. *Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, and Social Sciences and Humanities Research Council of Canada*, pp. 1–220. https://doi.org/10.1007/BF02627565

Tripathi, S., & Jigeesh, N. (2015). Task-Technology Fit (TTF) Model To Evaluate Adoption of Cloud Computing : A Multi-Case Study. *International Journal of Applied Engineering Research*, *10*(3), 9185–9200.

Umalusi. (2004). *Investigation into the Standard of the Senior Certificate Examination*.

Van Aken, J. E. (2004). Management research on the basis of the design paradigm: The quest for field-tested and grounded technological rules. *Journal of Management Studies*, *41*(2), 219–246. https://doi.org/0022-2380

Van Staden, C. J., Van Biljon, J. A., & Kroeze, J. H. (2015). eModeration. *Proceedings of the 2015 Annual Research Conference on South African Institute of Computer Scientists and Information Technologists - SAICSIT '15*, 1–11. https://doi.org/10.1145/2815782.2815821

Van Staden, C. (2010). IT Moderation Going Green. *SAICSIT '10*, 426–428.

Van Staden, C. (2017). *User experience evaluation of electronic moderation systems: A case study at a private higher education institution in South Africa*. UNISA.

Van Staden, C, Van Biljon, J., & Kroeze, J. (2017). Using a User Experience Evaluation Framework for eModeration. *2017 Conference on Information Communications Technology and Society*, 1–6. IEEE.

Van Staden, Corne, Van Biljon, J., & Kroeze, J. (2015). eModeration : Towards a User Experience Evaluation Framework. *SAICSIT*, (September 28-30), 1–11.

Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. *Decision Sciences*, *39*(2), 273–315.

Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the Qualitative-Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems. *MIS Quarterly*, *37*(1), 21–54.

Venkatesh, V., & Davis, F. D. (1996). A Model of the Antecedents of Perceived Ease of Use: Development and Test. *Decision Sciences*, *27*(3), 451–481. https://doi.org/10.1111/j.1540-5915.1996.tb01822.x

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model : Four Longitudinal Field Studies. *Management Science*, *46*(2), 186–204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, *27*(3), 425–478.

Verschuren, P. (2003). Case study as a research strategy: Some ambiguities and opportunities. *International Journal of Social Research Methodology*, *6*(2), 121–139. https://doi.org/10.1080/13645570110106154

Webb, M., Gibson, D., & Forkosh-Baruch, A. (2013). Challenges for information technology supporting educational assessment. *Journal of Computer Assisted Learning*, *29*(5), 1–23. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/jcal.12033/full

Wharfe, W., & Karrim, D. (2005). ePortfolio 2005 Transforming Individual and organisational learning. *EPortfolios for Assessment Cambridge 26-28 October*, 1–327. Retrieved from www.europortfolio.org

Wright, P. (2015). Comparing E-tivities , e-Moderation and the Five Stage Model to the Community of Inquiry Model for OnlineLearning Design. *The Online Journal of Distance Education and E-Learning*, *3*(2), 17–30.

Wu, B., & Chen, X. (2017). Continuance intention to use MOOCs : Integrating the technology acceptance model (TAM) and task technology fit (TTF) model. *Computers in Human Behavior*, *67*, 221–232. https://doi.org/10.1016/j.chb.2016.10.028

Wu, M., Chou, H., Weng, Y., & Huang, Y. (2011). TAM2-based study of website user behavior-using web 2.0 websites as an example. *WSEAS Transactions on Business and Economics*, *8*(4), 133–151.

Wyatt-Smith, C., Klenowski, V., & Gunn, S. (2010). The centrality of teachers' judgement practice in assessment: A study of standards in moderation. *Assessment in Education: Principles, Policy and Practice*, *17*(1), 59–75. https://doi.org/10.1080/09695940903565610

Yeh, C. J., & Inman, A. (2007). Qualitative Data Analysis and Interpretation in Counseling Psychology: Strategies for Best Practices. *The Counseling Psychologist*, *35*(3), 369–403. https://doi.org/10.1177/0011000006292596

Yen, D. C., Wu, C.-S., Cheng, F.-F., & Huang, Y.-W. (2010a). Determinants of users ' intention to adopt wireless technology : An empirical study by integrating TTF with TAM. *Computers in Human Behavior*, *26*(5), 906–915.

https://doi.org/10.1016/j.chb.2010.02.005

Yen, D. C., Wu, C. S., Cheng, F. F., & Huang, Y. W. (2010b). Determinants of users' intention to adopt wireless technology: An empirical study by integrating TTF with TAM. *Computers in Human Behavior*, *26*(5), 906–915. https://doi.org/10.1016/j.chb.2010.02.005

