Exploring the Factors Affecting the Adoption of E-Assessments among the Computer and Information Science Programmes in a Higher Education Institution in the Middle East (HEIME)

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This thesis results entirely from my own work and has not been offered previously for any other degree or diploma.

Signature Nafeth Al Hashlamoun. .....

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I. Abstract

The rapid development of Information and Communication Technology (ICT) opened up new possibilities for teaching and assessment practices in higher education. This has encouraged educational institutions worldwide to change assessment format from paper-based to computer-based assessments. In the higher education context, teachers' behavioural intention to adopt e-assessments is affected by a number of factors. The literature in the field of e-assessment adoption suggests that there is a need to better understand and conceptualise e-assessment adoption and the range of behavioural factors influencing e-assessment adoption decision-making in higher education. This study aims to address that need.

The study employed an exploratory sequential approach with mixed methods. It utilised both qualitative and quantitative research methodologies to meet the research aim: to investigate the e-assessment adoption process and related experiences and evaluations as reported by Computer and Information Science (CIS) teachers at a higher education institution in the UAE. The investigation was performed via proposing, designing, testing and developing a conceptual model for e-assessment adoption, building on the chosen most relevant ICT innovation adoption models (TRA[1], TPB[2], TAM[3], and UTAUT[4]), commonly known in the field of CIS.

[1] Theory of Reasoned Action Model (Fishbein & Ajzen, 1975)

[2] Theory of Planned Behaviour Model (Ajzen, 2002)

[3] Technology Acceptance Model I and II (Davis, 1989)

[4] Unified Theory of Acceptance and Use of Technology Model (Venkatesh, Morris, Davis, and Davis (2003)

The study found that the CIS teachers' behavioural intention to adopt e-assessments depends primarily on the technology-assessment fit, the perceived usefulness, and the social influence. It was also discovered that the perceived self-efficacy has a negative impact on computer anxiety, and at the same time, it has a positive impact on perceived ease-of-use. Furthermore, it was found that the perceived ease-of-use and the facilitating conditions have a positive impact on behavioural intention. However, the impact of those two factors is not as significant as the other factors (technology-assessment fit, perceived usefulness, and social influence).

II. Contents

III. Acknowledgements

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Thank you very much each and every one!

Nafeth Al Hashlamoun.

IV. List of Abbreviations

AVE	Average Variance Extracted
BI	Behavioural Intention
CA	Computer Anxiety
CAA	Computer-Assisted Assessments
CBA	Computer-Based Assessments
CB-SEM	Covariance-Based Approach
CIS	Computer and Information Science
DoI	Diffusion of Innovation
EE	Effort Expectancy
FC	Facilitating Conditions
HE	Higher Education
HEI	Higher Education Institution
HEIME	Higher Education Institution in the Middle East
ICT	Information and Communication Technology
IRB	Institutional Review Board
LV	Latent Variable
MMPR	Mixed Methods Phenomenological Research
MV	Measurement Variable
OLS	Ordinary Least Squares
PBC	Perceived Behavioural Control
PE	Performance Expectancy
PEoU	Perceived Ease-of-Use
PLS	Partial Least Squares
PLS-MGA	Partial Least Squares Multi-Group Analysis
PLS-SEM	Partial Least Squares Structural Equation Modelling
PSE	Perceived Self-Efficacy
PU	Perceived Usefulness
Q^2	Cross-Validated Redundancy
R^2	Coefficient of Determination
SEM	Structural Equation Modelling
SI	Social Influence
SN	Subjective Norm
TAF	Technology-assessment fit
TAM	Technology Acceptance Model
TAM II	Technology Acceptance Model II
TPB	Theory of Planned Behaviour

TRA	Theory of Reasoned Action
TTF	Task-Technology Fit
UAE	United Arab Emirates
UTAUT	Unified Theory of Acceptance and Use of Technology
VIF	Variance Inflation Factor
VoU	Voluntariness of Use

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Chapter 1 Thesis Overview and Background

This chapter introduces the research and the reasons behind the researcher's interest in e-assessments that can benefit a wider research and practitioner community. The research was conducted at one of the higher education institutions in the Middle East. As requested by the ethical research committee in this higher education institution, it will be referred to as the Higher Education Institution in the Middle East (HEIME), colleges in the United Arab Emirates (UAE). This chapter starts by explaining the need, the significance, and the envisaged impact of the study, followed by an explanation of the research aims and epistemology. Some details about the theoretical framework, the research questions, and the research design are also provided in the subsections of this chapter, further elaborated in the chapters to follow.

1.1: The Need for This Research

The fast evolution of Information and Communication Technology (ICT) opened up new possibilities for teaching and assessment practices in higher education (Clariana & Wallace, 2002). This has encouraged educational institutions worldwide to change assessment format from paper-based to computer-based assessments. In line with this trend, and in accordance with their strategic planning, the Higher Education Institution in the Middle East (HEIME) colleges in the United Arab Emirates (UAE) have reviewed their programmes. Upon the review, the new assessments policy is to centralise as many assessments as possible, and to shift all assessments from paper-based to electronic-based by the end of 2014. All CIS teachers in the HEIME colleges were obliged to follow the central e-assessments policy in order to meet with the

requirements of the new institutional policies. Such a shift is seen as an innovation turn in teacher practice.

A major challenge facing e-assessment adoption is the scarcity of research aiming to identify a comprehensive list of behavioural constructs linked to e-assessment adoption. Many studies adopt different theoretical approaches with regards to technological innovation. However, no study before this one has bridged together and developed the most prominent innovation adoption models as linked to e-assessment adoption process. It can be argued that a number of significant gaps still exist even with the substantial effort and attention that has been devoted to ICT adoption research. The study conducted by Terzis and Economides (2011) is one of the very limited studies that were conducted aiming to build a model that is related to an e-assessment adoption. It demonstrates the constructs that affect students' behavioural intention to use computer-based assessments. Additionally, Imtiaz and Maarop (2014) stated that the majority of technology adoption studies in the education area have been on e-learning and very few on e-assessment. They also noted that the oldest study on e-assessment adoption was done in the year 2011, which shows that the adoption and diffusion of e-assessments is still understudied. Furthermore, this reveals a lack of research in this area, proving the novelty of this research both on national and international levels. Additionally, the authors stated that all the studies on e-assessment acceptance focus mainly on students. They believe that there is a need to conduct more research that focuses on teachers.

In another call for researching e-assessments, Iskander (2013) declares that despite the potential of the e-learning initiatives to enrich learning and education, their results would not be realised if teachers, students, and education institutions do not use them

efficiently and effectively. Directly related to this research is the belief of the author of the above-listed study that "universities in the Middle East are still at a fundamental stage of adopting and implementing e-learning despite the plentiful factors that suggest e-learning as a support tool capable of enhancing the process of learning" (p. 1). Moreover, Iskander (2013) declares that unstable strategies for e-learning have existed in most of the Middle Eastern universities. Therefore, this study is timely, and it will add to the under-researched area of e-assessment adoption, both in the local context of the research and in general.

More specifically, the study aims to examine which factors and to what extent each of these factors influences the e-assessment adoption decision-making by CIS teachers. These factors are explored and identified, building on the factors identified within the most relevant technology adoption models.

In the context of this study, the definition of e-assessments comprises both Computer-Assisted Assessments (CAAs) and Computer-Based Assessments (CBAs) used in different Computer Information Science (CIS) courses. CAAs refer to the use of any computing device within the assessment process; the role of the computing device may be extrinsic or intrinsic. When using CAAs, the actual evaluation of students' responses is not done entirely by a computer. Instead, the computer role is simply facilitating taking the examination and mediating between students and the human evaluator (Bull & McKenna, 2004). On the other hand, CBAs refer to assessments that are developed in a way that enables teachers to author, schedule, control, deliver, and create reports on these assessments. The use of a computer is always intrinsic to these types of assessments. The key factor for CBAs is that the computer is grading or evaluating the responses provided by students (Conole & Warburton, 2005).

The empirical investigation was carried out through analysing the experiences and perceptions of a number of teachers who have used e-assessments while teaching CIS courses via an initial exploration of teachers' perceptions, which informed the design of a conceptual framework, followed by the framework evaluation with the teachers.

1.2: Rationale Behind Research Aims and Research Epistemology

The main aim of this study is to develop a conceptual framework for exploring CIS teachers' e-assessment adoption, building on the existing four models for ICT innovation adoption that are: (1) Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975); (2) Theory of Planned Behaviour (TPB) (Ajzen, 2002); (3) Technology Acceptance Model (TAM) (Davis, 1989); and (4) Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). These are the most influential adoption theories that were used to explain individuals' intention to adopt ICT (Korpelainen, 2011). Therefore, this study only focusses on the four models listed above. Further discussion with regard to the rationale behind the choice of these models is found in Section 2.2 in Chapter 2 (Literature Review).

When studying technology innovation, it is hard to choose only one model. According to Dillon and Morris (1996), each of the current ICT adoption models offers something to our understanding of technology adoption and user acceptance. At present, there appears to be little hope for an overarching model-based theory that will comprise both the clarification and the prediction of user acceptance, together with offering the techniques for ensuring that any design process leads to an acceptable product. For example, the DoI (Diffusion of Innovation) theory provides a general framework that can be used to model the social impact of a technology (Dillon & Morris, 1996). However, it can only help us understand the characteristics of those groups who will

adopt a particular technology. In addition, foreseeing how any one group or user will accept a new technology is not the strength of DoI, and this question is better tackled within the specific decision-making framework provided by another adoption model like TAM (Technology Acceptance Model) (Davis, 1989). On the other hand, computerised systems like e-assessments are used by a specific user group. Thus, DoI and TAM models cannot fully reflect teachers' motives and inhibitors to use e-assessments, requiring a search for additional intrinsic motivation factors[5] (Ong, Lai, & Wang, 2004). As a result, combining theories through the development of a broad and comprehensive list, using the constructs of related technology adoption theories, is a good approach to identify the most influential factors for e-assessment adoption.

The way the researcher has chosen to conduct his study reflects his epistemological and ontological positions relying on his personal understanding of pragmatism. The philosophy of pragmatism is an epistemological position that is not committed to any one system of philosophy and reality. It focuses on the outcomes of research and the solutions to problems. As a pragmatist, the researcher sees that it is perfectly possible to work with both the positivist and the interpretivist research philosophies in this study[6]. This reflects the research methodological choice adopted in this study that is mixed methods.

The type of mixed methods used in this study is Mixed Methods Phenomenological Research (MMPR). According to Mayoh and Onwuegbuzie (2015), MMPR is a research that combines phenomenological methods with other methods grounded in a different paradigm within the same study. Accordingly, Phenomenology was chosen to

[5] Details about the limitations of the TRA, TPB, and UTAUT models, and why we cannot depend on them to understand the adoption of e-assessments are provided in Section 2.2 of Chapter 2.
[6] Further discussion about research philosophies is provided in Section 3.2 of Chapter 3.

analyse the qualitative data in this study, as it gives emphasis to the existence of the individual human being, coupled with his or her own consciousness. This draws attention to individual and collective subjective experience as a source of all knowledge of objective phenomena. This perspective reflects the position expressed by Husserl (1931) who established the school of phenomenology. Phenomenology is the study of "phenomena". It studies conscious experience as felt from the subjective point of view. Thus, in this study, the researcher is primarily interested in the meaning of a phenomenon as lived and reported by the participants. Overall, the study explores the teachers' awareness of the phenomenon under investigation, which is the use of e-assessments (CBAs and CAAs).

1.3: Significance and Envisaged Impact

This research adds to the body of literature by further investigating and reflecting on the teaching experiences of CIS teachers in relation to CBAs and CAAs, building on some of the most influential theoretical models of technology adoption. As mentioned earlier in this chapter, according to Terzis and Economides (2011), there is a gap in the scholarly literature related to e-assessment adoption models. They claim that there are no studies on acceptance of computer-based assessments (CBA). Furthermore, Imtiaz and Maarop (2014) conducted a detailed review of the technology acceptance research in the area of education. They found that the majority of technology adoption studies in education have been on e-learning and very few on e-assessment. They also noted that the oldest study on e-assessment adoption was done in the year 2011, which shows a lack of research in this area. Additionally, the authors stated that all the studies on e-assessment acceptance focus on students. Further contributing to the rationale for this study, Imtiaz and Maarop (2014) add that "e-assessment is the future of assessment and

an area which has been left out by researchers; hence more research should be carried out in e-assessment field" (p. 31).

