

# eModeration: Towards a User Experience Evaluation Framework

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## ABSTRACT

eModeration (or online moderation) can improve the user experience of the examination process while lowering the risk of losing scripts or delaying the moderation process. Despite these benefits to optimising examination procedures, the application of online moderation is limited. There could be various reasons for the lack of adopting eModeration including the technical, organisational and human factors. The focus of this study is on the human factors involved in eModeration and the research is guided by the following question: What are the most important user experience constructs for evaluating an electronic moderation (eModeration) system within the context of Higher Education Institutions in South Africa? This research uses a design science methodology, which comprises the development and testing of a user experience framework. In this paper, we will only report on the identification of the constructs for the user experience framework. The data generation methods will include interviews with deans from the different faculties and a survey with moderators and deans. The research was conducted at Midrand Graduate Institute, a Private Higher Education Institution in South Africa. The contribution of the paper is to identify the most important user experience constructs for evaluating an eModeration system and also to provide some insights on the user experience of the two different user groups. The enriched understanding of eModerators' and deans' user experience of eModeration contributes to the understanding of the human factors that influence the adoption of innovative assessment practices.

## Categories and Subject Descriptors

### General Terms

K.3.1[Computer Uses in Education]: Computer-managed instruction (CMI)

### Keywords

eModeration, eModerators, user experience, functionality, effectiveness, efficiency.

## 1. INTRODUCTION

Manual moderation is still widely used at academic institutions but the process poses challenges in terms of time and cost; it relies on paperwork, hard copy storage space and intensive process management. The challenges that educators face with manual moderation processes call for a review of the manual moderation

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process and practices towards meeting the ever changing demands of academic process governance and structures embedded in technology. Midrand Graduate Institute (MGI), a Private Higher Education Institution (PHEI) in South Africa, recently reviewed their examination and moderation practices and realised the need for renewing assessment practices and structures. As a result the manual moderation process was replaced by an electronic moderation process. Preliminary limitations to electronic moderation might be connectivity, access and bandwidth. In the context of this research, electronic moderation, also referred to as eModeration, involves a process of moderating examination scripts online. For the purpose of this research the following definition of eModeration will be used: "eModeration can be defined as the electronic moderation [quality assurance/critical reading] of summative examination scripts by external moderators in a virtual learning environment called eModerate" [22:3]. Different actors are involved in the moderating process, including examiners, moderators and deans of faculties. The deans are the faculty heads who manage the moderation process. The user experience investigated is that of the eModerators and the deans of the faculties as users of the system. This paper reflects on the user experience constructs identified from the lessons learned from this migration. The study is guided by the following question: *What would be the most important user experience constructs for an electronic moderation systems evaluation framework?* After a literature overview of the salient concepts, the research approach and execution are discussed, followed by a summary of the results, a discussion and the conclusion.

## 2. LITERATURE STUDY

Given the novelty of eModeration, it is necessary to consider the difference between manual moderation and online moderation as done in section 2.1. In section 2.2 we distinguish it from the better known practice of online assessment and in section 2.3 we reflect on the relationship between user experience and eModeration.

### 2.1 Manual moderation and online moderation

Moderation is the process of ensuring that those being assessed are assessed in an accurate, consistent and well-designed manner, and that the examiners or markers are making similar judgments about the learners' performance [35]. Moderation processes are also used to ensure standards and outcomes [5]. It is also the task of moderation to ensure that assessors are using comparable assessment methods. Moderation involves a process whereby moderators review samples of (marked) learners' work to assure the comparability of assessment standards [5, 12]. If the moderation is done manually this quality assurance process will normally be paper-based. When the moderation process is done online the assessments and related functionalities are made available electronically.

An eModeration system is used to provide a user interface through which examination scripts can be submitted electronically [41]. The examination scripts of learners that are uploaded onto the eModerate system can contain scanned, hand-written answers and grading done manually by a lecturer using a red pen or electronic assessment tools. Some electronic assessment tools also provide feedback facilities for the eModeration, such as comments and changed marks in green. This electronic process is meant to speed up the delivery of marked papers to the eModerators, as well as the return of the quality assured marked papers to the dean [40]. It should limit the loss of marked scripts and moderation reports that are traditionally being mailed or couriered. Tracking of the process should be much easier, and feedback could be given more easily to students who query their marks and assessment. The electronic process is meant to be useful (being of service or serving a purpose), usable (capable of being used), functional and easy to use.

Very little literature could be found on the theory of eModeration as used in the South African context. Given the known benefits of online moderation it is necessary to address the knowledge gap on the constructs that influence the user experience.

## 2.2 Online assessment and electronic moderation

Online assessment, also referred to as eAssessment, or automated marking, is used in education in areas of computer-assisted assessment, online delivery of formal examinations and automated marking [7, 9, 10, 17]. eAssessment has been well-researched, but eModeration, the application context of this study, has not received the same attention. Morgan [23] defines eModeration as the function of a lecturer preceding over an online meeting, while Salmon [34] refers to the monitoring of online content. The term eModeration often refers to the process of a lecturer or assistant lecturer who acts as a mentor providing feedback to students on assessments on an electronic platform [3, 23, 33, 42]. Greatorex [11] summarises the difference between manual versus electronic moderation as the way in which students' assessment grading are presented, paper-based versus on-screen. There is a shortage of published research on electronic assessment practices – see research by Adie, Clow and Greatorex for some examples [1, 4, 11]. Especially the factors that determine the user experience in using eModeration have not been theorised in depth.