Yilmaz, K. (2013). Comparison of Quantitative and Qualitative Research Traditions : epistemological , theoretical. *European Journal of Education*, *48*(2), 311–325. https://doi.org/doi:10.1111/ejed.12014

Yin, R. K. (1981). The Case Study as a Serious Research Strategy. *Science Communication*, *3*(1), 97–114. https://doi.org/10.1177/107554708100300106

Yin, R. K. (2013). Validity and generalization in future case study evaluations. *Sage Publications*, *19*(3), 321–332. https://doi.org/10.1177/1356389013497081

Yin, R. K. (2015). Case Studies. *International Encyclopaedia of the Social & Behavioral Sciences*, *3*(2), 194–201. https://doi.org/10.1016/B978-0-08-097086-8.10507-0

Yu, T. K., & Yu, T. Y. (2010). Modelling the factors that affect individuals- utilisation of online learning systems: An empirical study combining the task technology fit model with the theory of planned behaviour. *British Journal of Educational Technology*, *41*(6), 1003–1017. https://doi.org/10.1111/j.1467-8535.2010.01054.x

Yusof, M. M., Kuljis, J., Papazafeiropoulou, A., & Stergioulas, L. K. (2008). An evaluation framework for Health Information Systems: human, organization and technology-fit factors (HOT-fit). *International Journal of Medical Informatics*, *77*(6), 386–398. https://doi.org/10.1016/j.ijmedinf.2007.08.011

Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*, *26*, 760–767. https://doi.org/10.1016/j.chb.2010.01.013

Appendix A: Ethics Approval Unisa

UNISA

UNISA COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY'S {CSET) RESEARCH AND ETHICS COMMITTEE

18 December 2018

Ref#: 081/VR/2018/CSET_SOC
Name: Mrs Vanitha Rajamany
Student #: 7232969

Dear Mrs Vanitha Rajamany

Decision: Ethics Approval for 3 years

(Humans involved}

Researchers: Mrs Vanitha Rajamany, 7 Drake Avenue, Eastleigh Ridge, 1609, 7232969 @m vlife.unisa.ac.za , +27 71 679 7271

Project Leader(s): Dr CJ van Staden, vstadci @uni sa.ac.za. +27 11 670 9429

Working Title of Research:

An Investigation into the Requirements for an eModeration System to be used for Grade 12 IT Portfolio Tasks in Secondary School in South Africa: A Case Study

Qualification: MSc in Computing

Thank you for the application for research ethics clearance by the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee for the above- mentioned research. Ethics approval is granted for a period of three years, from 18 December 2018 to 18 December 2021.

1. The researcher will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.

3. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
4. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
5. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
6. Permission to conduct this research should be obtained from the Departments of Basic Education (DBE), in Gauteng and KZN, and at schools affiliated with the Independent Examinations Board (IEB), in South Africa prior to commencing field work.
7. No field work activities may continue after the expiry date (18 December 2021). Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.
8. Field work activities may only commence from the date on this ethics certificate.

Note:

The reference number 081/VR/2018/CSET_SOC *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Unisa College of Science, Engineering and Technology's {CSET) Research and Ethics Committee.*

Appendix A

Yours sincerely

Dr. B Chimbo

Chair: Ethics Sub-Committee SoC, College of Science, Engineering and Technology (CSET)

RECEIVED
2018 -12- 18
OFFICE OF THE EXECUTIVE DEAN
College of Science, Engineering and Technology

Prof I. Osunmakinde

Director: School of Computing, CSET

Prof B. Mamba

Executive Dean: CSET

Approved - decision template – updated Aug 2016

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Appendix B_1: Permission Letter (IEB)

Request for permission to conduct research with teachers at IEB schools in South Africa

Title: “An investigation into the requirements for an eModeration system to be used for grade 12 IT portfolio tasks in South African secondary schools.”

10/11/2018

Ann Oberholzer

5 Anerley Road, Parktown, 2193

PO Box 875, Highlands North, 2037

Assessment Specialist: IEB

Tel: +27 (011) 483 9720

E-mail: oberholzera@ieb.co.za

Dear Ms Oberholzer

I, Vanitha Rajamany am doing research with Dr C. J. Van Staden a Senior Lecturer in the School of Computing towards a M.Sc. in Computing at the University of South Africa. We are inviting you to participate in a study entitled “An investigation into the requirements for an eModeration system to be used for grade 12 IT portfolio tasks in South African secondary schools.”

The aim of the study is to determine the requirements for an efficient eModeration system for IT SBA assessments at grade 12 level in South Africa.