The current study highlights the key elements that should be considered before the development and the implementation of e-assessments. To improve the acceptance of e-assessments, it is essential to understand the theoretical variables of the synthesised model. Exploring the factors that influence teachers' use (or lack of use) of e-assessments is critical to the successful design and implementation of e-assessments across international institutions of higher education in general and the UAE in particular.

The findings of this study will provide a space and time for reflection on the factors influencing and hindering the adoption of e-assessments. Additionally, they are anticipated to have a significant value to the research community, lecturers, educational institutions, and e-assessment solution providers. The proposed e-assessment adoption model can also improve the e-assessments solution providers' understanding of why some teachers choose to adopt e-assessments, while others do not. It is also expected to help educational institutions develop suitable professional development plans related to the use of e-assessments.

1.4: Context and a Brief Overview of the Research Project

The system of the Higher Education Institution in the Middle East (HEIME) is an educational community of approximately 2,000 staff and 20,000 students based on seventeen modern, technology-enhanced men's and women's campuses all over the United Arab Emirates (UAE). HEIME is the largest higher education institution in the UAE, fostering innovative and hands-on teaching and learning methodologies which

are based on the philosophy of Learning-by-Doing. HEIME offers many different, English language-taught, work-relevant degrees via different programmes, such as Computer and Information Science (CIS), Business, Applied Communication, Engineering Technology, Health Sciences and Education at various levels. These seventeen campuses follow the same policies directly mandated by HEIME's central services. The focus in this study will be on the CIS faculty members who can best inform the questions of this study.

1.5: Research Questions

The literature review conducted shows that there is a gap in the scholarly literature related to e-assessment adoption. This is the reason that encouraged the researcher to conduct this study. The aim of this research is to explore, describe and analyse the perceived factors affecting the adoption of e-assessments among the CIS programmes in the HEIME colleges. To accomplish this purpose, the researcher used the most influential adoption models (TRA, TPB, TAM, and UTAUT) as the base models, and then some constructs were removed and others were added to expand the base models as per the context of the study.

Two primary research questions and several subordinate questions were chosen to guide the design and implementation of this study. Further rationale behind the research questions is provided in the literature review chapter that follows. The goal was to explore the phenomenon of using e-assessments to test students' work in CIS courses from multiple perspectives; in particular, those of the CIS teachers from the seventeen HEIME colleges. The primary research questions and related sub-questions are:

Question 1 ***"What are the factors that influence the CIS teachers' choice to adopt e-assessments on the HEIME campuses?"***

The related sub-questions are:

1.1. What are CIS teachers' perceptions of e-assessments?

1.2. What are the factors that positively influence the CIS teachers' choice to adopt e-assessments in the HEIME colleges? In other words, what are the enablers of e-assessment adoption in the context of this study?

1.3. What are the factors that negatively influence the CIS teachers' choice to adopt e-assessments in the HEIME colleges? In other words, what are the disablers of e-assessment adoption in the context of this study?

Question 2 ***"What e-assessment model and what constructs can be suggested after investigating the factors of CIS teachers' e-assessment adoption and evaluation of the models?"***

The related sub-questions are:

2.1. How do teachers evaluate the unification of the existing models to explain and help them with e-assessment adoption?

2.2. What model conclusions and suggestions can be drawn on the final unified model based on teachers' opinions?

1.6: Research Design Strategy

This study employed the exploratory sequential research design strategy using mixed methods in which the researcher followed Creswell's (2012, pp. 542-544) recommendation. The researcher carried out the data collection and analysis into two phases, with the collection and analysis of the qualitative data occurring before the collection and analysis of the quantitative data. By employing this research design

strategy, the study started with the first phase which was intended for an e-assessment adoption theoretical model generation. In this phase, the qualitative data were collected to recognise the CIS teachers' views and feelings towards the adoption of e-assessments, and then he used that as the basis for putting together a theoretical model that represents the data collected during this phase. In the second phase, the researcher adopted a descriptive research design, which involved correlation analysis to describe the causal relationships[7] between the latent variables of the model that was constructed in the first phase. The mixed-method design was chosen after an intensive research that was conducted to identify convincing reasons for mixing quantitative and qualitative methods within this study. More details about the mixed method design, and the reasons for mixing qualitative and quantitative methods in this study are provided in Chapter 3.

1.6.1: Participants and Sampling

The first phase of this study involved qualitative data collection in which the researcher used purposeful random sampling to identify the participants who were interviewed (Suri, 2011). 'For many audiences, random sampling, even of small samples, will substantially increase the credibility of the results' (Patton, 2002, pp. 240-241). The researcher identified the CIS faculty members who could best inform the questions of this study, and then randomly selected fifteen faculty members from this pool for in-depth discussion. This is consistent with Creswell's (1998, p. 64) suggested range of participants. Creswell stated that phenomenological studies could be based on samples that range between five to twenty-five participants.

[7] This statement and all other statements relating to causality refer to causality identified with previous published models, rather than to factors associated with practice that this study explores.

The second phase involved quantitative data collection in which the researcher tried to obtain responses from all individuals in the targeted population, which is all the CIS teachers in the HEIME. All CIS teachers were contacted and asked to complete the online survey. The targeted number of participants was simply all the individuals in the target population who are 142 CIS teachers.

1.6.2: Researcher-Participants Relationship

The knowledge of and bias regarding the topic can influence the interview and the analysis of the data collected (Creswell, 2012). The researcher's professional experience includes serving as one of the CIS teachers in the HEIME system. Hence, he had a good working relationship with most of the potential research participants. The researcher ensured that the relationship between him and the research participants was a positive and ethical relationship. An introduction meeting was held with each potential research participant one week before the actual interview. The researcher used this introduction meeting as a chance to establish trust with the research participants, go over ethical considerations, complete consent forms, and explain the aim of the research.

1.7: Theoretical Framework

The type of mixed methods used in this study is the Mixed Methods Phenomenological Research (MMPR) (Mayoh & Onwuegbuzie, 2015). It uses the "PHEN → quant" model in which phenomenological data are collected in the first phase. The qualitative methods used in the first phase set the stage for quantitative research used to test theories developed during the phenomenological inquiry (Robbins & Vandree, 2009). The use of MMPR does not constitute a theoretical framework because it is not a theory

that can itself provide a conceptual lens for the study. However, phenomenology by itself represents an important theoretical framework. This theoretical framework was the basis for the collection and analysis of qualitative data through the use of semi-structured interviews. This is explained in Chapter 4 (Qualitative Study).

Moreover, there are a number of theoretical models that this study focused on. These theoretical models are: TRA, TPB, TAM, and UTAUT which were described in Section 1.2. Another theoretical model used in this study is the Task-Technology Fit (TTF). This model refers to the concept that individuals' level of adopting of technology is based on the suitability between the technology characteristics used and the required task. This theoretical model is further explained in Chapter 4.

The theoretical models listed above were used thoroughly in the qualitative phase of this research. In this phase, the researcher examined which of these theoretical models' constructs the CIS teachers recognise and relate most to their practices in e-assessments using phenomenological questions. The reason for doing that was to identify the most influential factors for e-assessment adoption. This was achieved by bringing the most influential theoretical models together and asking teachers to evaluate their applicability and relevance to e-assessments.

1.8: Overview of the Thesis

The following is an overview of the chapters that construct the rest of this thesis.

- Chapter 2 provides an overview of relevant literature. This is related to existing literature on e-assessment studies, literature on ICT innovation adoption models, and literature on e-assessment adoption models.

- Chapter 3 explains the research philosophy, approach, design and methodology used in a further detailed and comprehensive way.
- Chapter 4 explains the qualitative part of this study. It shows how data were collected and analysed. It also reports the development of the conceptual framework that was discovered earlier on a smaller sample before carrying out the quantitative study.
- Chapter 5 focuses on the quantitative part of this study. It analyses the outcomes of testing the hypotheses proposed in Chapter 4 (Qualitative Study).
- Chapter 6 concludes the research and provides a summary of the research findings in relation to the research questions. This is followed by a list of the theoretical and practical implications of the study. This chapter finally concludes with a reflection on the research and list of limitations of the adopted approach.

Chapter 2 Literature Review

This chapter reviews the literature that informs this research by exploring e-assessment as an ICT innovation practice. The chosen scope of the literature review is as follows:

1. An overview of existing literature on e-assessment studies,
2. Theory-informed ICT innovation adoption models,
3. Existing literature on e-assessment adoption models,
4. Other perspectives on teacher use of technology and assessments.

Reviewing and summarising the existing literature on these three areas is relevant in a number of ways, since it supports: (1) the identification of currently under-explored research issues; (2) the selection of technology adoption models appropriate for this research investigation; and (3) the formation of research methodology and questions.

This will be further explored and justified in the following sections.

2.1: An Overview of Existing Literature on E-assessment Studies

The fast evolution of ICT in the field of teaching and learning opened up new possibilities for delivering learning content and examinations. Consequently, e-assessments attracted the attention of academic institutions, pedagogues, and practitioners who are intrigued by their benefits and advantages. This has encouraged educational institutions to change from paper-based to computer-based assessments (Baleni, 2012; Clariana & Wallace, 2002; Deutsch, Herrmann, Frese, & Sandholzer, 2012; McCann, 2009).

Assessments using information and communication technologies are nowadays known as e-assessments. This involves the entire assessment process, from designing assignments to storing the results with the help of ICT (JISC, 2007). These e-

assessments can be used for both formative and summative purposes. Summarising student accomplishments by making a decision or finalising a grade is called summative assessment. Whereas, formative assessments are conducted during the learning process in a course. It normally aims at supporting students' learning by providing them with feedback on their progress (Stödberg, 2012).

Many articles have explored the teaching experiences of teachers using computer-based assessments. For example, Clariana and Wallace (2002) conducted a study to compare between computer-based and paper-based test modes where they investigated the following factors: *computer familiarity, content familiarity, technical competitiveness,* and *gender.* They found that *competiveness, gender* and *computer familiarity* do not affect performance, whereas *content familiarity* had a noticeable effect. These factors are taken into account to inform the research questions.

2.2: ICT Innovation Adoption Theoretical Models

In order to figure out which factors affect the CIS teachers' acceptance and intention to use e-assessments, the researcher reviewed the ICT innovation adoption through examining the motivations and hurdles of ICT adoption in general.

In their comprehensive review of literature, Williams, Dwivedi, Lal, and Schwarz (2009) have explored the theories and theoretical models used in the adoption and diffusion of many systems and technologies in different contexts and geographical locations. This extensive review shows that a significant, nonetheless diverse, body of theoretical and empirical investigations has been conducted to examine the adoption and diffusion of ICT innovations.

In order to provide an overview of the current state of ICT adoption research, Williams et al. (2009) conducted a systematic and comprehensive review of 345 papers appearing across 19 different peer-reviewed journals during a period of 22 years. They found that these papers have used 51 theories. The Technology Acceptance Model (TAM) (Davis, 1989) was found to be the most popular theory where 88 (29% of the total) employed it, followed by the Diffusion of Innovation (DoI) theory (Rogers, 2003), which was used in 49 (16.3% of the total) publications. The third most popular model used was the Theory of Planned Behaviour (TPB) (Ajzen, 2002) as it was utilised in 17 studies, followed by Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), which was used in eight studies only. Another 48 theories and 182 theoretical constructs were recorded from a variety of other studies. In another study, Korpelainen (2011) stated that the most influential adoption theories that were used to explain individuals' intention to adopt ICT are: TAM, TRA, TPB and the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT was developed by Venkatesh, Morris, Davis, and Davis (2003) through reviewing eight models that explain ICT usage including TRA, TAM and TPB.

Another important observation made from the literature review is that, ontologically, existing technology adoption theories focus on different units of analysis: some consider the user (or individual) as the unit of analysis; and others focus on the firm (or organisation) (see Table 1). The focus in this study will be on the teacher (an individual) as the unit of analysis. Therefore, the models that this study will focus on are TRA, TPB, TAM, and UTAUT. The other models like DoI will be excluded, as their level of analysis is organisational and not individual.

Table 1: Level of Analysis in the Adoption Models

#	Theory	Level of Analysis	Author
1	Theory of Reasoned Action (TRA)	User/Individual	(Fishbein & Ajzen, 1975)
2	Theory of Planned Behaviour (TPB)	User/Individual	(Ajzen, 2002)
3	Technology Acceptance Model (TAM) and Technology Acceptance Model II (TAM II)	User/Individual	(Davis, 1989)
4	Unified Theory of Acceptance and Use of Technology (UTAUT)	User/Individual	(Venkatesh et al., 2003)

I proceed to provide more details about each one of the above listed theories.