Online moderation (assessment) of examination scripts is an essential emerging technology but the application as assessment practice is still novel [23]. The limited application of online assessment of examination scripts is opposed to automated marking that has been applied and used widely and researched in depth. Salmon [34:113] states that “[a]s e-moderators become more comfortable with their online teacher roles, I think they will start to look closely at online assessment and evaluation and will not wish their time and their students' time to be constrained by old assessment methods.”

In the rest of the article eModeration refers to the electronic quality assurance of the assessment of summative examination scripts by external peers using a virtual learning environment called eModerate [22]. In the context of this research, the eModerator will be the moderator of a module who will be moderating examination scripts electronically and who will provide the moderation report on the assessment. The relationship under consideration will be between the eModerator and the deans of the different faculties.

## 2.3 User experience and eModeration

User experience relates to what the user feels while interacting with a product, e.g. web applications and digital devices [19, 28, 30]. Elements that contribute to positive emotional outcomes of user experience are pleasure, fun, pride and excitement [14, 29]. Tullis and Albert [37] agree with Kuniavsky [19] that user experience looks at the individual's entire interaction with a system, the feelings, the opinions and perceptions that result from interaction. The International Organisation for Standardisation's current ISO standard 9241-210 clause 2.15 on human-centred design describes user experience as: “a person's perception and responses resulting from the use and/or anticipated use of a product, system or service” [18].

In addition, the following definitions of user experience should be considered:

- “User experience refers to a concept that places the end-user at the focal point of design and development efforts, as opposed to the system, its applications or its aesthetic value alone. It's based on the general concept of user-centered design. The user experience is primarily made up of four factors: branding, usability, functionality, and content” [32:2].
- According to Hassenzahl and Tractinsky [14] user experience is the consequence of the following components: context (environment in which the user operates), system (characteristics of a system) and the user's internal state such as needs, motivation and moods.
- Roto [31] extended Hassenzahl and Tractinsky's [14] definition by including factors such as infrastructure, services, people and technology context that also contribute to the interaction of users with a product.

For the purpose of this study, user experience will be considered as a concept where the end user is placed at the focal point of design and development, instead of the system alone or its aesthetic value, and where it is made up of usability, functionality, context, system and the user's internal state.

Usability in turn is generally defined in terms of efficiency, effectiveness, utility, learnability, memorability, safety and user satisfaction [18, 29]. According to Tullis and Albert [37] and Preece et al. [29] usability includes usability of systems as well as the user's experience when interacting with the system and the ability of the user to use a system to carry out a task successfully. For the purpose of this study the definition of usability as defined by Nielsen and Loranger [26] will be used, namely: how efficient are the users while using the system, how quickly can users learn to use the system, how memorable is the experience, how error prone is the system and how much do users prefer to use the system? An in depth discussion of the relationship between usability and user experience is beyond the scope of this paper but we will abide by the relationship described by Väättäjä, Koponen, and Roto [39] where usability is a component of user experience. This aligns with Rubinoff's explanation of user experience consisting of usability, functionality, content and branding.

Usability is an essential part of any interactive system, be it an eLearn site, an mLearn site, the intranet of a company or an online moderation system. When the user experiences the interactive systems as difficult to use and implement, the user will simply stop using the system and find alternative ways of performing the same

tasks [2, 24]. In the case of this study, deans and moderators who find the online moderation system difficult to use, could revert back to the manual paper-based moderation process. Therefore it is necessary to consider how usability attributes can contribute to a positive user experience.

As stated the user experience is influenced by the interplay between the following components: context, system and the user's internal state [14]. The challenge in user experience is to measure the user's internal state, the context and the perceived images of the product's instrumental (usability) and non-instrumental (appeal) qualities associated with the design process that will impact on the user's emotional reaction [14, 21, 25, 38, 42].

A mapping between the elements of Rubinoff [32] and Paluch [28], the components of Hassenzahl and Tractinsky [14] and Roto [31] and the corresponding questions in eModeration can be seen in Table 1. Table 1 was used as a guideline for the design and development of the artefact. The users (deans and moderators) and processes (moderation) involved in the eModerate system need to comply with the user experience components to be successful. Various elements can affect the user and the context when designing for eModeration user experience, especially when viewed from a designer perspective compared to a user perspective [13]. Key components that should be taken into consideration in eModeration user experience for this study, as identified through the literature review of different authors, are:

- system – terminal, connection and web applications
- context – eModeration in a PHEI environment; and
- user – eModerator and manager (dean).