Your company has been selected because the existing practices of IT portfolio moderators at IEB schools should be investigated to determine to what extent eModeration is being carried out in IT SBA assessments at grade 12 level. The specific aim is to determine current practices, processes and procedures of moderation with the intention of informing the next steps in promoting efficient and effective eModeration practices.

The nature and purpose of the research

The study will entail anonymous surveys being distributed to participants via emails and focus group interviews with between 8 and 12 participants.

- Participants' participation will involve them being asked to complete a short survey of about 20 minutes.
- The researcher will work with participants associated with IEB schools to obtain data relating to:
    - Current moderation practices
    - Access to ICT resources
    - Schools' ICT infrastructures
    - Benefits of eModeration
    - Challenges of eModeration
    - The requirements for an effective eModeration system

Benefits of this study

- The focus of this study will be to produce guidelines for the development of an online digital moderation system specifically for implementation at grade 12 level in South African secondary schools.
- This study has the potential to inform policy making within the IEB.
- Software developers can gain valuable insights into the requirements for a system that allows for online submissions, moderation and feedback to assessors.
- Implementing such a system could create opportunities to ease the workload of already overburdened teachers.
- Dissemination of the research findings and the proposed model will contribute both to research as well as the professional practice of IT educators and moderators.
- In a broader context, the proposed guidelines could serve as a template for the employment of a digital moderation system within the secondary school sector in other subject areas.

There are no potential risks to individuals participating in this study.

Yours sincerely

Vanitha Rajamany
Head of Department: Information Technology

I, Anne Kathleen Oberholzer, grant permission for IT and CAT teachers at IEB schools who are willing to do so, to participate in this study.

SIGNATURE: DATE: 31 January 2019

Chief Executive
Officer
DESIGNATION:

Appendix B_2: Permission Letter from Principals

Request for permission to conduct research with teachers at IEB and DBE schools in South Africa

Title: “An investigation into the requirements for an eModeration system to be used for grade 12 IT portfolio tasks in South African secondary schools.”

10/11/2018

Dr Daniela Pitt

Director: Academics

SAHETI School

Civin Drive, Bedfordview

Tel: +27 (011) 479 3700

E-mail: dpitt@saheti.co.za

Dear Dr Pitt

I, Vanitha Rajamany am doing research with Dr C. J. Van Staden a Senior Lecturer in the School of Computing towards a M.Sc. in Computing at the University of South Africa. We are inviting you to participate in a study entitled “An investigation into the requirements for an eModeration system to be used for grade 12 IT portfolio tasks in South African secondary schools.”

The aim of the study is to determine the requirements for an efficient eModeration system for IT SBA assessments at grade 12 level in South Africa.

Your school has been selected because the existing practices of IT portfolio moderators at secondary schools should be investigated to determine to what extent eModeration is being carried out in IT SBA assessments at grade 12 level. The specific aim is to determine current practices, processes and procedures of moderation with the intention of informing the next steps in promoting efficient and effective eModeration practices.

The nature and purpose of the research

The study will entail anonymous surveys being distributed to participants via emails and focus group interviews with between 8 and 12 participants.

- Participants' participation will involve them being asked to complete a short survey of about 15 minutes.
- The researcher will work with participants associated with IEB and DBE schools to obtain data relating to:
  - Current moderation practices
  - Access to ICT resources
  - Schools' ICT infrastructures
  - Benefits of eModeration
  - Challenges of eModeration
  - The requirements for an effective eModeration system

Benefits of this study

- The focus of this study will be to produce guidelines for the development of an online digital moderation system specifically for implementation at grade 12 level in South African secondary schools.
- This study has the potential to inform policy making within the IEB and DBE.
- Software developers can gain valuable insights into the requirements for a system that allows for online submissions, moderation and feedback to assessors.
- Implementing such a system could create opportunities to ease the workload of already overburdened teachers.
- Dissemination of the research findings and the proposed model will contribute both to research as well as the professional practice of IT educators and moderators.
- In a broader context, the proposed guidelines could serve as a template for the employment of a digital moderation system within the secondary school sector in other subject areas.

There are no potential risks to individuals participating in this study. We do not foresee that you will experience any negative consequences by participating in this study.

Yours sincerely

Vanitha Rajamany

Head of Department: Information Technology

I, (print name) grant permission for my organization to participate in this study.

SIGNATURE: DATE:

UNISA university of south africa

Appendix B_3: Participant Information Sheet

Ethics clearance reference number: 081/VR/2018/CSET_SOC

28 January 2019

Title: An investigation into the requirements for an eModeration system to be used for grade 12 IT and CAT portfolio tasks in South African secondary schools: A Case Study.