2.2.1: Theory of Reasoned Action (TRA)

The TRA theory is aimed at understanding the relations that link human intentions, attitude, and behaviours (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). This theoretical model is broadly applied in the social sciences.

The main constructs in TRA are: behavioural intention, attitude toward performing the behaviour, and subjective norm related to performing the behaviour. TRA suggests that an individual's behavioural intention depends on the individual's attitude about the behaviour and subjective norms. See Figure 1 below:

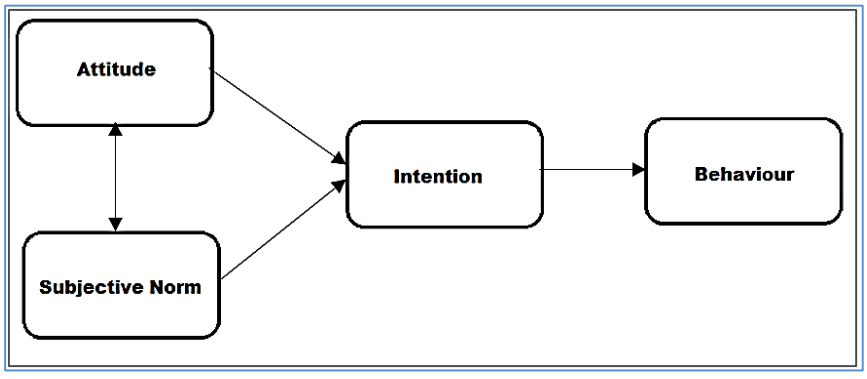


Figure 1: TRA Diagram. Source: Fishbein and Ajzen (1975)

2.2.1.1: Definitions of TRA's constructs:

- **Attitude (A):** Individual's positive or negative feeling about performing the target behaviour. For example: using a new system.

- **Subjective Norm (SN)**: Individual's perception that most individuals who are important to him/her think he should/should not perform the behaviour in question.

- **Intention (I) and Behaviour (B)**: Intention precedes behaviour and is an indicator of preparedness to implement a particular behaviour. As seen in Figure 1, the intention forms under the impact of attitude toward the behaviour, and the subjective norm, i.e. a positive attitude toward a behaviour together with a positive subjective norm forms individual's intention to engage in the behaviour, and in turn results in performance.

2.2.1.2: Applicability of TRA's constructs on E-Assessments:

The extent to which the constructs of this model (attitude, subjective norm, intention, and behaviour) can be generalised to e-assessments is still unknown. Hence, during the interviews, participants were asked to elaborate on their experiences in e-assessments. The researcher also examined which of these constructs the CIS teachers recognise and relate most to their practices in e-assessments using phenomenological questions in the quantitative part of this study. Table 2 shows some examples of the questions used in the phenomenological interviews:

Table 2: TRA General Questions

#	Interview question	Related Construct	Model
1	*Please describe a situation in which you experienced the use of e-assessments while teaching CIS courses. Be sure to describe the reasons why you used this type of e-assessments, and what is it like to use this type? Be as specific and detailed as possible*	All	All
2	*Can you tell me more about these reasons? Exactly what were the reasons?*	All	All

Table 3: TRA Follow-up Questions (Used only when the Attitude or/and the Subjective Norm were mentioned by the participant)

#	Interview question	Related Construct	Model
1	Ok, "*Your feeling about using e-assessments*". Can you tell me more about it? How has this affected you? In other words, what impact has it had on you?	Attitude	TRA
2	You mentioned "*The beliefs of people in your social environment about the benefits of e-assessments*". How has this affected you? In other words, what impact has it had on you?	Subjective Norm	TRA

2.2.1.3: Limitations of TRA

TRA was criticised for not taking into account the social factors that in real life could be an important influence on individual behaviour (Grandon & Mykytyn Jr, 2004). Social factors represent the influences of the environment surrounding the individual (such as norms) which may affect the individual behaviour. Relevant to the current study, what this model does not explain is the teachers' perception of the degree to which they are capable of, or have control over using e-assessments. This shows that the TRA model is not enough by itself to understand the adoption of e-assessments, and this is where TPB is expected to help.

2.2.2: Theory of Planned Behaviour (TPB)

TPB is an extended version of the TRA. TPB defines central concepts in the social and behavioural sciences in a way that predicts a person's intention to engage in a behaviour at a specific time and place. The theory was intended to explain all behaviours over

which people have the ability to exercise self-control. The key component of this model is 'Perceived Behavioural Control'. According to Taylor and Todd (1995), the perceived behavioural control considers perceptions of internal and external constraints on behaviour. TPB states that behavioural achievement depends on both motivation (intention) and ability (behavioural control) which is related to the person's perception of the ease (or difficulty) of carrying out the behaviour of interest. See Figure 2 below:

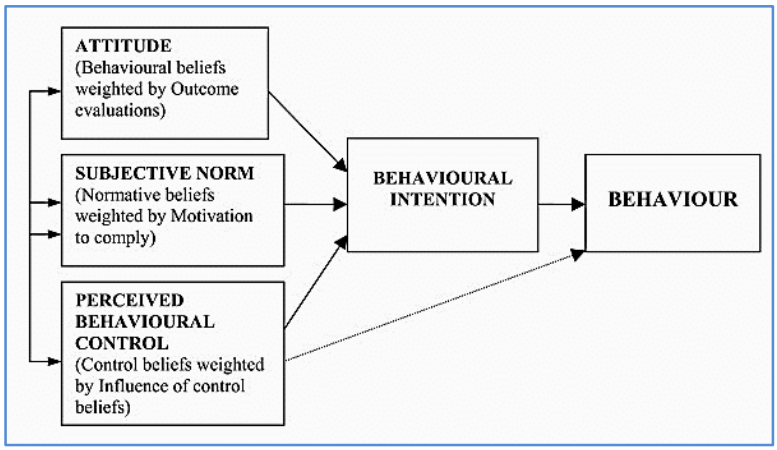


Figure 2: TPB Diagram. Source: Ajzen (1991)

2.2.2.1: Definitions of TPB's extra constructs:

- **Perceived Behavioural Control (PBC):** People's perception of the degree to which they are capable of, or have control over, performing a given behaviour. For example: When a person believes that he/she can perform a behaviour, he/she gets motivated to try to perform that behaviour. This is expected to increase the likelihood that he/she will put effort and keep trying in their attempts.

2.2.2.2: Applicability of TPB's constructs on E-Assessments:

The extent to which the constructs of this model (attitude, subjective norm, perceived behavioural control, intention, and behaviour) can be generalised to e-assessments is also unknown. Hence, during the interviews, the CIS teachers will be asked to elaborate

on their experiences in e-assessments. The researcher will then examine whether the CIS teachers recognise and relate this additional construct (PBC) to their practices in e-assessments. Possible examples of these questions are listed in Table 4.

Table 4: TPB Follow-up Questions (Used Only When the Perceived Behavioural Control was Mentioned by the Participant)

#	Interview question	Related Construct	Model
1	You talked about "your confidence in your ability to use e-assessments". Can you tell me more about it? How has this affected you and your decision to adopt e-assessments? In other words, what impact has it had on you and your decision to adopt e-assessments?	Perceived Behavioural Control	TPB
2	OK, you said, "*adopting e-assessments is of your own volition*". Can you tell me more about that? How has this affected you and your decision to adopt e-assessments? In other words, what impact has it had on you and your decision to adopt e-assessments?	Perceived Behavioural Control	TPB

2.2.2.3: Limitations of the TPB

The limitations of the TPB are mainly related to the fact that TPB overlooks emotional variables such as mood, fear, anxiety, threat, and positive and negative feelings. TPB measures them in a limited fashion (Conner & Armitage, 1998). Many of this model's measures have been replaced by TAM. In light of the objectives of this study, what this model does not explain is the perceived ease of use, and the perceived usefulness, and this is where TAM is expected to help. This shows that we cannot depend on this model's constructs unaccompanied with other constructs to understand the adoption of e-assessments.

2.2.3: Technology Acceptance Model (TAM)

TAM is one of the most influential extensions of Ajzen and Fishbein's TRA in the literature. It is considered as one of the key theories that offers a theoretical base for adoption. This model was modified to fit the information technology context (Bagozzi,

Davis, & Warshaw, 1992; Davis, Bagozzi, & Warshaw, 1989). It was designed to further explain the usage and adoption of technology among individuals.

TAM replaces many of TRA's attitude measures with two main factors that have an influence on users' decisions when introduced to a new technology. These factors are: the perceived ease of use, and the perceived usefulness (Davis, 1989). See Figure 3 below:

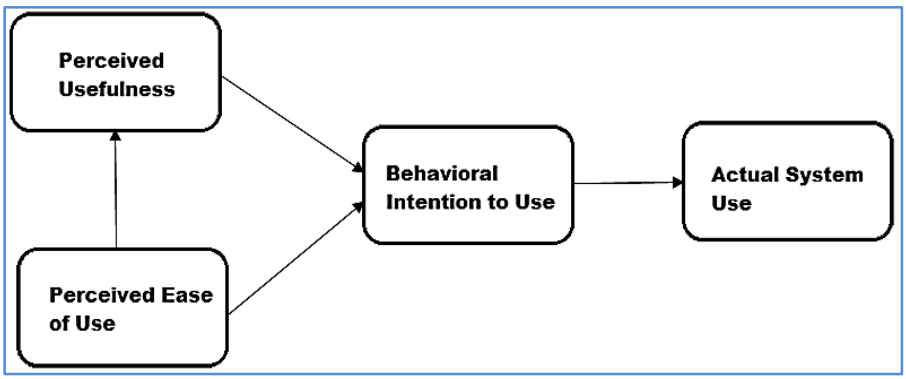


Figure 3: TAM Diagram. Source: Davis et al. (1989) & Venkatesh et al. (2003)

2.2.3.1: Definitions of TAM's Additional constructs:

- **Perceived Usefulness (PU)**: The degree to which an individual believes that using a particular system will help him or her to attain gains in job performance.
- **Perceived Ease-of-Use (PEoU)**: The degree to which an individual believes that using a particular system would be free from effort

2.2.3.2: Applicability of TAM's New Constructs on E-Assessments:

Similar to TRA and TPB, the extent to which the constructs of this model can be generalised to e-assessments is also unknown. Hence, during the interviews, the CIS teachers were asked to elaborate on their experiences in e-assessments. The researcher will then examine whether the CIS teachers recognise and relate these additional

constructs (PU and PEoU) to their practices in e-assessments. Some of the interview follow-up questions that the researcher asked are listed in Table 5.

Table 5: TAM's Follow-up Questions (if the Perceived Usefulness and/or the Perceived Ease-of-Use were Mentioned by the Participant)

#	Interview question	Related Construct	Model
1	You mentioned, "e-assessment is very useful/unuseful". Can you tell me more about it? How has this affected you and your decision to adopt e-assessments? In other words, what impact has it had on you and your decision to adopt e-assessments?	Perceived usefulness	TAM
2	Ok, "The ease-of-use of e-assessments". Can you tell me more about it? How has this affected you and your decision to adopt e-assessments? In other words, what impact has it had on you and your decision to adopt e-assessments?	Perceived ease of use	TAM

2.2.3.3: Limitations of TAM

According to Taylor and Todd (1995), one of the main shortcomings of TAM is that it offers only limited explanation of how to influence usage through design and implementation. In addition, Bagozzi (2007) believes that in reality, an adopter may take into consideration many factors that in turn could influence his intention and/or his decision, yet TAM specifies only a few factors for acting. This shows that we cannot depend on this model unaccompanied by other constructs to understand the adoption of e-assessments. This is where a unified theory like UTAUT is expected to help in understanding the adoption of e-assessments.

2.2.4: Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003) reviewed the existing literature related to user acceptance and examined eight leading models (including TRA, TPB, and TAM), with the purpose of proposing a unified theory of the acceptance and use of technology. The UTAUT model has 8 independent variables for predicting behaviour, and 41 independent variables for predicting intentions (Bagozzi, 2007).