**Table 1. Mapping between eModeration and user experience components**

	User experience components	eModeration
<b>System</b>	<b>Functionality:</b> Timely response to submission and query. The task progress is clearly communicated. The application adheres to security and private standards [32].	How functional is the eModerate system?
	<b>Fluidity of interaction:</b> The ability to input information, quick response time and intuitive workflow [28].	How fluid is the eModerate system?
	<b>System:</b> The characteristics of a system comprises various factors: complexity, purpose and functionality. The system also includes product, objectives, services, people and infrastructure involved in interaction [14].	What is the characteristics of an eModerate system?
	<b>Usability:</b> Effectiveness, efficiency and user satisfaction [28]. Navigation and accessibility, e.g., visitors accomplish tasks and goals, site adheres to its own consistency and standards [32]. <b>Content:</b> Link density provides clarity and easy navigation. Content is structured in such a way that it facilitates the achievement of user goals. Content is appropriate [32]. Comprehensibility of the	What usability goals are relevant to eModeration systems? What is the accuracy and the comprehensive-ness and meaningfulness

	User experience components	eModeration
	information and features. Accuracy of information presented [28].	of the information?
<b>Context</b>	<b>Context:</b> Higher Education Institutions. Context also refers to the environment in which the user operates and is affected by numerous factors such as organizational settings and meaningfulness of the activity [14]. The infrastructure, services, people and technology context also contribute to the interaction of users with a product [31].	What contextual requirements are related to eModeration systems?
<b>User</b>	The user's internal state can be made up by expectations, needs, motivations and moods [14]. The user experience is a consequence of the user's internal state. 'User' also refers to the following contexts of the users: physical, social, temporal and task [31].	Who are the users of an eModeration system?

The study investigated the possibility of adapting or changing existing user experience frameworks to suit the needs for a user experience eModeration framework. User experience frameworks that could be found in literature focus on websites where people can purchase a product or find information, and not on eModeration web pages. A website used for an eModeration system has a specific purpose, it contains specific content and operates in a specific environment in a specialised context. A user experience framework presented by Mahlke and Thuring [21] captures the components and consequences associated with user experience in the context of using portable auto players. The user experience framework encompasses the system, user and context when interacting with technology. They then separate the user experience components into perception of instrumental qualities (objective), emotional user reaction and the users' perception of non-instrumental qualities, which are subjective. The lower level of Mahlke and Thuring's [21] framework presents the consequences of the user experience. The concepts and principals used in their framework can be adopted to support the user experience framework for eModeration.

A user experience framework presented by Schulza and Kromker [36] included factors influencing the user's experience. Hassenzahl [13], however, asserts that the satisfaction levels experienced by users when interacting with the product are influenced by the product qualities: utility, usability, visual appeal and hedonic qualities. Further influencing factors are the popularity, relatedness and stimulation of the product use and quality perception by users. A system used for eModeration should be usable and visually appealing. The framework presented by Schulza and Kromker [36] is used to measure the direct and indirect influencing factors of user experience. The information provided needs to be related to eModeration and the quality should be acceptable to ensure a positive user experience. The evaluation of user experience in this context includes aspects that will support academic processes which users will follow in assessment practices known as eModerate.

### 3. RESEARCH APPROACH

#### 3.1 Research design

The research approach used in this study is Design Science Research. Design Science Research involves building an artefact to solve a problem, and then evaluating the artefact [15]. In Design Science Research the focus is on developing new IT artefacts with the intention to offer a construct, model, method or instantiation as a contribution to knowledge [27]. The development of a framework for measuring the user experience for an eModeration system fits the design-science paradigm. Design Science Research involves a process of interwoven cycles namely relevance, design and rigour [16]. The relevance cycle begins with a literature review and context analysis to develop a conceptual framework for the research. The second cycle, design and development, is an iterative design, namely development and formative evaluation of an artefact or intervention. The third cycle of rigour (theory building) targets the generation of design principles. The cyclic procedure is not always linear, but overlapping. It is also not uncommon to go back and forward between the cycles.

In an analysis of Design Based Research (DBR) and Design Science Research (DSR) De Villiers and Harpur [8] identifies the common features and contrasts of these two research approaches. Based on that analysis both approaches would be suitable but for the purpose of this study DSR was chosen due to the availability of research guidelines as mentioned by Hevner et al. [15] for guiding the research.

The following steps in the DSR process were followed. Firstly, the literature review was used to do the identification, understanding and motivation of the relevance of the problem. Secondly, the objectives were defined with a focus on the research to solve the problem. Thirdly, the design and development of the artefact were done to solve the problem through knowledge search, using surveys and interviews in the design cycle using an iterative process.

#### 3.2 Research context

The eModerate system is embedded in the eLearn system of MGI. MGI decided to use the eModeration system in the faculties of Information Technology, Creative Arts, Commerce, Social Science, and Science. The electronic moderation system allows the moderator to make use of eAssessment tools, such as free online marking tools that is Internet-based or sticky notes in Adobe to grade the students' examination scripts. After the eModeration, the dean reports back to the lecturer of the module; hence there are three entities involved in the electronic moderation process, namely:

- the dean who arranges that the marked scripts for moderation are uploaded onto the eModerate system, receives the moderation report and provides feedback to the lecturer;
- the eModerator who moderates the marking (acts as a second marker/quality assurer of assessment); and
- the lecturer who originally graded or scored the papers.