Dear Prospective Participant

My name is Vanitha Rajamany and I am doing research with Dr C. J. Van Staden a Senior Lecturer in the School of Computing towards a M.Sc. in Computing at the University of South Africa. We are inviting you to participate in a study entitled "An investigation into the requirements for an eModeration system to be used for grade 12 IT and CAT portfolio tasks in South African secondary schools."

WHAT IS THE PURPOSE OF THE STUDY?

I am conducting this research to determine to what extent eModeration is being carried out in IT and CAT SBA assessments at grade 12 level. The specific aim is to determine current practices, processes and procedures of moderation with the intention of informing the next steps in promoting efficient and effective eModeration practices.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

You are invited to participate in a survey. It is anticipated that the information gained from this survey will help to inform the next steps in promoting efficient and effective eModeration practices. You are, however, under no obligation to complete the survey and you can withdraw from the study prior to submitting the survey. The survey is developed to be anonymous.

Additionally, the study involves a focus group interview. The questions will focus on the

current moderation processes, challenges and barriers to eModeration, the benefits of eModeration and the requirements for an efficient eModeration system. You will be required to participate in the discussion for about 90 minutes.

Should you be amenable to participating in this study, please fill in the section below:

I, (name, please print) am willing to:

☐ Complete the anonymous survey

☐ Participate in the focus group interview

☐ Participate in both the focus group interview and survey

☐ Decline to participate

The email address to which the survey can be sent is:

I can further be contacted on (telephone):

CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the data obtained from the focus group discussion.

I have received a signed copy of the informed consent agreement.

Participant Name and Surname… …… (please print)

Participant Signature……..Date ……

Researcher's Name & Surname…Vanitha Rajamany……(please print)

Researcher's  signature Date…….

Appendix C_1: eModeration Questionnaire

Ethical clearance #: 081/VR/2018/CSET_SOC
Research permission #:
COVER LETTER TO AN ONLINE ANONYMOUS WEB-BASED SURVEY
Dear Prospective participant,
You are invited to participate in a survey conducted by Vanitha Rajamany under the supervision of Dr C. J. Van Staden and Professor J. Van Biljon from the School of Computing towards a M.Sc. in Computing at the University of South Africa.
The survey you have received has been designed to study the current moderation practices of IT and CAT teachers at IEB schools with a view to drawing up guidelines for the implementation of an efficient eModeration system. You were selected to participate in this survey because of your role as an IT and/or CAT teacher/moderator. By completing this survey, you agree that the information you provide may be used for research purposes, including dissemination through peer-reviewed publications and conference proceedings.
It is anticipated that the information gained from this survey will help to inform the next steps in promoting efficient and effective eModeration practices. You are, however, under no obligation to complete the survey and you can withdraw from the study prior to submitting the survey. The survey is developed to be anonymous, meaning that we will have no way of connecting the information that you provide to you personally.
Consequently, you will not be able to withdraw from the study once you have clicked the send button based on the anonymous nature of the survey. If you choose to participate in this survey it will take up no more than 15 minutes of your time. You will not benefit from your participation as an individual, however, it is envisioned that the findings of this study will create opportunities to ease the workload of already overburdened teachers, contribute both to research as well as the professional practice of IT educators and moderators and serve as a template for the employment of a digital moderation system within the secondary school sector in other subject areas.
We do not foresee that you will experience any negative consequences by completing the survey. The researcher undertakes to keep any information provided herein confidential, not to let it out of my possession and to report on the findings from the perspective of the participating group and not from the perspective of an individual.
The records will be kept for five years for audit purposes where after it will be permanently destroyed. Electronic versions will be permanently deleted from Google drive. You will not be reimbursed or receive any incentives for your participation in the survey.
The research was reviewed and approved by the Research Ethics Review Committee of the School of Computing Unisa. The primary researcher, Vanitha Rajamany, can be contacted during office hours at 7232969@mylife.unisa.ac.za. The study leader, Dr C. J. Van Staden can be contacted during office hours at 011 670 9429. Should you have any questions regarding the ethical aspects of the study, you can contact the chairperson of the Research Ethics Review Committee of the School of Computing Unisa at socethics@unisa.ac.za. Alternatively, you can report any serious unethical behaviour at the University's Toll Free Hotline 0800 86 96 93.
Section A: Biographical Information of Participant
Section B: Current Moderation Practices
Section C: Perceived Challenges of eModeration
Section D: User Characteristics and Organizational Structure
Section E: Technology characteristics
Section F: General
You are making a decision whether or not to participate by continuing to the next page. You are free to withdraw from the study at any time prior to clicking the send button.
Thank you very much for your collaboration. Your input is really important to this study.
*Required

1. **Email address** *

_____

2. **Age of participant** *
Mark only one oval.