The UTAUT model consists of four core direct determinants of usage intention. They are: performance expectancy, effort expectancy, social influence, and facilitating conditions, along with another four moderators of key relationships (gender, age, experience, and voluntariness). See Figure 4 below:

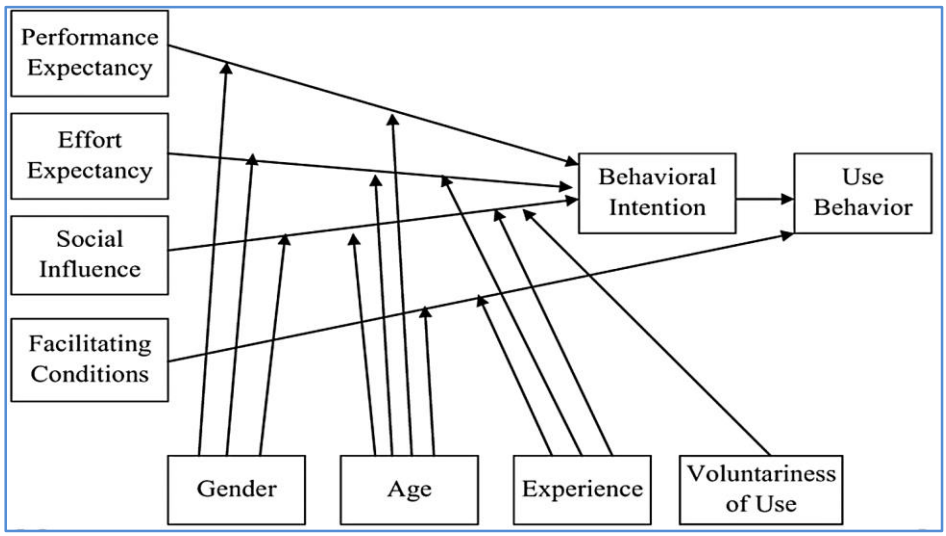


Figure 4: UTAUT Diagram. Source: Venkatesh et al. (2003)

2.2.4.1: Definitions of UTAUT Core Constructs:

- **Performance Expectancy (PE)**: The degree to which an individual believes that using the system will help him or her to attain gains in job performance. Note: This is similar to "Perceived Usefulness".

- **Effort Expectancy (EE):** The degree of ease associated with the use of the system. Note: This is similar to "Perceived Ease of Use".

- **Social Influence (SI)**: The degree to which an individual perceives that important others believe he or she should use the new system. Note: This is similar to "Subjective Norm".

- **Facilitating Conditions (FC)**: The degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system.

- **Voluntariness of Use (VoU):** The extent to which potential adopters perceive the adoption decision to be non-mandatory.

- **Gender (G):** the state of being male or female (typically used with reference to social and cultural differences rather than biological ones).

- **Age (Ag):** The length of time that a person has lived.

- **Experience (E):** Familiarity with a skill or field of knowledge acquired over months or years of actual practice.

2.2.4.2: Applicability of UTAUT's Core Constructs on E-Assessments

Similar to TRA, TPB, and TAM, the extent to which the constructs of this model can be generalised to e-assessments is still unknown as well. Hence, during the interviews, the CIS teachers will be asked to elaborate on their experiences in e-assessments. The researcher will then examine whether the CIS teachers recognise and relate these additional constructs (PE, EE, SI, FC, VoU, G, Ag, and E) to their practices in e-assessments. Some of the interview follow-up questions that the researcher asked are listed in Table 6.

Table 6: UTAUT's Follow-up Questions (if One or More of the UTAUT's Constructs were Mentioned by the Participant)

#	Interview question	Related Construct	Model
1	You referred to "*Your colleagues' opinion about e-assessment*". Can you tell me more about that? How has this affected you and your decision to adopt e-assessments? In other words, what impact has it had on you and your decision to adopt e-assessments?	Social Influence	UTAUT
2	You talked about "*The technical infrastructure and support that the HEIME provides to you while using e-assessment*". Can you tell me more about that? How has this affected you and your decision to adopt e-assessments? In other words, what impact has this had on you and your decision to adopt e-assessments?	Facilitating Conditions	UTAUT

2.2.4.3: Limitation of UTAUT

The most important limitation of UTAUT is the large number of independent variables (41 independent variables). According to Bagozzi (2007, p. 245) "in the end we are left with a model with 41 independent variables for predicting intentions and at least eight independent variables for predicting behaviour". He claims that studying the ICT adoption using such a model has reached a stage of chaos. As a conclusion, this model may prove to be too complex to be used to understand the adoption of e-assessments on its own when all its constructs are used.

2.2.5: Adoption Models Conclusion

To conclude, because important limitations and inadequate results are common in this area of study, there is a need to have a comprehensive combination of the reviewed theories (TRA, TPB, TAM, and UTAUT) to understand the adoption of e-assessments. Previous studies followed the same strategy; for example, Konana and Balasubramanian (2005) united factors of TAM, TRA and TPB with a new financial element (Perceived Financial Gains) into their proposed framework of online investing. For that reason, as recommended in earlier studies, amalgamating theories through the development of a broad and comprehensive list, using the pertinent theories' constructs, is a good approach to identify the most influential factors for e-assessment adoption. This will be achieved by bringing the most influential models together and asking teachers to evaluate their usefulness and relevance to e-assessments.

2.3: Existing Literature on E-assessment Adoption Models: Overview

Many variables from existing theoretical models have been used to explain the acceptance to use different e-learning systems. Perceived Ease-of-Use and Perceived

Usefulness were chosen to explain the acceptance and adoption of e-learning in many studies. For example, Ong et al. (2004) used the technology acceptance model in explaining engineering students' decisions to accept e-learning. They also proposed a new construct that is perceived credibility, to explore the applicability of TAM in the context of their study. In addition, many researchers developed theoretical models based on causal relationships in order to explain a learner's satisfaction (Terzis & Economides, 2011). For example, some researchers like Ong and Lai (2006) provided evidences of the effect of Perceived Usefulness on the Behavioural Intention to use an e-learning system. Using the same train of thought, Terzis and Economides (2011) suggest that "if the CBA is useful for the learner then it will help to increase the learner's concentration, and probably enjoyment". They believe that Perceived Usefulness has an effect on students' Behavioural Intention to use CBA. However, according to Terzis and Economides (2011), there is a gap in the scholarly literature related to e-assessment adoption models. They stated, "Although there are previous studies on acceptance of learning management systems (LMS), there was not any previous study on acceptance of CBA". Furthermore, Imtiaz and Maarop (2014) declared that e-assessment adoption is an area that has been left out by researchers; hence, more research should be carried out in the e-assessment field.

In addition, the researcher conducted a search of relevant information sources to help determine what is already known about e-assessment adoption and how extensively the adoption of e-assessment has already been researched. The Education Resources Information Centre (ERIC) and Web of Science were the major electronic databases used while conducting the search about e-assessment adoption and e-assessment adoption models.

The researcher started by listing all possible relevant terms and their synonyms in order to have a working vocabulary for use in the research databases. ERIC provided the first and primary source of literature. The keywords the researcher used are: “e-assessment adoption”, “e assessment adoption”, “e-assessments adoption”, “e assessments adoption”, “CBA adoption”, “CAA adoption”, “adoption of e-assessment”, “adoption of e assessment”, “adoption of e-assessments”, “adoption of e assessments”, “adoption of CBA”, “adoption of CAA”, “e-assessment acceptance”, “e assessment acceptance”, “e-assessments acceptance”, “e assessments acceptance”, “CBA acceptance”, “CAA acceptance”, “acceptance of e-assessment”, “acceptance of e assessment”, “acceptance of e-assessments”, “acceptance of e assessments”, “acceptance of CBA”, “acceptance of CAA”, “e-assessment adoption model”, “e assessment adoption model”, “e-assessments adoption model”, “e assessments adoption model”, “CBA adoption model”, “CAA adoption model”, “adoption of e-assessment”, “adoption of e assessment”, “adoption of e-assessments”, “adoption of e assessments”, “adoption of CBA”, “adoption of CAA”, “e-assessment acceptance model”, “e assessment acceptance model”, “e-assessments acceptance model”, “e assessments acceptance model”, “CBA acceptance model”, and “CAA acceptance model”.

To gain a broader perspective on other fields, the researcher used the Web of Science to increase the pool of literature obtained from ERIC. This search was conducted using the same keywords that were used while searching the ERIC database. Table 7 shows a list of the resultant studies and the focus of each one of these studies.

Table 7: Studies Related to the Adoption of E-Assessments

Study Details	Focus
The Acceptance and Use of Computer Based Assessment (Terzis and Economides (2011)	Student-focused study
The Effect of Emotional Feedback on Behavioral Intention to Use Computer Based Assessment (Terzis, Moridis, and Economides, 2012a)	Student-focused study
How student's personality traits affect Computer Based Assessment Acceptance: Integrating BFI with CBAAM. (Terzis, Moridis, and Economides, 2012b)	Student-focused study
Continuance acceptance of computer based assessment through the integration of user's expectations and perceptions (Terzis, Moridis, & Economides, 2013a)	Student-focused study
Measuring instant emotions based on facial expressions during computer-based assessment (Terzis, Moridis, & Economides, 2013b)	Student-focused study
Temporal learning analytics for computer based testing. (Papamitsiou, Terzis, & Economides, 2014)	Student-focused study
The Acceptance and Use of Computer Based Assessment in Higher Education (Maqableh, Masa'deh, & Mohammed, 2015)	Student-focused study
Mobile-based assessment: Investigating the factors that influence behavioral intention to use (Nikou & Economides, 2017)	Student-focused study

As a result, it can be said that no investigative model exists for the research problem under study – e-assessment adoption. Yet, some studies like Baleni (2012) and McCann (2009) have dealt with factors influencing e-assessment adoption, albeit not via theoretical models. Therefore, this study will build on existing research by developing a theoretical framework and empirically validating this framework in a particular context.

The different theoretical frameworks reviewed in Section 2.2 (TRA, TPB, TAM, and UTAUT), do not provide a clear explanation of the aspects and issues that influence the acceptance and intentions to use e-assessments by teachers. The researcher will use these models as the base models and extend/modify them with other constructs in order to formulate a new conceptual framework (an e-assessment adoption model).

2.4: Other Perspectives on Teacher Use of Technology and Assessments

One of the perspectives concerning the use of technology and assessments, is related to the challenges teachers encounter when trying to effectively use technology in their classrooms. A research study in the Kingdom of Saudi Arabia by Alabdulaziz and Higgins (2016) examined the obstacles that teachers encounter when using technology, applying semi-structured interviews and observations with six teachers. The study proposes that the scarcity of training, the negative attitudes and beliefs about teaching mathematics using technology, and the lack of technical support provided by the school were the major obstacles teachers face when using technology. These points were seen as important factors affecting the teachers' decision to use or not to use technology. In a similar study, Mumtaz (2000) reviewed the literature related to teachers' acceptance of ICT. He listed a number of reasons of why teachers do not make use of computers in their teaching including: "access to resources, quality of software and hardware, ease of use, incentives to change, support and collegiality in their school, school and national policies, commitment to professional learning and background in formal computer training".

Additionally, Higgins and Moseley (2001) suggests that teachers' attitudes and beliefs are of high importance and must be taken into account while developing successful professional development. The authors of this study state that teachers' beliefs and attitudes about effective practices in general, and the effective use of technology in particular have a direct effect on their feelings and perceptions of teaching and learning practices in the classroom, which is also expected to affect the way they teach. In another research study, Moseley et al. (1999) investigated the attitudes and feelings of

a number of teachers. At the end of their analysis, they found that teachers who have positive feelings towards the use of ICT would use it more efficiently and effectively.

2.5: Chapter Conclusion

In this literature review, the researcher has reviewed the major literature on e-assessments studies in the field of CIS with regard to ICT adoption theoretical models in general, and on e-assessment adoption models in particular. The adoption and diffusion of new technological innovations like e-assessments seem to be still understudied. The study conducted by Terzis and Economides (2011) is one of the very limited studies that were conducted aiming to build a model that is related to e-assessment adoption. It demonstrates the constructs that affect students' behavioural intention to use CBA. Additionally, Imtiaz and Maarop (2014) stated that there is a lack of research in the area of e-assessment. They stated that all the studies on e-assessment acceptance focus on students, and that there is a need to conduct more research that focuses on teachers or lecturers. As a result, further theoretical and empirical investigation is needed to reach a better understanding of e-assessment adoption.

Chapter 3 Research Design and Methodology

3.1: Introduction

This chapter looks at the overall research design. It commences by giving an overview on the research philosophy adopted. Following this overview, a choice is made for the research approach implemented. Subsequently, the research design and its applicability are rationalised in the context of this study. The rationale behind the choice of the research approach and the research methodology are also provided. In the research methods section, the researcher provides details about both the qualitative and quantitative methods used, as well as the participants. Clarification on how the research data were collected and explanations on how the data were analysed are also provided in this section within the remit of the ethical requirements. An alignment of the research questions with methods and tools is also presented. Finally, the ethical considerations related to the data collection in this study are discussed.