#### 3.3 Sampling strategy

All the moderators for modules in both semesters of the Private Higher Education Institution were selected as participants, except for the Law faculty who did not participate in the study. As some moderators are moderating more than one module, the number of moderators and the number of modules do not correspond. Table 2 illustrates the various participants involved in the study, the number of modules in the relevant faculty as well as the number of modules

selected in the study. Table 2 also indicates which faculty deans participated. Theoretical and practical modules were selected with an even distribution over the two semesters.

Table 2. Breakdown of faculties

Faculty	Number of modules	Number of modules moderated in total per faculty and total number of scripts	Percentage of modules used in the eModeration research per faculty
Commerce	83	20 modules and a total of 388 scripts	25%
Social Science	39	15 modules and a total of 111 scripts	38%
Science	39	21 modules and a total of 280 scripts	51%
Creative Arts	44	6 modules and a total of 150 scripts	14%
Information Technology	37	14 modules and a total of 220 scripts	38%

The percentage of modules involved in the Creative Arts is low because the format of the assessments in many modules implies that not all assessments can be moderated electronically. Only four of the five deans were interviewed because the IT dean is one of the researchers.

#### 3.4 Research strategy

The case study in question was conducted over two examination sessions, collecting detailed information using data collection procedures such as interviews with deans and surveys with the deans and eModerators. The interviews were arranged into three sections: biographical information, a survey that gathers information regarding the deans' perceptions of eModeration, and, finally, a structured interview. Open-ended questions, as well as some Likert scale survey items, which are quantitative, were used in the interviews with four deans from four of the six faculties to determine their views on the user experience of the eModerate system and process. The interviews with deans were to determine which user experience constructs would be relevant in the design and development of the artefact from a management perspective. Qualitative data is useful to identify the relevant themes and categories contained [20] since that provides an understanding of a research problem [6, 27]. All the moderators (77) were asked to participate in the study as eModerators, except in modules where it is not possible to use online moderation. A total of 30 moderators responded to the survey by completing the questionnaire that was arranged in five sections as follows:

- A-Biographical data (as well as infrastructure/internet);
- B-Questions on moderation (moderators only);
- C-Questions on usability and design heuristics;
- D-Questions on general interface design heuristics criteria to determine user experience.

The deans also completed the questionnaire: sections A, C and D. Section A concentrated on the users' system, internet and infrastructure in order to determine if it plays a role in their experience. It was not necessary for deans to complete section B because the questions only relate to moderators. Section B focused on gathering information from the moderators such as the number of times they moderated for the institution before and whether it was paper-based or via the eModeration system. Section B also identified the users' perception of the moderation process and

procedures followed to determine if it played a role in their experience. Section C concentrated on identifying the usability constructs and design heuristics associated with user experience for eModeration systems. Section D of the questionnaire focused on the general interface design heuristics criteria to determine user experience, which in turn contributed to the technical eModeration requirements and DSR environment area. Responses from the different sections were analysed to verify and confirm the findings and the responses of the users.

#### 4. FINDINGS

The following section reports back on some of the research findings of the interviews and surveys. The feedback will be given in the following order:

- Interviews with deans.
- Survey with moderators and deans.

##### 4.1 Reflection from qualitative interviews

Faculties experienced the eModerate system differently. For example, the Science faculty had a problem with moderators who did not complete the moderator's report and/or did not upload the report, although enough information was provided to eModerators about the process. The deans of the Social Science and Commerce faculties did not experience any problems either with the usability or the user experience of the system. Three of the deans indicated that they accessed the eModerate system from their work stations with only one dean accessing it from home. An observation from the interviewees was that the bandwidth of the user machine might have a direct correlation to the user experience. The participants, i.e. the deans and eModerators in the research, were, therefore, required to answer questions on their internet access to determine if any correlation exists between the users of the eModerate system (that are internet dependent) and their user experience.

None of the deans has previously used an eModeration system. Before the eModerate system a manual paper-based moderation system was used. The data obtained from the interview with deans indicated that the move from a manual paper-based approach to eModerate is perceived as a positive development; the process is faster and fewer people are involved. In the deans' opinion the internet infrastructure is able to handle the eModerate system, and the process is easier.

During the interview participants were asked to comment on their initial impression of the eModerate page(s) with reference to graphical intensity, likes and dislikes. Interviews were transcribed and themes identified. The deans were not user-experience professionals, and, therefore, the constructs were abstracted and then matched to user experience constructs. For example, the construct of *usefulness* mentioned by the deans relates to *effectiveness* in user experience terms. Table 3 contains some of these themes - that were identified as constructs - with quotes from the different faculties that were extracted after the interviews. In the interviews deans were asked about their overall experience with usefulness, usability, the process, flow of information, control of the system and procedures followed from a management point of view. These constructs were selected based on constructs identified in literature and definitions of user experience.