- ◯ 18 - 24
- ◯ 25 - 34
- ◯ 35 - 44
- ◯ 45 - 54
- ◯ 55+

1-5

3. **Gender of participant** *
Mark only one oval.

- ◯ Female
- ◯ Male
- ◯ Prefer not to say
- ◯ Other: _____

6-9

4. **Home language of participant** *
(The language you speak most often at home)
Mark only one oval.

- ◯ English
- ◯ Afrikaans
- ◯ isiZulu
- ◯ Xhosa
- ◯ Sotho
- ◯ Other: _____

10-15

5. **Institution at which participant is employed** *
Mark only one oval.

- ◯ Private School
- ◯ Public School
- ◯ Other: _____

16-18

6. **Participant's designation within the institution** *

Mark only one oval.

- ◯ Teacher
- ◯ Head of Department
- ◯ Other: _____

19-21

7. **Organization that the institution is affiliated with** *

Mark only one oval.

- ◯ IEB
- ◯ Department of Basic Education
- ◯ Other: _____

22-24

8. **I am answering this questionnaire in my capacity as:** *

Mark only one oval.

- ◯ IT Educator
- ◯ CAT Educator
- ◯ Internal moderator
- ◯ Cluster moderator
- ◯ Regional moderator
- ◯ National moderator
- ◯ Other: _____

25-31

9. **Experience in the use of technology** *

Mark only one oval.

- ◯ < 1 year
- ◯ 1 - 5 years
- ◯ 6 - 10 years
- ◯ > 10 years
- ◯ Other: _____

32-36

10. **Software Experience: I use the following applications in my job.** *
Mark only one oval per row.

	Never	Seldom	Sometimes	Often	Always
Word Processors					
Email					
Virtual Learning Environments					
Mobile Learning					
eModeration Systems					

37-41

Section B: Current Moderation Practices

11. **Learners submit tasks for assessment in the following format** *
Mark only one oval per row.

	Never	Seldom	Sometimes	Often	Always
All paper					
Mostly paper based and some digital					
Some paper but mostly digital					
All digital					

42-45

12. **Tasks are submitted for external moderation in the following format** *
Mark only one oval per row.

	Never	Seldom	Sometimes	Often	Always
All paper					
Mostly paper based and some digital					
Some paper but mostly digital					
All digital					

46-49

13. **The turn around time of receiving feedback from the external moderator when moderation is done manually i.e. paper-based moderation is:** *
Mark only one oval per row.

	Never	Seldom	Sometimes	Often	Always
An hour or less					
Several hours					
A day					
A week					
More than a week					
A month or more					

50-55

14. **I use the following applications to submit portfolio tasks for external moderation.** *
Mark only one oval per row.

	Never	Seldom	Sometimes	Often	Always
Google Drive					
Email					
Intranets					
Dropbox					
Word processor with tracked changes					
PDF with annotations					

56-61

Section C: Perceived Challenges of eModeration

Rate the extent to which you believe that the following factors will hamper the digital moderation process.

15. **Infrastructure and resources** *
Mark only one oval per row.

	Never	Seldom	Sometimes	Often	Always
Inadequate infrastructure e.g. network, internet access					
Access to relevant hardware e.g. scanners, printers					
Access to appropriate software tools					
Speed of Internet connection					

62-65

16. **Cost** *
Mark only one oval per row.

	Never	Seldom	Sometimes	Often	Always
Additional hardware needs to be purchased to submit tasks for moderation e.g. scanners and storage media					
Additional software with annotation tools needs to be purchased					
Cost of an Internet connection					
Cost of additional security measures					

66-69

17. **Personal Experience: to what extent do the following contribute to you not engaging with a digital moderation process.** *

Mark only one oval per row.

	Never	Seldom	Sometimes	Often	Always
Anxiety in using unfamiliar digital moderation technology	◯	◯	◯	◯	◯
A sense of displacement due to a lack of visual cues	◯	◯	◯	◯	◯
I do not have the time to learn to engage with a new system	◯	◯	◯	◯	◯

70-72

18. **Productivity** *

Mark only one oval per row.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I believe that it will be time consuming to organize digital material into categories	◯	◯	◯	◯	◯
I believe that it will be time consuming to upload digital material.	◯	◯	◯	◯	◯
I believe that it will be time consuming to scan all documents before uploading portfolios.	◯	◯	◯	◯	◯

73-75

19. **Quality of file submissions** *

Mark only one oval per row.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Poor quality of scanned documents can hamper the eModeration process	◯	◯	◯	◯	◯
Differing file formats may result in files being difficult to read	◯	◯	◯	◯	◯
Availability of relevant annotation tools may make it difficult to view the assessor's and/or moderator's annotations	◯	◯	◯	◯	◯

76-78

Section D: User Characteristics and Organizational Structure

Questions pertaining to user abilities and the areas within the organization dealing with the human aspect

20. **The following factors will encourage me to digitally submit portfolios for moderation.** *

Mark only one oval per row.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Training on the use of an eModeration system					
Professional support					
Mandatory changes to institution practices					
Colleagues are in favour of the use of such a system.					