3.2: Research Philosophy

According to Saunders, Lewis, and Thornhill (2009), research philosophy is a belief about how data regarding a phenomenon should be collected, investigated and used. In addition, the authors stated that "Research philosophy is an over-arching term related to the development of knowledge and the nature of that knowledge" (p. 107). Furthermore, they claimed that the adopted research philosophy encompasses essential assumptions about how the researcher views the world. These assumptions form the basis of the chosen research strategy and methods. Based on the above arguments, the main factor influencing the way this research is conducted is the researcher's view of the relationship between knowledge and how the knowledge is developed.

3.2.1: Epistemology and Ontology

Epistemology and ontology are two of the major elements of the philosophy of knowledge that help researchers determine the appropriate choice of the research philosophy. According to Doolin (1996, p. 21), epistemology is a research philosophy related to the assumptions about what constitutes valid knowledge, whereas the other research philosophy, ontology, refers to assumptions about the nature of physical and social reality. In other words, epistemology is about '*the way we know things*', while ontology is about '*what things are*'. The epistemological and ontological assumptions together influence the researchers' chosen methodology. The chosen methodology here refers to what they consider appropriate methods for obtaining the required knowledge. Congruently, there are important philosophical differences between a quantitative study that focuses on figures and facts, and a qualitative study that is concerned with understanding human behaviour from the informant's perspective. For instance, a researcher (Researcher-A) who is concerned with discovering facts about social phenomena, is likely to have a dissimilar view on the way research should be conducted to another researcher (Researcher-B) who is concerned with understanding human behaviour from the informant's perspective. The way the two researchers view what is important and what is useful is not the same. Henceforward, choosing an adequate research philosophy is very important, primarily because it will determine the research strategy and the research methods that will be used (Johnson & Clark, 2006). In the above example, Researcher-A is comfortable with the collection and analysis of numbers and facts. For this researcher, 'reality' is represented by objects that are believed to be 'real'. Hence, this researcher would give much less importance to the data collected by Researcher-B, who is interested in understanding human behaviour from the informant's perspective. Researcher-A would view the 'feelings and attitudes'

that Research-B is interested in, as social phenomena which have ‘no external reality’. He would give more importance to such data that is presented in the form of a spreadsheet of statistical data. Researcher-A in this example is adopting the **positivist** perspective, whereas Researcher-B holds the **interpretivist** position.

3.2.2: The Research Philosophy Adopted by the Current Study

The researcher’s philosophy in this study reflects both the principles of positivism, as well as those of interpretivism. He has chosen to consider himself as a **pragmatist** throughout the research. The philosophy of **pragmatism** is an epistemological position that is not committed to any one system of philosophy and reality. It focuses on the outcomes of research and the solutions to problems. Pragmatism supports that the major determining factor of the research philosophy is the research question(s). Similarly, pragmatists believe that the problem being studied and the questions that are asked influence the research methodology. They also believe that one approach may be more suitable than another approach in answering particular questions.

As a pragmatist, the researcher sees that it is perfectly possible to work with both the positivist and the interpretivist research philosophies in the same study. Hence, the mixed methods research methodological choice has been adopted in this study. This approach has been assumed previously by several scholars who clearly associated mixed methodology with pragmatism (Denscombe, 2007; Johnson & Onwuegbuzie, 2004; Maxcy, 2003; Mkansi & Acheampong, 2012; Morgan, 2007; Tashakkori & Teddlie, 2003).

3.3: Research Approach

Deductive and inductive approaches are the main types of research approach. Using a **deductive** approach means that a researcher develops a theory and one or more hypotheses and then use a research strategy to test them. In contrast, using an **inductive** approach involves collecting data and then developing theory as a result of the data analysis. Deduction is related more to positivism and induction to interpretivism (Saunders et al., 2009). In this study, joined elements using both inductive and deductive approaches were utilised, as explained below.

In order to gain an understanding of the meaning CIS teachers attach to the use of e-assessments, this study started by applying an inductive approach. This allowed the researcher to examine the themes and categories that emerged from the research qualitative data. According to Saunders et al. (2009), using an inductive approach allows researchers to have close understanding of the research context.

Next, a deductive approach was used to collect and investigate the quantitative data. This allowed the researcher to move from unstructured questions and qualitative data to structured questions and quantitative data. In addition, it helped him explain causal relationships between variables. Furthermore, it helped him improve the generalisability of the research (Saunders et al., 2009).

3.4: Research Design

To ensure that the research design fits the research questions, it seems best to start with the questions and then choose the design (Tharenou, Donohue, & Cooper, 2007). Based on the literature reviewed, it was found that no exploratory framework exists for the research problem under study. That is why the researcher opted to design an exploratory

sequential study. The most influential models on innovation adoption (TRA, TPB, TAM, and UTAUT) were used as the basis for formulating a conceptual framework (an e-assessment adoption model) and empirically validating this framework. Understanding the constructs used in these theoretical frameworks helped the researcher study and analyse the adoption and implementation of e-assessments. It also allowed him to formulate relevant questions to investigate the constructs within the reviewed theoretical frameworks and thus, focus on appropriate e-assessment issues during data collection in both qualitative and quantitative phases.

3.4.1: The Mixed Methods Design

As mentioned in Section 3.2, the researcher worked with both the positivist and the interpretivist research philosophies. This reflects the research methodological choice adopted, that is mixed methods. Before choosing the mixed-method design, the researcher tried to identify convincing reasons for mixing quantitative and qualitative methods within this study. He started by reviewing the detailed list of reasons provided by Bryman (2006) who listed 16 different reasons. This list offered a useful and detailed examination of why researchers choose to use mixed methods. In his study, Bryman (2006) stated that researchers have multiple reasons for mixing, and that new reasons for mixing may emerge. The 16 reasons are: *(1) triangulation, (2) offset, (3) completeness, (4) process, (5) different research questions, (6) explanation, (7) unexpected results, (8) instrument development, (9) sampling, (10) credibility, (11) context, (12) illustration, (13) utility or improving the usefulness of findings, (14) confirm and discover, (15) diversity of views, and (16) enhancement or building upon quantitative and qualitative findings.*

In view of that, the researcher finds that the most important reasons related to this particular study are: *(1) instrument development*, which refers to contexts in which qualitative research is employed to develop questionnaire and scale items; *(2) credibility*, which suggests that employing both approaches, enhances the integrity of findings; *(3) confirm and discover*. This reason refers to using qualitative data to generate hypotheses and using quantitative research to test them within a single project.

3.4.2: The Exploratory Sequential Design Strategy

This study employed an exploratory sequential design strategy using mixed methods. In this strategy, researchers start by collecting qualitative data. Then, the qualitative data collected are used to develop or locate quantitative instruments; forming categorical information for a later phase where quantitative data are collected (Creswell, 2012, p. 552). As shown in Figure 5, the exploratory sequential design uses sequential timing. Sequential timing occurs when researchers implement the collection and analysis of data in two separate phases, with the collection and analysis of qualitative data occurring before the collection and analysis of quantitative data (Creswell, 2012, pp. 542-544).

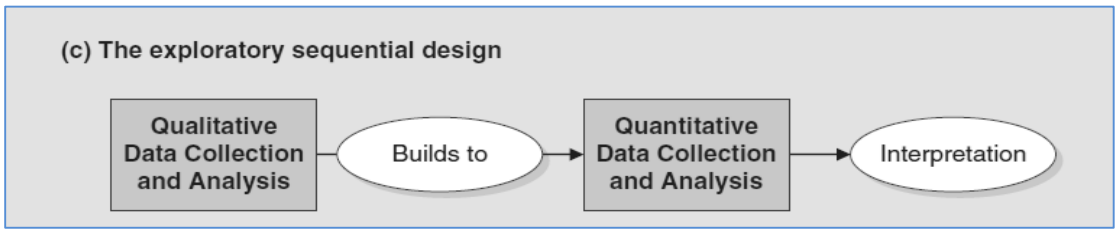


Figure 5: The Exploratory Sequential Design. Source: Creswell (2012, p. 541)

Building on Creswell (2012), this study was conducted in two phases: the first phase involved qualitative data collection with a small number of interviewees, followed by quantitative data collection with a larger number of participants. The first phase was intended for theory generation, where qualitative data were collected to explore CIS

teachers' perceptions of the use of e-assessments, clarify related problems, elicit information about teachers' views regarding e-assessment adoption, and construct research hypotheses for the following phase.

In the second phase, the researcher adopted a descriptive research design, which involved correlation analysis, to describe relationships between the constructs of the generated model (see Figure 6).

Figure 6: Research Design – Research Phases

3.5: Research Methodology

3.5.1: First Phase: Qualitative Data Collection

The type of mixed methods used in this study is Mixed Methods Phenomenological Research (MMPR). According to Mayoh and Onwuegbuzie (2015), MMPR is a research that combines phenomenological methods with other methods grounded in a different paradigm within the same study. Mayoh and Onwuegbuzie (2015) provided five different models for MMPR research: (1) quantitative → phenomenological; (2) qualitative → phenomenological; (3) phenomenological → quantitative; (4) phenomenological → qualitative; and (5) a combination of phenomenological and alternative qualitative methods. More details about each one of these models are provided in Table 8.

Table 8: Models for MMPR. Source: Mayoh and Onwuegbuzie (2015)

Model	Description	Purposes
phen --> QUAN or phen --> QUAL	Preliminary phenomenological method with priority given to the method from an alternative paradigm	The preliminary phenomenological stage is used to generate theory about the nature of lived experience that can feed into a larger QUAN or QUAL study. This approach is especially useful when the study requires an overall more deductive thrust.
quan --> PHEN or qual --> PHEN	Preliminary method from an alternative paradigm with priority given to the phenomenology	The preliminary quan/qual phase is used to orientate the predominant PHEN stage to the most relevant and interesting phenomenon. This model is very useful when the study requires an overall more inductive thrust.
QUAN --> phen or QUAL --> phen	Preliminary method from an alternative paradigm which is also given priority	The secondary phen stage is used to explore unanticipated QUAN or QUAL findings. This model is especially useful when the study requires an overall more deductive thrust.
PHEN --> quan or PHEN --> qual	Preliminary phenomenology which is also given priority	The secondary quan/qual phase is used to help improve the utility and generalisability of phenomenological findings. This approach is very useful when the study requires an overall more inductive thrust.
quan + phen or qual + phen	Concurrent approach. Normally methods have equal priority (however, it is possible to give priority to a single method depending on the overall thrust of the study).	Within this model, phenomenological and complementary data are collected concurrently in order to cross-validate or to confirm findings. This model is especially useful when the study requires an overall more abductive thrust.

This study uses the "PHEN → quant" model in which phenomenological data are collected in the first phase. The qualitative methods used in the first phase set the stage for quantitative research used to test theories developed during the phenomenological inquiry (Robbins & Vandree, 2009).

The phenomenological methods mentioned above are based on phenomenology that is a theoretical framework focusing on exploring how human beings make sense of their experiences and transfer these experiences into consciousness, both in isolation and as shared meaning (Patton, 2002). It aims to clarify the structure and meaning of a phenomenon via the person's description. Besides, it is used to determine thorough descriptions of participants' experiences. These descriptions are used to conduct a "structural analysis which portrays the general meaning or essence of experiences" (Moustaka, 1994).

According to Hycner (1985), the first step in the analysis of phenomenological data are identifying the phenomenon that will define the shared experiences of participants. In the phenomenological part of this study, the educational activity that is described as the phenomenon is "the use of e-assessments (CBAs and CAAs) to assess students' work while teaching CIS courses". The phenomenological part of the study also focuses on how CIS teachers experience the transition from using traditional paper-based assessments to e-assessments.

3.5.2: Second Phase: Quantitative Data Collection

Empirical data in the form of survey research were gathered and used in the second phase to validate and determine the direction of the assumed (hypothesised) associations. The researcher collected closed-ended data in the form of survey research.

The gathered data were used in this phase to validate and determine the direction of the assumed (hypothesised) associations and related factors and models' usefulness, upon interviews with teachers.

The quantitative data collection was conducted with a relatively large number of participants in comparison to the number of participants in the qualitative data collection. The researcher recruited 112 participants from the seventeen HEIME colleges that are spread around the United Arab Emirates.