**Table 3. Constructs abstracted from the interviews with deans**

Faculty	Constructs identified based on quotes and comments by deans
	Usefulness associated with design heuristics to determine user experience
Commerce	I think it is a very useful system.
Social Science	Concern however on graphical intensity of the moderator's green pen, it is difficult to see on screen, maybe a different colour pen should be used.
Science	Potential to be useful. Less chance to misplace examination scripts.
Creative Arts	It is a very useful system, especially the page layout that is clear, and it is quick to find what is needed.
	<b>Usability of the system</b>
Commerce	I think ePortal and the eModeration page colour is consistent, with each other making it very usable.
Creative Arts	The fact that multiple documents can be up-/downloaded makes it a very usable system.
	<b>Ease of use</b>
Social Science	Moderation sending off is easier than manual courier system.
Science	Did not know anything about it and was initially afraid.
	<b>Learnability</b>
Commerce	Clear, easy to understand.
Creative Arts	Page layouts are clear and easy to understand.
	<b>Flow of information</b>
Commerce	Nice flow to process.
Creative Arts	Positive about the fact that you are in control of what is happening in the process and of where information is at what time.
	<b>Efficiency</b>
Social Science	Very impressed with the conduct and speed. Not time consuming.
Science	Should make the moderation process quicker.
Creative Arts	It saves time.
	<b>Process control</b>
Commerce	It made my life easier, it was easier to keep in contact with moderator. It was easier to see how far the moderator is with the moderation process, because I received an email telling me that the moderator uploaded. It is more controllable. A track of the process improved the whole moderation process.
Social Science	More control over bigger packs.
Science	Like to see what moderator is doing; both moderator and dean see the same view which makes it easier to assist with queries.
Creative Arts	The control over the moderation process and moderators empowered the dean with a feeling of being more in control of process. A challenge will however be for people to change the way they work – being more software savvy.

The faculties' deans were in agreement regarding the following advantages: the process is acceptable, effective and efficient. The

findings from the questionnaire corroborate the themes identified by the qualitative data, namely: acceptable, effective and efficient, as shown in section 4.2. A challenge that the deans face is to convince moderators to adapt to eModeration, e.g., not to print the examination scripts but to rather use technology like online marking tools to moderate.

The quantitative results reflected in Table 5 from eModerators were used to confirm the themes identified during the interviews with the deans. This process of triangulation contributed elements to the environment and requirements layers of the user experience framework for eModeration, such as people, organisation, process, procedure, devices and technology needed to ensure satisfactory user experience. Retrospectively, these elements correlate with the literature review and Table 1. In Table 1 specific mention was made to system, context and user. Under the *system* category deans agreed on the functionality, namely the work flow process that is faster; this was then captured in the evaluation framework as eModeration process and procedure A detailed explanation of the levels and constructs (evaluation criteria) of the framework is explained in Table 4 and Table 7. The deans were also in agreement that the infrastructure, devices and technology used are important constructs in the requirement level. The usability goals relevant to eModeration such as effectiveness, efficiency and freedom of control emerged from the interviews as user experience constructs. The usability goals relevant to eModeration were confirmed by quantitative data gathered from eModerators and added to the eModeration user experience level. This will be discussed in the next section.

## 4.2 Reflection on quantitative data

This section reflects on the feedback from the responses of the survey conducted. There may be other interpretations to the responses because it is an interpretative study but due to limited space in the paper not all the data could be presented.

Section A of the questionnaire was used to identify the application domain (environment), the people and the organisation relevant to the design of the artefact which correlates to the first area of the three areas of DSR [15]. The results from Section A were used as input to the environment layer of the designed artefact, by identifying which users need to be involved in the use of an eModerate system, with roles and responsibilities defined. The second construct under the environment level is organization - in this case study Higher Education Institutions as discussed in Table 4.

Section B of the questionnaire was completed only by eModerators to determine their experience on the migration from manual to electronic moderation. Results from Section B were then also used to determine the constructs for an eModerate system requirement level of the artefact. For example, eModerators were asked about the devices they use to access the eModerate system, and they were also asked to indicate the advantages of eModeration compared to the manual paper-based system. The findings from the questions asked in Section B were then triangulated with those from the related interview-question results from deans to determine the application domain (eModeration) and eModeration requirements needed for the user experience evaluation framework. The eModeration process and procedure findings were then used to identify the requirement level constructs.

**Table 4. Environmental and requirements level explained**

<b>Environment Level</b>	
People	<p><b>ROLES:</b></p> <p><b>Managers/deans:</b> To identify eModerators for respective modules. To provide information needed for eModeration to eModerator system operator.</p> <p><b>eModerator system operator:</b> To control the process of creating pages, access, security and navigation.</p> <p><b>eModerator:</b> The eModerator role will be to agree to work with the eModerate system and moderate examination scripts electronically.</p>
	<p><b>RESPONSIBILITIES</b></p> <p><b>Manager/dean:</b> To communicate to the eModerator system operator a list of all eModerators.</p> <p><b>eModerator system operator:</b> To create eModerate pages for each module and assign secure access rights to eModerators. This person is also responsible to upload information needed for eModeration.</p> <p><b>eModerator:</b> Responsible to download scripts and eModerate the examination scripts. After eModeration (s)he uploads the electronic scripts back onto the system.</p>
Organisation	<p><b>HIGHER EDUCATION INSTITUTION</b></p> <p>In the current application domain and for the purpose of this study a Private Higher Education Institution has been used in the first design and development of the framework.</p>
<b>eModertaion Requirements Level</b>	
Process	<p><b>ACCESSING THE PLATFORM</b></p> <p>The process of assigning and awarding secure access for the relevant people to the eModerate pages per module. Creating appropriate login pages.</p>
	<p><b>UP-/DOWNLOADING</b></p> <p>The process followed to up-/download examination papers, memorandums, reports and examination scripts for moderation and after moderation the back-up load of eModerated scripts and feedback reports.</p>
Procedure	<p><b>eModerate</b></p> <p>The eModeration procedure determined by the institution to be used and followed.</p>
	<p><b>FEEDBACK</b></p> <p>The procedure to follow when providing feedback.</p>
eModeration	<p><b>NETWORK INFRASTRUCTURE</b></p> <p>One of the requirements of the eModerate system would be to ensure appropriate network infrastructure for satisfactory user experience.</p>
	<p><b>SERVICE QUALITY</b></p> <p>The level of service and the quality will also contribute to the user experience.</p>
	<p><b>SUPPORT</b></p> <p>Enough support from the eModerate system operator is needed by managers and eModerators to ensure satisfactory user experience.</p>
	<p><b>SECURITY</b></p> <p>The eModerate system needs to be secure and not accessible by people that are not allowed onto the system.</p>