79-82

21. **Perceived Self Efficacy** *

Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have the necessary skills to use an eModeration system easily					
I have the technical skills to access an eModeration system					
I feel confident that I will be able to use an eModeration system to access candidates' moderated work					

83-85

Section E: Technology

Questions pertaining to TASK REQUIREMENTS

22. **Compatibility: It is important to be able to access the system via each of the following devices.** *

Mark only one oval per row.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Laptop					
PC					
Mobile device e.g. tablet, iPad					

86-88

23. **Effectiveness: To what extent do you agree with each of the following statements on using a standard, usable eModeration system** *

Mark only one oval per row.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Using an eModeration system should enhance my ability to moderate portfolio submissions					
Using an eModeration system should increase my accuracy when moderating portfolios					
An eModeration system should enable me to moderate without the need to access hard copies of portfolio tasks					

89-91

24. **Availability (adapted from Zhou, Lu and Wang (2010), McGill & Daphne (2009), Goodhue, Klein, & March (2000) and Goodhue & Thompson (1995))** *

Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I would need to access the eModeration system at any time					
I would need to access the eModeration system from anywhere					
I would need to acquire moderation information in real time					

92-94

25. **Efficiency** *

Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The use of an eModeration system should decrease the time needed to complete the moderation process					
The use of an eModeration system should increase the output for the same amount of effort					
I should be able to get information about portfolios quickly and easily when I need it					
Using an eModeration system should improve the speed at which moderation processes are completed					

95-98

26. **Task Requirements** *
Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
An eModeration system should allow me to easily upload and download student portfolios					
An eModeration system should allow me to easily communicate feedback					
An eModeration system should allow me to easily maintain records for different schools					

99-101

27. **Perceived ease of use: The following factors will affect my acceptance of an eModeration system.** *
Mark only one oval per row.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
My interaction with the eModeration system should be clear and understandable					
Interaction with the eModeration system should not require a lot of mental effort					
The eModeration system should be easy to use					

102-104

Section F: General

28. **Indicate any comments regarding your current moderation practices and the challenges and/or the benefits thereof.**

29. **What challenges have you encountered or expect to encounter when using an eModeration system?**

30. **What do you believe are the most important benefits of eModeration?**

31. **What do you believe are the critical requirements for an efficient digital moderation system?**

Appendix C_2: List of Topics for Focus Group Interview

Challenges of Moderation processes:

1.1. Please share some of the challenges that you experience as a **teacher** submitting assessments for:
   1.1.1. Manual paper-based moderation?
   1.1.2. Digital moderation?

1.2. In your role as a **moderator**, what are the challenges faced when:
   1.2.1. Submissions are in a non-digital format?
   1.2.2. Moderating manually (paper-based)?
   1.2.3. Moderating digitally?

1.3. What do you consider as the general challenges of eModeration?

2. Are there any additional issues of eModeration that need to be considered?

3. Moderation processes
   3.1. How does the moderation process differ when you are submitting portfolios as opposed to when you are moderating portfolios?
   3.2. In what way does the way (digital/hard copy) in which learners submit tasks for assessment have an effect on the process of moderation?
   3.3. Elaborate on your experiences of manual versus digital moderation (time taken, efficiency of the process, nature of submissions etc.)
   3.4. How do you feel about moderating written examination/test scripts electronically?
   3.5. Which of the processes (manual/digital) do you prefer – please explain your preference.

4. Benefits of eModeration
   4.1. What do you consider to be the benefits of eModeration?

5. Requirements for an efficient eModeration system
   5.1. Google Drive and email seem to be the more popular applications for moderation. Why do you think this is the case?
   5.2. What factors contribute to moderation being done digitally but not via a dedicated eModeration system? [58% of submissions to a moderator are often or always all digital but only 36% indicate that they either sometimes, often or always use an eModeration system]
   5.3. In your opinion, what are the requirements for an efficient eModeration system?