3.6: Research Methods

The research methods used in this study are divided into two different types. Some of these methods were used in the qualitative phase, while others were used in the quantitative phase. The below subsections explain the research methods that were used in each one of these two phases.

3.6.1: Phase 1 (Qualitative Phase)

3.6.1.1: The methodological tool of interviewing

Data gathering and analysis in the qualitative phase are based on phenomenology. The researcher collected data concerning the lived experiences about the phenomenon stated above from all participants. According to Giorgi (2009), there is no prescriptive quality to a good phenomenological interview. However, the researcher considered a major criterion, which is, as stated by Giorgi (2009, p. 122): "What one seeks from a research interview in phenomenological research is as complete a description as possible of the experience that a participant has lived through." In phenomenological studies, researchers should make sure that the questions they use in the semi-structured

interviews are used to "direct the participants" and not to "lead the participants" (Giorgi, 2009, p. 123).

In the qualitative phase, data collection relied on both audio-recorded and video-recorded semi-structured interviews using digital audio recorders for the face-to-face interviews and a video-conferencing tool called Zoom[8] for interviewing CIS teachers who are located in other campuses. Interviewees were given the chance to describe and explain their experiences 'in depth' and discuss their points of view. Each interview took around 60 minutes. In these interviews, the researcher stood back from the social phenomenon being investigated and maintained a 'professional' distance from the participants. He tried to observe the phenomenon as an outsider.

3.6.1.2: Interview questions

The interview questions were open-ended, leaving room for impromptu questions based on the dynamic way of communication between the interviewer and the interviewee. This gave a chance to the interviewees to introduce factors different from those included in the literature, allowing them to voice their experiences in using e-assessments in teaching CIS courses. The first question was to ask them to *describe their experience in using e-assessments to assess their students' work*. Based on the interviewee answer, a follow up question was about *the factors influencing his/her decision to adopt e-assessments*. Additionally, several questions and requests for clarifications were given spontaneously in between these two questions. These questions helped the researcher collect the information necessary for this study's particular phenomenon.

[8] Zoom is a videoconferencing cloud service (see Zoom Video Communications (2016) for more details about this service)

All interviews started with a set of preliminary ‘seed’ questions (see Figure 7).

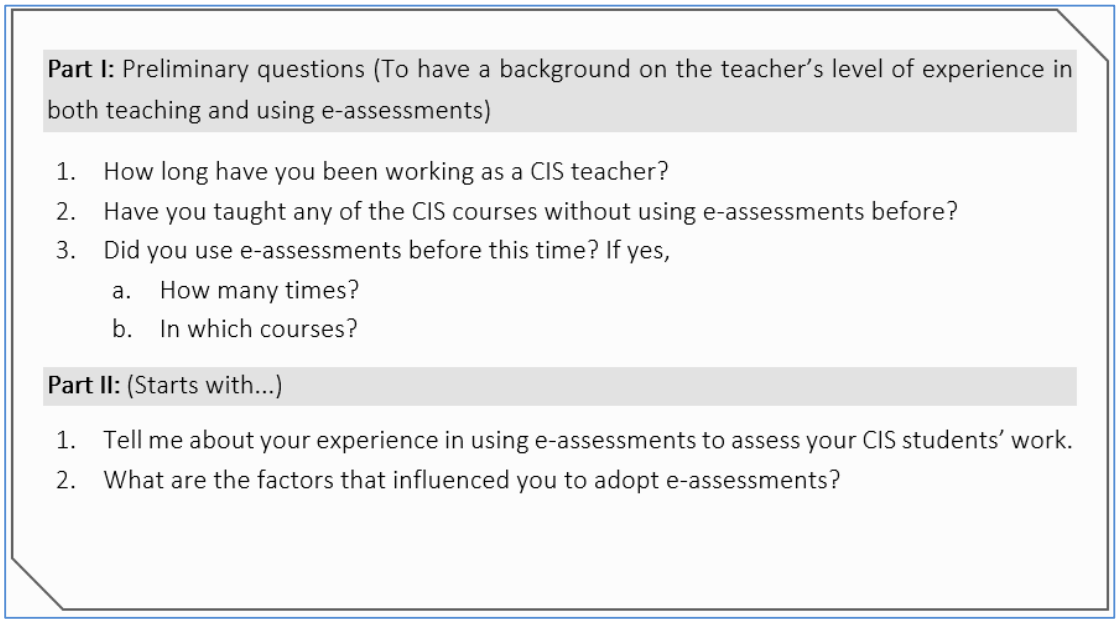


Figure 7: The Interviews' Preliminary Seed Questions

3.6.1.3: Qualitative (Phenomenological) Analysis

In order to add rigour and insight to the exploration of the collected data, Hycner’s (1985) recommendations were followed. In his paper, he advises that an explicitation of data versus an analysis is necessary in a phenomenological research. The reason being that the word analysis implies breaking something into parts and consequently a loss of the whole phenomena, while explicitation looks at all the constituents of the phenomena, keeping the whole in context (Groenewald, 2004). Accordingly, six explicitation steps were applied: (1) bracketing and phenomenological reduction; (2) listening to the interview repeatedly for a holistic sense of the phenomenon; (3) delineating units of meaning; (4) clustering of the units of relevant meaning (codes) to form themes; (5) summarising each interview and identifying the critical segments of the text; and (6) distinguishing general and unique themes for all the interviews.

3.6.2: Phase 2 (Quantitative Phase)

3.6.2.1: The methodological tool of survey

In this study, the quantitative data collection was based on online surveys. Survey is one of the main quantitative methods that are well recognised in the social sciences (Myers & Avison, 2002). Using survey research methods appears to be the most commonly used data collection strategy over other alternatives for ICT adoption research (Williams et al., 2009). This is because the survey helps to investigate relationships between variables and to create models of these relationships. It can also generate quantifiable, empirical data. An invitation email was sent to each one of the participants. The invitation email contained some details about the aim of the study, mainly because the questionnaire is planned to be self-administered. More details about how these surveys were administered and how data were collected are provided in Chapter 5 (Quantitative Study).

3.6.2.2: Questionnaire Development

The design of the survey questionnaire is based on the literature review and the responses of the semi-structured interviews that were conducted in phase 1. Additionally, the researcher made sure that the questionnaire was clear and easy-to-understand. The construction and flow of questions were given high importance.

3.6.2.3: Statistical Analysis Techniques:

The data analysis techniques the researcher used in the quantitative part of this study are listed below:

- **Partial Least Squares Structural Equation Modelling (PLS-SEM)**: PLS-SEM is one of the methods used for multivariate analysis. It is one of the two major

techniques used for estimating structural equation models. This technique was originally developed by Wold (1980) who advised that this technique is designed to work with multidisciplinary and special applications in which the situations investigated are complex and the needed theoretical knowledge is limited. One of the main reasons this technique was chosen for the estimation of this study's model is the ability to use this technique when the sample size is small. In other words, when there are limited research participants (Wong, 2013). Another reason is that PLS is able to explain the variance in the dependent variables when examining the model (Hair, Ringle, & Sarstedt, 2012; Sarstedt et al., 2014).

- **Outer model loadings**: The outer model loadings or measurement loadings are the path weights connecting the latent variables to the indicators. These values were used to view the correlations between the latent variables and the indicators.

- **Internal consistency reliability test**: In this study, the internal consistency reliability was evaluated using "Composite Reliability" which is considered as a better alternative measure when compared with "Cronbach's Alpha" (Bagozzi & Yi, 1988; Hair et al., 2012).

- **Convergent validity test**: This test is to check the degree to which the indicators used to measure the same latent variable are in agreement. The Average Variance Extracted (AVE) was used to assess the convergence validity.

- **Discriminant validity test**: Discriminant validity examines the degree to which a latent variable is empirically different from other latent variables in the model (Sarstedt et al., 2014). In this study, the researcher used this test to ensure that each

one of the model's reflective latent variables has the strongest association with its own indicators.

- **Multi-collinearity tests**: Multicollinearity problem appears when two or more independent variables are highly inter-correlated. To ensure that the model does not suffer from the multi-collinearity problem, the researcher used the Variance Inflation Factor (VIF) to examine the model for collinearity.

- **Assessing the predictive accuracy of the model**: The researcher used the values of both the coefficient of determination (R^2) and the cross-validated redundancy (Q^2) to assess the model's predictive accuracy and the predicative relevance of the endogenous latent variables in the model.

Detailed description of each one of the above listed quantitative data analysis techniques is provided in the quantitative study in Chapter 5.

3.6.3: Linking the Research Questions with the Data Collection Methods

As mentioned earlier, this study used different methods to collect data instead of relying on just one type. Table 9 on the next page lists the data collection methods and the analysis techniques the researcher used to answer the research questions.

Table 9: Research Questions, Data Collection Methods and Analysis Techniques

Research Questions	Data Collection Methods	Analysis Techniques
Q1 "What are the factors that influence the CIS teachers' choice to adopt e-assessments on the HEIME campuses?" ***THE RELATED SUB-QUESTIONS ARE:*** • What are CIS teachers' perceptions of e-assessments? • What are the factors that positively influence the CIS teachers' choice to adopt e-assessments in the HEIME colleges? • What are the factors that negatively influence the CIS teachers' choice to adopt e-assessments in the HEIME colleges? In other words, what are the disablers of e-assessment adoption in the context of this study?	Phenomenological Interviews	Thematic Analysis (Coding, Themes, and Central Themes)
Q2 "What e-assessment model and what constructs can be suggested after investigating the factors of CIS teachers' e-assessment adoption and evaluation of the models?" ***THE RELATED SUB-QUESTIONS ARE:*** • How do teachers evaluate the unification of the existing models to explain and help them with e-assessment adoption? • What model conclusions and suggestions can be drawn on the final unified model based on teachers' opinions?	Online Surveys	Partial Least Squares Structural Equation Modelling (PLS-SEM)

3.7: Ethical Considerations

The ethical concerns of the research, which could harmfully affect participants and the organisation, were carefully considered when planning for the research design and methodology. According to Gorard and Taylor (2004), these concerns mainly focus on "the actions of the researcher in respect to the participants" (p. 172) and that quality, thoroughness and rigour are critical. Privacy and confidentiality of the participants were maintained and an informed consent was obtained from each one of the participants (see Appendix C). Names and other details were not associated with participants. In addition, there were no known risks to participants. Plus, an ethical approval form was

submitted to HEIME, and a written approval was received before the study began (see Appendix E).

3.8: Chapter Summary

In this chapter, the researcher described the research philosophy, design, and approach adopted to conduct this research. He also explained the research methodology and how it is divided into two phases (qualitative and quantitative). This chapter also presented the research methods used in each one of these phases. Finally, the ethical concerns of the research were explained and listed.

Chapter 4 Qualitative Study

4.1: Introduction

The aim of this chapter is to report the development of the conceptual framework that was created earlier from a small sample of 12 participants before carrying out the quantitative study. The findings of this chapter aim to explore the factors that have an impact on the adoption of e-assessment and feed into the quantitative study.

4.2: Data Collection and Analysis

As defined by Maypole and Davies (2001), a phenomenological research is a descriptive method that tries to understand the lived experiences of the people who were involved with the issue that is being researched. This approach "the phenomenological" must be clearly distinguished from the phenomenographic approach. They are related in that each of them is based on the term "phenomenon", which means "to bring to light". However, even if phenomenography and phenomenology have much in common, they have different aims, methods and goals, and therefore different results. Phenomenography refers to a research approach aiming at describing the different ways a group of people understand a phenomenon (Larsson & Holmström, 2007). Likewise, it aims to document the range and variety of experiences informants bring to the topic of interest, whereas phenomenological approach aims to clarify the structure and meaning of a phenomenon. Following the same line of thought, a phenomenological study captures what the German philosopher Husserl (1931) referred to as the "essential character" of the experience through the eyes of the participants (who are the "teachers" in this study). Hence, phenomenology is an appropriate research method to discover what Husserl would call the teachers' lived experiences.

This part of the study followed a phenomenological approach, with the aim of answering two different research questions. The first is about the factors that influence the CIS teachers' choice to adopt e-assessments on the HEIME campuses; and the second is about the developed e-assessment model and the constructs that can be suggested after investigating the factors of CIS teachers' e-assessment adoption and evaluation of the models.

4.2.1: Conducting the Interviews

The phenomenological interviews were designed to bring forth the interviewees' awareness of the phenomenon under investigation (Marton & Booth, 1997; Moustaka, 1994; Prosser, Trigwell, & Taylor, 1994).