Devices	<b>TYPES</b>
	Users can complete the eModeration process using tablets, PCs or laptops of their choice as long as it is cross platform.
Technology	<b>SOFTWARE</b>
	Moodle has been used as a software package in the case of MGI.

The internal consistency of participants' responses to items relating to the same construct were assessed by Cronbach's alpha. The reliability refers to the way the instrument measures the consistency of the instruments' measurements under similar conditions. Response values higher than 0.8 were accepted as good reliability, while values between 0.6 and 0.8 were accepted as reliable. The internal reliability was determined and used to identify the constructs needed in the design and development of the artefact's different layers.

A second test was used to measure and confirm reliability of constructs. This method is called factor-based score, taking the average of the items. The items with an average above three were selected for inclusion as constructs. The items were found to be reliable, therefore a single score for each construct was used (the average of the individual items/statements).

A Likert scale from 1 – 5 was used. The scale of the individual questions which form the constructs is stated as follows: strongly disagree SD = 1, disagree D = 2, neither agree nor disagree N = 3, agree A = 4, strongly agree SA = 5. The items with an average above 3 were selected for inclusion as constructs.

Items were also analysed to assess the reliability of the different constructs measured in the questionnaire between sections C and D. Specific questions on eModeration requirements in Section B, questions 14.1 to 14.5 were compared to specific eModeration requirements questions in Section E to determine the internal consistency of scale by using Cronbach's alpha. For example, reliability estimates were 0.78 for responses to "Satisfaction", which indicated acceptable reliability. The mean of the construct "Satisfaction" is 3.79 with a standard deviation of 0.72. This means that the satisfaction score ranges between Neutral to Agree. The construct score for "Satisfaction" were calculated by taking the average of the items, for example "Satisfaction" score = (C54+C55+C56+C57)/4.

Section C of the questionnaires was used for the identification and confirmation of constructs, and to determine the role of usability in the design heuristics of the user experience of eModeration. Section D of the questionnaire focused on the general interface design heuristics criteria to determine the user experience, which in turn contributed to the technical eModeration requirements and DSR environment area. Table 5 provides some feedback on the impressions of the users of the eModerate system, where the results reflect that the process, procedures and overall experience of devices and technology are satisfactory. Items with an average from three (neither agree nor disagree) to five (strongly agree) were selected for inclusion as constructs. The findings in Table 5 confirm that the eModerators also agreed with the flexibility and efficiency of use of the system.

**Table 5. eModerator's impression of the eModerate system**

Variable	Items Construct	SD	D	N	A	SA
<b>Flexibility and efficiency of use</b>						
D21	Content clear	0%	5%	14%	52%	29%
D22	Flow of process	0%	0%	19%	52%	29%
D23	Upload process efficient	10%	0%	19%	33%	38%
D24	Download process efficient	5%	0%	19%	33%	43%

Based on the findings of Table 5 the constructs of overall experience, content, navigation and functionality were added to the framework's user experience level. It can also be concluded that the environment and requirement level contributes to the user-experience and should be in place for the success of the user experience level of the evaluation framework for eModeration, as demonstrated by findings and supported by literature from Roto [31] as well as Hassenzahl and Tractinsky [14]. The identified environment and requirement levels of the framework are explained in Table 4.

The deans' and eModerators' perspectives on whether it is a time consuming process are, however, contradicting. As reflected in Table 3, deans from three faculties experienced the use of the eModeration system as faster and not time consuming, and they were impressed with the speed of the system. However, the eModerators' other comments contradicted the deans' perceptions – 48% of the eModerators perceived the process and use of the system as time consuming. A possible reason for this discrepancy can be the roles fulfilled by the two different role players. eModerators have to complete more tasks than deans in an eModeration environment. The eModerator has to download the scripts in order to work on the script by grading it electronically before uploading it back onto the system again. The dean only has to upload the initial script and download the final moderated script. Internet bandwidth can also play a role, but the results to determine if there is a correlation between bandwidth issues were also captured and showed no significance. The distribution reflects the eModerators' and deans' perception on constructs that should form part of the framework (values above 50% were included).