Appendix D: Statistical Analysis

Table D-1: Correlation Coefficients

<table>
<tr><th colspan="2">CONSTRUCTS</th><th>CORRELATION MATRIX</th><th>CORRELATION COEFFICIENT</th><th>DIRECTION</th><th>STRENGTH</th></tr>
<tr><td>Personal experience</td><td>Ease of use</td><td>
Correlations
<table>
<tr><th></th><th></th><th>Ease of Use</th><th>Personal Experience</th></tr>
<tr><td>Ease of Use</td><td>Pearson Correlation</td><td>1</td><td>.079</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td></td><td>.549</td></tr>
<tr><td></td><td>N</td><td>60</td><td>60</td></tr>
<tr><td>Personal Experience</td><td>Pearson Correlation</td><td>.079</td><td>1</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td>.549</td><td></td></tr>
<tr><td></td><td>N</td><td>60</td><td>61</td></tr>
</table>
</td><td>0.079</td><td>+</td><td>weak</td></tr>
<tr><td>Personal experience</td><td>Efficiency</td><td>
Correlations
<table>
<tr><th></th><th></th><th>Personal Experience</th><th>Efficiency</th></tr>
<tr><td>Personal Experience</td><td>Pearson Correlation</td><td>1</td><td>-.389**</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td></td><td>.002</td></tr>
<tr><td></td><td>N</td><td>61</td><td>60</td></tr>
<tr><td>Efficiency</td><td>Pearson Correlation</td><td>-.389**</td><td>1</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td>.002</td><td></td></tr>
<tr><td></td><td>N</td><td>60</td><td>60</td></tr>
</table>
**. Correlation is significant at the 0.01 level (2-tailed).
</td><td>-0.39</td><td>-</td><td>weak</td></tr>
</table>

Appendix D

<table>
<tr><th colspan="2">CONSTRUCTS</th><th>CORRELATION MATRIX</th><th>CORRELATION COEFFICIENT</th><th>DIRECTION</th><th>STRENGTH</th></tr>
<tr><td>Self-efficacy</td><td>Ease of use</td><td>
Correlations
<table>
<tr><th></th><th></th><th>Self Efficacy</th><th>Ease of Use</th></tr>
<tr><td>Self Efficacy</td><td>Pearson Correlation</td><td>1</td><td>.003</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td></td><td>.982</td></tr>
<tr><td></td><td>N</td><td>61</td><td>60</td></tr>
<tr><td>Ease of Use</td><td>Pearson Correlation</td><td>.003</td><td>1</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td>.982</td><td></td></tr>
<tr><td></td><td>N</td><td>60</td><td>60</td></tr>
</table>
</td><td>0.03</td><td>+</td><td>weak</td></tr>
<tr><td>Efficiency</td><td>Ease of use</td><td>
Correlations
<table>
<tr><th></th><th></th><th>Ease of Use</th><th>Efficiency</th></tr>
<tr><td>Ease of Use</td><td>Pearson Correlation</td><td>1</td><td>.416**</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td></td><td>.001</td></tr>
<tr><td></td><td>N</td><td>60</td><td>60</td></tr>
<tr><td>Efficiency</td><td>Pearson Correlation</td><td>.416**</td><td>1</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td>.001</td><td></td></tr>
<tr><td></td><td>N</td><td>60</td><td>60</td></tr>
</table>
**. Correlation is significant at the 0.01 level (2-tailed).
</td><td>0.416</td><td>+</td><td>moderate</td></tr>
</table>

Appendix D

<table>
<tr><th colspan="2">CONSTRUCTS</th><th>CORRELATION MATRIX</th><th>CORRELATION COEFFICIENT</th><th>DIRECTION</th><th>STRENGTH</th></tr>
<tr><td>Availability</td><td>Efficiency</td><td>
Correlations
<table>
<tr><th></th><th></th><th>Efficiency</th><th>Availability</th></tr>
<tr><td>Efficiency</td><td>Pearson Correlation</td><td>1</td><td>.170</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td></td><td>.194</td></tr>
<tr><td></td><td>N</td><td>60</td><td>60</td></tr>
<tr><td>Availability</td><td>Pearson Correlation</td><td>.170</td><td>1</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td>.194</td><td></td></tr>
<tr><td></td><td>N</td><td>60</td><td>60</td></tr>
</table>
</td><td>0.170</td><td>+</td><td>weak</td></tr>
<tr><td>Task requirements</td><td>Ease of use</td><td>
Correlations
<table>
<tr><th></th><th></th><th>Ease of Use</th><th>Task Requirements</th></tr>
<tr><td>Ease of Use</td><td>Pearson Correlation</td><td>1</td><td>.441**</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td></td><td>.000</td></tr>
<tr><td></td><td>N</td><td>60</td><td>60</td></tr>
<tr><td>Task Requirements</td><td>Pearson Correlation</td><td>.441**</td><td>1</td></tr>
<tr><td></td><td>Sig. (2-tailed)</td><td>.000</td><td></td></tr>
<tr><td></td><td>N</td><td>60</td><td>60</td></tr>
</table>
**. Correlation is significant at the 0.01 level (2-tailed).
</td><td>0.441</td><td>+</td><td>moderate</td></tr>
</table>