In order for the interviewees to have an idea about the study, they were provided with information about its aim prior to participating in the interviews. Interviews lasted 40 to 60 minutes each. At the beginning of each interview, interviewees were asked some questions related to their previous experience and the number of times they had used e-assessments while teaching CIS courses. Following that, interviews started by asking the interviewees to talk about their experiences in terms of the phenomenon under study (which is using e-assessments in teaching CIS courses). At the time of conducting the qualitative part of this study, one hundred and thirty CIS teachers were teaching different CIS courses across the campuses in the HEIME colleges. Twelve out of these faculty members were selected randomly. The 12 randomly-selected CIS faculty members were asked to participate in the study. At the beginning, five of them apologised for not being able to participate. Five other CIS faculty members were selected randomly. The random selection process continued until the researcher ended up with a random sample of 12 participants, all of which are CIS faculty who confirmed

their willingness to participate in this study. The demographics of the interviewees are presented in Table 10.

Table 10: Demographics of the Interviewees

	N1[a]	Gender	Age	N2[b]
Interviewee-1	11 years	Male	40-50	~14 times
Interviewee-2	2 years	Female	20-30	~4 times
Interviewee-3	6 years	Female	30-40	~10 times
Interviewee-4	16 years	Male	40-50	>12 times
Interviewee-5	17 years	Female	40-50	~14 times
Interviewee-6	8 years	Male	30-40	>10 times
Interviewee-7	17 years	Male	40-50	~8 times
Interviewee-8	19 years	Male	50-60	~15 times
Interviewee-9	15 years	Male	40-50	~10 times
Interviewee-10	15 years	Female	40-50	~8 times
Interviewee-11	20 years	Male	60-65	~10 times
Interviewee-12	10 years	Male	30-40	~2 times

a. ***N1****: Years of experience as a CIS faculty*
b. ***N2****: Number of times teaching CIS courses using e-assessments (including this semester)*

4.2.2: Interview Setting

According to Miles and Huberman (1984) and Caelli (2001), the interview setting in the research process should be very clear and organised. Accordingly, a folder with a section for each interview was organised with the following components:

1. Copies of the informed consent forms that were signed by the participants.
2. Notes made by the interviewer during each of the interviews.
3. Transcripts of the interviews.
4. Notes made during data analysis of the transcript for each interview.

In addition to this folder, a digital copy of the audio recordings for each interview was stored in an external hard disk that the researcher stored securely.

4.2.3: The Explicitation of the Data

According to Hycner (1985), an explicitation of data versus an analysis is necessary in a research that uses the phenomenological approach. The reason being that the word analysis implies breaking something into parts and consequently a loss of the whole phenomena, while explicitation looks at all the constituents of the phenomena, keeping the whole in context. Accordingly, five explicitation steps were applied:

4.2.3.1: Bracketing and phenomenological reduction

On the word of Gearing (2004), bracketing is a "*scientific process in which a researcher suspends or holds in abeyance his or her presuppositions, biases, assumptions, theories, or previous experiences to see and describe the phenomenon*" (p. 1430). Similarly, Tufford and Newman (2012) define bracketing as a method used to mitigate the potential negative effects of the researcher's presumptions that are related to the study, and as a result, increase the rigour of the project. Moustaka (1994) has also suggested that the researcher should not make any presumptions and concentrate on a particular issue "freshly and naively". These recommendations were used to avoid improper subjective judgment and to allow the phenomena to emerge fully and holistically from the interviews. For instance, the researcher started the analysis of data by specifying what he thought he might find (such as: "teachers believe that both e-assessments are very good"). Then he put these expectations aside in order to hear what the data were telling him. This helped the researcher to get the "pure" phenomena from the participants' viewpoint.

4.2.3.2: Listening to the interview recordings repeatedly

As advised by Hycner (1985) and Creswell (2012, p. 273), the interviews in this research were listened to repeatedly to allow the researcher to develop a holistic sense of the phenomenon. Besides, Creswell (2012) stated that there is a need to read through the data in order to obtain an overall sense of the material. Hence, the transcripts were examined thoroughly more than once. Special attention was given to the non-verbal and para-linguistic levels of communication. For instance, many of the interviewees kept changing their voice levels and pitch along with the changes in the topics of discussion. One of them spoke softly and slowly when he was hesitant to discuss a sensitive issue like the adherence to the institutional policies. Oppositely, one of the interviewees used an increased volume when he was excited about some issues like the marking load.

4.2.3.3: Delineating the codes (units of meaning)

At this stage, the researcher started to investigate the data carefully. He tried to make sense out of the text data by picking up the essence of the meaning expressed in words, phrases, sentences, paragraphs, and non-verbal or para-linguistic cues during the interview (Hycner, 1985). Further to that and based on Creswell's (2012) recommendation, the entire transcripts were coded. "Coding is the process of segmenting and labelling text to form descriptions and broad themes in the data" (Creswell, 2012, p. 243). Hence, the interview data were analysed for noteworthy statements, sayings, or quotes that deliver a comprehension of how the participants experienced the phenomenon.

A list of codes (units of relevant meaning) was created, and redundant ones were recognised. This resulted in a smaller and more manageable number of codes. These codes are demonstrated in the left column of Table 11.

4.2.3.4: Clustering of codes (the units of relevant meaning) to form themes

At this stage of the process, similar codes were clustered together to form the themes. To achieve that, the researcher tried to identify the codes that seem to "fit together" to describe one theme. For example, as represented in the third row in Table 11, the following codes: *"Using something that is already built saves time", "So it saves so much time", "I was spending too much time in marking papers", "Correcting the students' work can be done instantly",* and *"It reduces your marking load"* seem to fit together to describe the major idea "Saving time" which represents a theme.

The first column of Table 11 lists the units of relevant meaning (codes) that were expressed by participants. The number besides each one of these codes refers to the participant number. For example, the statement "*In order to analyse them later – 1"* is a statement that was said by Participant-1. Additionally, the second column of this table shows the number of participants that talked about each one of the emerged themes. These themes are listed in the third column under the title (Themes).

Furthermore, the rows with a *green* background represent the relationships between the emerged themes as expressed by the participants. The analysis of these relationships is based on the definitions of the constructs listed in the literature review (Section 2.2), which are related to the most influential adoption models (TRA, TPB, TAM, and UTAUT).

Table 11: Codes (Units of Relevant Meaning) and the Developed Clusters (Themes)

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "In order to analyse them later" - 1 • "Analysis at the end" - 2 • "You can even get some statistics at the end of the exam" - 6 • "The analysis of the results" - 8 • "You can do statistics and analysis of the results" - 9 • "This gives you statistics of the students who did good and bad " - 10 • "Analysis of result" - 11 • "I tried to analyse some of the students' answers" - 12	**8**	**1. Facilitates the analysis of students' results**
• "Using something that is already built saves time" - 1 • "teachers don't have to waste a lot of time in marking" - 1 • "So it saves so much time" - 2 • "So by this I saved time" - 3 • "In terms of saving some time and effort" - 4 • "This is mainly to save the time " - 5 • "But you save time when it comes to grading and marking" - 6 • "I was spending too much time in marking papers" - 7 • "Correcting the students' work can be done instantly." - 8 • "We are saving time" – 9 • "It reduces your marking load" – 11 • "Helps teachers to mark quickly" – 12	**11**	**2. Saving time**
• "having a central repository of the students' work" – 2 • "I have everything I need in one place" – 3 • "One storage area or central repository" – 4 • "Archiving students' work" – 5 • "At least you have them all in one place" – 6 • "Storing the exam questions and students' answers in one place" – 7 • "The availability of students' work for marking" – 10	**7**	**3. Central Repository System**

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "It will force them to submit on time" – 2 • "Control the time of submission of the assignments" – 4 • "You can say that deadline is tomorrow midnight" – 6 • "Can control the start and the end time of the exam" – 7 • "Uploaded to the Bb learn server at a specific time" – 8 • "Stick to the deadline of the assignments – 10	**6**	**4. Punctuality**
• "The availability of the questions banks" – 1 • "Re-usability of questions in the other courses" – 4 • "These publishers provide ready-made test banks" – 5 • "Availability of test banks from publishers" - 6 • "You can have something like a bank of questions" - 7 • "You can create lots of pools" – 8 • "You get some questions from publishers" – 11	**7**	**5. Availability of question banks**
• "Reduces the chances of cheating" -1 • "We can check plagiarism" -2 • "There is no fear of losing the students' papers" -3 • "Paper-based exams are a bit less secure" - 4 • "Help secure the exams and the questions in general" - 4 • "The security of the exam" – 5 • "To avoid cheating" – 6 • "For security reasons" – 7 • "Eliminate the cheating incidents" - 8 • "It's better controlled in a centralised way" – 9 • "enable students to securely access the exam" – 9 • "the security of the exam" -10 • "questions are changing and students cannot copy from each other" – 11 • "I think that e-assessments are more secure" – 12	**12**	**6. Enhanced Examination Security**
• "You can personalize even the questions based on the learning profile of the students"	**1**	**7. Personalising of questions based on the learning profile**

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "They get instant feedback as well about their performance" – 4 • "Students see explanations about their marks" – 5 • "They get an instant feedback once they finish the exam" – 7 • "Can also give instant feedback to your students" – 8 • "Can also give instant feedback to your students" – 12	5	8. Getting instant feedback
• "To review concepts through doing practice tests" – 4 • "You can create practice tests" – 5 • "Good source for practice exams" – 6	3	9. Allows students to practice tests
• "I can access students work from anywhere at any time" - 2 • "You will always have access" - 3 • "A guarantee that students have access" – 4 • "To access it from anywhere at any time" – 6 • "You can correct students' scripts from anywhere" – 8 • "They are able to access the assessments" -10 • "I can mark it during my lunch or my break" – 11	7	10. Ability to access students' work from anywhere
• "They see their mark and they don't argue – 7 • "It will reduce the students' complaints" – 8 • "YOU don't have to argue with students about the time" – 9 • "No complaints actually" – 11 • "We can avoid them totally when we use e-assessments" – 12	5	11. Less students' complaints about their marks
• "The clarity of students' handwriting" – 9 • "Easier to read their handwriting" – 6 • "Solves the bad handwriting problem for some students" - 11	3	12. Easier to read students' responses
• "This is more environment-friendly" – 3	1	13. Fostering sustainability
• "Will add all the marks together and give you the final mark, and this is more accurate and has less chances to have mistakes" – 8	1	14. Accuracy

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "Be involved more in the technical issues" – 1 • "Technical issues with the machines or to a lesser extent to worry about technical issues with Bb Learn itself" – 2 • "We face these types of problems" – 3 • "Facing technical problems" – 4 • "Any network issues and all those, any technical issues" – 5 • "The disadvantage is just the technical issues" – 7 • "You have to fix the problem before the assessment" – 8 • "Technology can have some interruptions" – 10	**8**	**15. A possibility of facing technical issues**
• "Let me tell you about the number 1 reason for the use of e-assessment from my point of view. I believe that the number-1 reason is security" – 9 • "I would definitely prefer to use e-assessments as this will reduce the marking load" • "If you want to do the analysis after the assessment, then your life will be easier using the built-in feature in Bb learn" • "They can also have software problems. So these are some of the disadvantages of using e-assessments"		• **Perceived usefulness affects teachers' behavioural Intention** • **No moderating factors were mentioned**
• "it's easier in many ways" – 1 • "Because it is easier for me to learn how to use it" – 2 • "Definitely to make it easier on my side" – 4 • "it is very easy to create them online" – 5 • "It's easily accessible" – 9 • "Managing different versions of the assessment is easier" – 10 • "It is very easy to setup" – 11 • "It is easier for me to mark on the computers" – 11 • "It became very easy to use" – 11 • "Just to make things easy for the teacher" – 12	**8**	**16. Ease-of-using e-assessments**
• "Easier to control and troubleshoot" – 3 • "If you have a wrong question, you can easily delete it" – 6 • "It is easy to control the start and end time of the exam" – 7 • "Easier and more controlled I believe" • "The ease-of-marking, the ease-of-control, the analysis" – 12	**5**	**17. Ease-of-control and troubleshooting**