The reliability of entire sets were also determined for B14.1-B14.5 – eModeration requirements, C37-C40 – effectiveness of task, C41-C45 – efficiency of resources and C54-C57 – satisfaction, using Cronbach alpha values as demonstrated in Table 6. For example C41-C45 was compared to E21.8 – effectiveness – and B14.1-B14.5 to determine the reliability of constructs in the eModeration requirements level in the artefact.

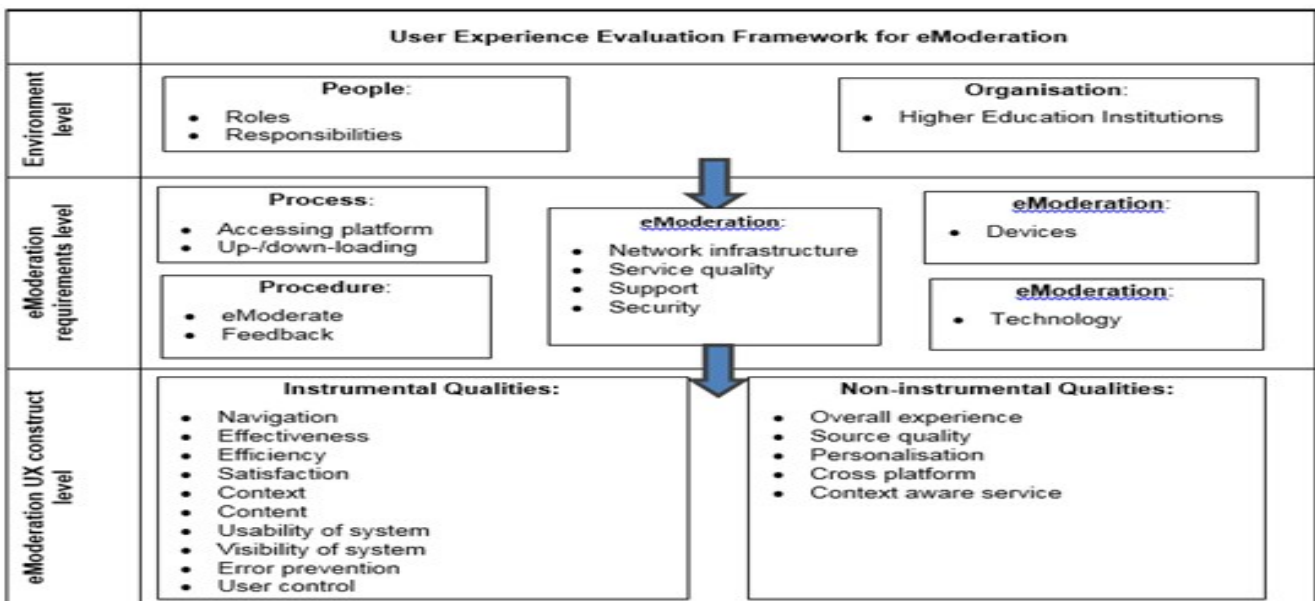
**Table 6. Reliability of constructs using Cronbach alpha**

Reliability B14.1-B14.5 eModeration requirements	Entire set 0.8795 $\alpha$
B14.1 It is a positive development.	0,8361
B14.2 The process is faster.	0,8429
B14.3 Fewer people will be involved.	0,8811
B14.4 My Internet infrastructure is able to handle the eModerate system.	0,8854
B14.5 The process will be easier.	0,8162

Construct	Mean	Std Dev	N	Reliability
eModeration requirements	3,944	0,878	30	Good
<b>Reliability C37-C40 Effectiveness of task</b>				<b>Entire set 0.8612 <math>\alpha</math></b>
C.37 The eModerate website enables participants to moderate the module(s)				0,8335
C.38 The eModerate system uses less time for moderation than the manual system				0,8171
C.39 The eModerate website allows access to the documents needed to complete the moderation task (e.g. memorandum)				0,8658
C.40 The eModerate system allows participants to get the job done				0,7617
Construct	Mean	Std Dev	N	Reliability
Effectiveness of task	3,931	0,804	34	Good
<b>Reliability C41-C45 Efficiency of resources</b>				<b>Entire set 0.7801 <math>\alpha</math></b>
C.41 Once participants have learned how to use an eModerate system, they can sustain a high level of productivity to carry out their tasks.				0,6299
C.42 The eModerate system shortens the time spent completing the entire moderation process compared to the manual paper-based moderation process.				0,7367
C.43 The eModerate system's Internet resource requirement is a consideration.				0,7615
C.44 The eModerate system requires no transport resources (e.g. examination script moving around between moderator and campus).				0,7767
C.45 The email that is generated after assessments have been uploaded is sufficient notice for the process to continue.				0,7640
Construct	Mean	Std Dev	N	Reliability
Efficiency of resources	4,1455	0,6372	34	Acceptable

Figure 1 illustrates the first presentation of the user experience evaluation framework for eModeration.

**Figure 1: User Experience Evaluation Framework for eModeration**



On the environment level of the evaluation framework the environment includes people with roles and responsibilities as well as an organization in the domain of Higher Education Institutions. The people involved in an eModerate system are eModerators, deans or managers involved in examination moderation and system operators as explained in Table 4.