Appendix D

CONSTRUCTS		CORRELATION MATRIX	CORRELATION COEFFICIENT	DIRECTION	STRENGTH
Productivity	Ease of use	**Correlations**	0.248	+	weak

Correlations

		Ease of Use	Productivity
Ease of Use	Pearson Correlation	1	.248
	Sig. (2-tailed)		.056
	N	60	60
Productivity	Pearson Correlation	.248	1
	Sig. (2-tailed)	.056	
	N	60	61

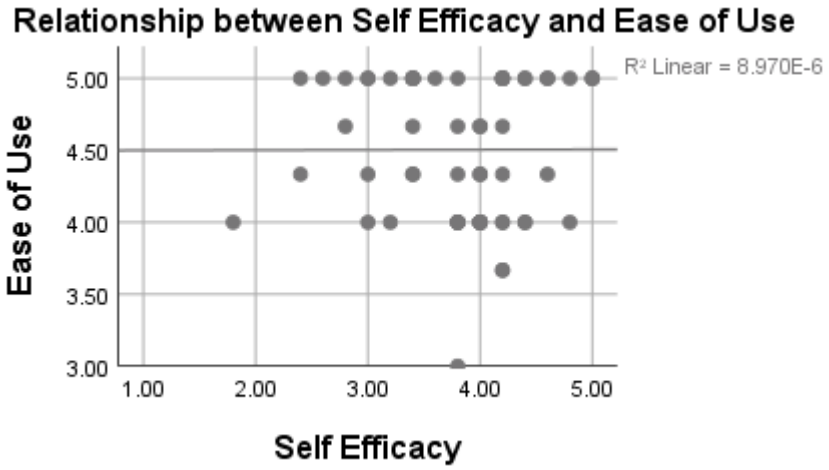


Figure D-1: Relationship between self-efficacy and ease of use

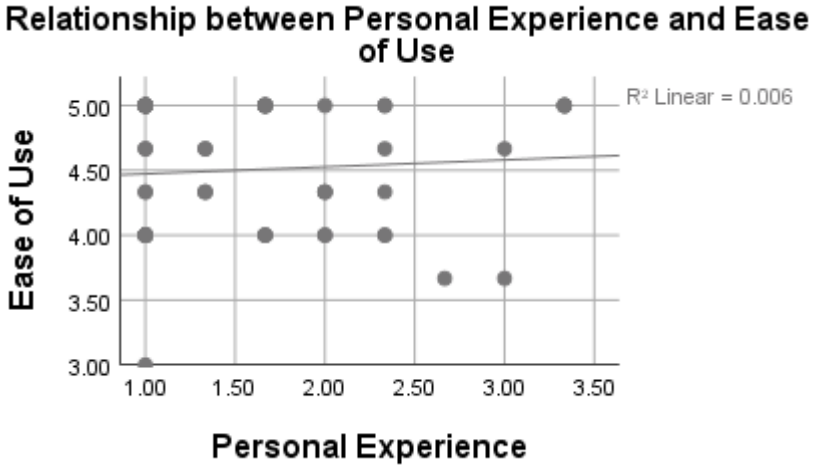


Figure D-2: Relationship between personal experience and ease of use

Appendix E: ICTAS Conference Publication

eModeration adoption requirements for secondary school education: a critical literature review (full article available at: https://ieeexplore.ieee.org/document/9082446

Vanitha Rajamany
University of South Africa
Johannesburg, South Africa
7232969@mylife.unisa.ac.za

Judy van Biljon
University of South Africa
Johannesburg, South Africa
vbiljja@unisa.ac.za

Corne Van Staden
University of South Africa
Johannesburg, South Africa
vstadcj1@unisa.ac.za

Appendix F: I3E Conference Publication

Vanitha Rajamany [0000-0002-8210-377X] C.J. van Staden[0000-0002-3991-3128] and J.A. van Biljon[0000-0002-4646-1641]

Requirements for an eModeration system in private schools in South Africa (full article available at: https://link.springer.com/chapter/10.1007/978-3-030-44999-5_46)