The middle level of the framework pertains to the eModeration requirements that are identified in correlation with what is needed for a system to function effectively and to ensure good user experience. The eModeration requirement level addresses the questions identified in Table 1 associated with the system, such as functionality, time, workflow, system characteristics, process and procedures, devices and which technology platform is needed to ensure good user experience.

The last level of the evaluation framework includes the user experience constructs needed to ensure satisfactory user experience by users in the domain of eModeration, as the users' perception of instrumental qualities (objective – usability) and the users' perception of the non-instrumental qualities (subjective – user experience components) also impact the user experience evaluation criteria. Table 7 reflects the user experience constructs identified for the user-experience evaluation framework for eModeration.

**Table 7. eModeration user experience constructs**

eModeration user experience components	
Instrumental Qualities	<b>Navigation</b> Navigation, accessibility and ability to accomplish task forms part of the usability goal associated with user experience.
	<b>Effectiveness</b> The users of the eModerate system experienced the system as effective, it enables users to eModerate papers, it uses less time than the manual system, and it allows users access to information to complete the task.
	<b>Efficiency</b> The users experienced the system as efficient because they could sustain a high level of productivity, complete the task in a shorter time frame, no transport arrangements were needed and the uploading notification assisted all users in the control of the process, as shown in data and supported by literature.
	<b>Satisfaction</b> The eModerate users' satisfaction levels when interacting with the product are influenced by the product qualities: utility,



	usability, and visual appeal. The satisfaction levels are also influenced by stimulation of the product use and quality perception by users. The results proved that the users are satisfied with the eModerate system.
	<p style="text-align: center;"><b>Context</b></p> <p>Literature indicated that context also refer to the environment in which the user operates and that organizational settings also affect the activity. Infrastructure, services, people and technology will also contribute to the interaction in context. Context was also identified as a necessary construct for the framework.</p>
	<p style="text-align: center;"><b>Content</b></p> <p>Content refer to the clarity and easy navigation of information of the user with their interaction with the system. Content also refers to providing the appropriate comprehensive and accurate information. As indicated by data and literature content plays an important role in eModeration.</p>
	<p style="text-align: center;"><b>Usability of system</b></p> <p>The users agreed that the system should be usable; otherwise they will revert back to the manual paper-based moderation process.</p>
	<p style="text-align: center;"><b>Visibility of system</b></p> <p>The appeal of the system is seen as a non-instrumental quality and was identified as a construct for eModeration.</p>
	<p style="text-align: center;"><b>Error prevention</b></p> <p>When designers design eModerate systems it is important to take into consideration how users will be able to recover from errors or how to prevent errors.</p>
	<p style="text-align: center;"><b>User control</b></p> <p>The deans were particularly in favour of the control that the user has over the process of eModeration.</p>
Non-Instrumental qualities	<p style="text-align: center;"><b>Overall experience</b></p> <p>It is important that the users' overall interaction with the system be positive to contribute to a positive user experience. The overall experience by the users of the system were positive.</p>
	<p style="text-align: center;"><b>Source quality</b></p> <p>The quality of the information provided as well as the source is also very important to the users of eModerate systems.</p>
	<p style="text-align: center;"><b>Personalization</b></p> <p>The eModerators indicated that they appreciated the personalization of the pages, for example they could see that they are logged in as users.</p>
	<p style="text-align: center;"><b>Cross platform</b></p> <p>It is very important that eModerators are able to access the eModerate system using different platforms and different devices.</p>
	<p style="text-align: center;"><b>Context aware services</b></p> <p>Data also demonstrated that the users should be made aware of the services that the eModerate system offers.</p>

It is worth noting that effectiveness and efficiency as discussed in Table 7 above are seen as instrumental qualities that are associated with the design process that will impact on the user's emotional reaction [14, 21, 25, 39, 43]. It is also important to consider how usability attributes can contribute to positive user experiences.

## 5. CONCLUSION AND RECOMMENDATION

This research investigated what an appropriate framework for measuring the user experience in using an eModeration system would be, by using a design science methodology. The initial constructs of the framework were abstracted from a literature study on user experience and then synthesized with contextual factors from the Private Higher Education Institution in South Africa,

chosen as the application context. Based on these constructs and existing user experience questionnaires a new questionnaire was developed and tested during interviews with deans and a survey with moderators and deans.

The analysis of the interviews with the deans supported the usefulness of the eModeration system and validated the constructs of fluidity of interaction and progress. It is important to note that this is a managerial view and that the objectives and functionality are different from the eModerators' perspectives. New constructs added from eModerators' perspectives are effectiveness and efficiency. The analysis of the survey with the moderators confirmed the ease of use, usefulness, effectiveness and functionality of the eModeration system.

The theoretical contribution is an updated set of constructs towards a framework for measuring the user experience in using an eModeration system. The practical contribution is the practical issues uncovered in introducing an eModeration system at a Higher Education Institution. Further research is necessary to evaluate the framework as comprehensive and complete in presenting the constructs that determine the user experience in eModeration and also to indicate how the constructs relate to the different role players. Given the fact that eModeration is an emerging technology but not yet widely used this research is relevant and timely towards renewing ICT teaching and learning.

## 6. ACKNOWLEDGMENTS

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