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "You can just download a copy of the assessment that is available online" – 5 • "Find the files you are looking for without much of effort" – 6 • "You have these answers stored and ready for you for the archival purposes" – 8 • "We have all of this done easily" – 9 • "I don't have to scan it." – 11 • "It's a headache for us to do any physical archiving" – 11	5	**18. Ease-of-archiving and access**
• "Because it is easier for me to learn how to use it, I think, it encourages me more to use it" – 2 • "We decided to use e-assessment just to make things easy for the teacher" – 12 • "Being a CIS teacher makes it easier for you to run e-assessments" – 5		• **Perceived Ease-of-Use affects the teachers' behavioural intention** • **The influence of PEoU on the BI will be moderated by Specialty**
• "Students themselves not being able to use BB learn" – 2 • "If students are not used to that particular technology" – 3 • "Students are technology natives" – 5 • "Our students are digital students and are very much familiar with all types of technology – 10 • "They are ready to take the exam" – 12	5	**19. Students' ability to use e-assessments**
• "They don't have experience using BB learn" – 2 • "If they knew how to use it themselves, they might be more encouraged to use it" – 2 • "If they have the skills they might take an active decision" – 4 • "If the teacher is competent enough" – 5 • "Experience and computer skills are very important." – 6 • "Without these skills teachers won't know how good and beneficial the use of e-assessments is" – 9 • "Another reason can be their confidence level." – 11 • "The competency level of the teachers" – 12	7	**20. Teachers' technical skills and experience**
• "The competency level of the team members might affect me" - 3	1	**21. Team members' competency level**

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "If they have the skills they might take an active decision saying I know how to use the tool, there are some benefits why I don't utilise it." – 4 • "Students are technology natives. This makes them less reluctant to use e-assessments" – 5 --- • "If the teacher knows how to manage it and implement it with her students, then it is easier" – 5 • "I think not knowing makes it hard and makes them not like it." – 2		• **Perceived self-efficacy negatively affects computer anxiety.** • **Perceived self-efficacy affects teachers' perceived ease-of-use** • **No moderating factors were mentioned**
• "You still have people, evaluators who still want to see papers in their hands" – 1 • "The resistance to change applies on both teachers and students" – 3 • "When we talk to older teachers saying, you know, there is a better way to do this, they would say, just tell me this much" – 5 • "They might not like to change" – 5 • "You would like to do the same thing" – 9 • "You might resist; you might feel more at ease of whatever you have" – 10 • "Faculty are still not using e-assessments; they are still using paper-based exams as this is what they are used to" – 11 • "Here is always human tendency to resist to any change" – 11	**6**	**22. Teachers' resistance to change**
• "They don't know the benefits, then they won't prefer it" – 3 • "Some of them feel that they need to see the question in front of them" – 4 • "when you see some resistance, you know, sometimes to introduce the technology" – 10 • "Some students saying we don't want the exams to be on bb learn, can you make it on papers?" – 11	**4**	**23. Students' resistance to change**
• "I'm always worried usually in the final exams that something may go wrong with the BB learn" – 2 • "With assessments people don't want to take any chance because it is very crucial for the students" – 5	**2**	**24. E-assessment anxiety**
• "If I used to do these types of assignments as pen-and-paper, I might say, ok, not this time, maybe next time." – 3 • "They will prefer to keep doing what they used to do" – 5 • "They would say use the old method, that's the easiest thing" – 5 • "We don't want the exams to be on bb learn" - 11 • "When we talk to older teachers saying, you know, there is a better way to do this, they would say, just tell me this much" – 5		• **Computer anxiety negatively affects teachers' behavioural intention** • **The influence of computer anxiety on teachers' behavioural intention will be moderated by *age***

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "The support you are getting from the EdTech and the IT team" – 1 • "For us teachers, we do get good support." – 2 • "If I know that the help and support is around, I will have more confidence" – 3 • "Help and support for the technical services department" – 5 • "Network infrastructure and technical support are very important" – 6 • "The support was very good" – 7 • "You don't have technical problems like internet disconnections" – 9 • "The level of technical support is important" – 10 • "They are always there to support us" – 11 • "But in this college, we have a very good support" – 12	10	25. The provided technical support
• "The network between us and the central is used to be a risk" – 1 • "Network infrastructure is better in the city campus because it is more stable" – 5 • "Network infrastructure and technical support are very important" – 6 • "You need a good infrastructure" – 9 • "All of this come down to the infrastructure" – 9 • "I must have a good infrastructure" - 11	5	26. The provided network infrastructure
• "With more training, they will be more open to using it" – 2 • "They need to have some training" – 3 • "Training students to use Bb Learn" – 4 • "They can just attend a PD session about the use of e-assessments and that will make it easy for them" – 5 • "They need to be trained on how to use the LMS and how to use the e-assessments" – 5	4	27. The provided training
• "Using students' own devices may cause problems" – 4 • "Should be able to support all the devices" – 5 • "Teachers have to think about the type of devices student are using" - 5	2	28. Need to support a wide variety of devices and platforms
• "Having a good and reliable wireless connection with good bandwidth" – 5 • "We need a broadband connection, you need a fast and secure Internet connection" – 9 • "I mean the internet connection should be fast" – 11	3	29. Need to have a reliable wireless connection and good bandwidth
• "We cannot always guarantee to have good configurations in the students' laptops" – 7 • "You have to fix the problem before the assessment. This might cause delay to start the assessment" – 8	3	30. Need to have ready devices

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "May have some technical problems in their laptops" – 9		
• "If my exams were in a lab, I wouldn't be that worried" – 2 • "Needs dedicated testing labs" – 3 • "You have to think of different settings and configurations" – 5 • "Take your students to a lab where all the computers are centrally monitored" – 9 • "It should be in an assessment lab" – 10	4	**31. Need for dedicated testing labs**
• "You need proper infrastructure and proper configuration, and properly-trained invigilators" – 9	1	**32. Need for ready invigilators**
• "With more training that they will be more open to using it" – 2 • "If I came and saw everyone using paper based and there was no proper training on Bb learn, and they give me the option I would use paper for sure" – 2 • "Without good technical support, I would go for paper-based" – 3 • "If I know that the help and support is around, I will have more confidence" – 3		• **Facilitating conditions affect teachers' behavioural intention** • **No moderating factors were mentioned**
• "Teachers in the CIS department were encouraging me to use e-assessments" – 2 • "We might also see best practices from other teachers." – 3 • "The digital students and the people around me have affected me" – 10 • "Because of the students' awareness and their feeling towards the ease of using technology" – 10 • "Being a CIS teacher is one of the main reasons I tried to use the e-assessments" – 12	4	**33. Encouraged by the team and the digital age students.**
• "It is highly recommended by the institution to do the exam in Bb learn" – 6 • "This was encouraged by the top management" – 6 • "We are encouraged by the management to use Bb learn" – 8 • "We are moving almost everything into an electronic portfolio" – 9 • "received an email encouraging us to implement the mobile learning" – 10	4	**34. Institutional encouragement**
• "Everybody wants to go green and to save the environment" - 3	1	**35. Everyone wants to go green**

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "We have to follow what the management says" – 2 • "Complying with the institutional policies and procedures" – 4 • "To comply with the institutional requirements" – 4 • "The college mandates that this assessment should be on Bb learn" – 5 • "If it is a requirement from the management, then teachers will definitely use it" - 5 • "If the policy is to use e-assessments, then you have to use it" - 6 • "We had some quality assurance requirements" – 6 • "If we have some instructions that say we need to use Bb learn, then we cannot say no" – 7 • "I have to do it because it is a policy" – 11 • "It is part of the guidelines and the rules here in the college" – 12 • "This is a requirement for the accreditation" – 11	**7**	**36. Institutional compliance**
• "Being a CIS teacher is one of the main reasons I tried to use the e-assessments" – 12 • "The digital students and the people around me have affected me" – 10 • "I guess that complying to these policies is a must." – 10 • "If it is a requirement from the management, then teachers will definitely use it" – 5 • "If the policy is to use e-assessments, then you have to use it." – 6 • "If we have some instructions that say we need to use Bb learn, then we cannot say no" – 7 • "I am using it because it is part of the guidelines and the rules here in the college" – 12		• **Social influence affects teachers' behavioural intention.** • **No moderating factors were mentioned**
• "Richness of the features in the assessment tool" – 2 • "Strength of the assessment tool itself" – 2 • "There are so many options available – 5 • "All these things can be achieved easily in the Bb Learn – 6 • "But lots of improvement are there in Bb Learn. This encouraged us to use e-assessments." – 8 • "The analysis of results is an important thing here" – 8 • "The availability of the analytical tools provided in Bb learn" – 9 • "Using the Bb learn is very accessible by all students" – 10 • "Availability of Bb learn app on different platform" – 10 • "The 2nd thing I like about it is the randomisation" – 11 • "With the use of lockdown browser, they cannot cheat" – 11 • "May be because I trust the tool" – 12 • "I discovered that we can use rubrics, so it is really fantastic" – 12	**8**	**37. Richness of the features of the e-assessment tool**

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "In BB learn, students' work is automatically backed up by the system" – 2 • "I have everything I need in one place" – 3	**2**	**38. Richness of the archiving features**
• "Remaining 10% of questions are of different nature like drawing diagrams" – 3 • "It depends on nature of the exam" – 3 • "When there is drawing, better to have the exam as pen and paper" – 4 • "This is mainly because of the nature of the courses I teach" – 4 • "Those tests that are technologically-dependent" – 4 • "Is related to assessments that are done using computers" – 4 • "Nature of assessment requires the students to prepare a presentation" – 4 • "it all depends on the chapter or the topics that you are teaching and the things you want to test" – 5 • "An assessment can be valid or not valid based on the course itself" – 6 • "when we talk about the first type of assessments that is CBA, it is very logical to use e-assessments" – 6 • "Not suitable for essay and short answer questions, especially that they have spelling difficulty" – 6 • "when you ask students to write somethings" – 7 • "All of this depends of the course I was teaching" - 7 • "For this type of assessments, I mean the theory-based" – 8 • "A combination of both types of questions in one assessment" – 9 • "The nature of the assessment itself" - 12	**8**	**39. Nature of the course, the assessment and the questions**
• "students are panicking because their tasks are not finished" – 3 • "The responsibility of running the assessment in so many colleges" – 5 • "I believe that the size of responsibility […] is very important" – 5 • "If I have a course with so many assessments, I would definitely prefer to use e-assessments" – 6 • "More students increased the chance of having technical issue" – 7 • "Having more sections encourages me to use e-assessments" – 7 • "Especially when you talk about huge number of students" – 10 • "Having more students encourages me to use e-assessments – 11	**6**	**40. Number of students, sections, and colleges**

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "Like drawing diagrams and other tasks that are easier to be done using a pen-and-paper" – 3 • "When there is drawing, better to have the exam as pen and paper" – 4 • "Nature of assessment requires the students to prepare a presentation and present their findings in front some audience" – 4 • "The suitability of question types is very important" – 5 • "You can even measure the validity of the assessment type based on the learning outcomes" – 6 • "Multiple choice questions (These are what you like to call CBA) are obviously better to be created as e-assessments" - 6 • "So you have to redesign the questions and make sure that they can answer them" – 6 • "Some teachers would write a question that is good but not suitable to be used as a Bb learn question" – 6 • "Not suitable for essay and short answer questions" – 6 • "I don't see it effective if you ask students to write the answers or write an essay" - 7 • "like when you ask students to write somethings, it is not preferable" - 7 • "If the software doesn't allow me to, or don't provide me with tools" – 12	**6**	**41. Suitability of the assessment tool**
• "So you have to redesign the questions and make sure that they can answer them" – 6 • "A question that is good but not suitable to be used as a Bb learn question" – 6 • "Assessment should be suitable to the way you teach" – 7 • "Their assessment is not suitable to be given as a Bb learn exam" – 8 • "Students have to model and have to sketch using a pen and paper. For these things, we cannot just use the e-assessments" - 12	**4**	**42. Suitability of the assessment and the questions**

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "For this type of assessments, I mean the theory-based, of course my first choice will be to use e-assessments" – 8 • "Then your life will be easier using the built-in feature in Bb learn" – 8 • "Their assessment is not suitable to be given as a Bb learn exam" – 11 • "With some courses, we can design the assessments as Bb learn or e-assessments" – 12 • "Not suitable for essay and short answer questions" – 6 • "An assessment can be valid or not valid based on the course itself" – 6 • "I have everything I need in one place. This is a great benefit" – 3 • "Something we were not able to do with the traditional paper-based exams." – 11 • It helps a lot in the grading process as well as to avoid cheating" – 6 • "If the software doesn't allow me to, or don't provide me with tools which allow the students to answer exactly the way I want, so may be in this case, I will go for paper-based exams" – 12		• **Technology-Assessment Fit[9] affects teachers' behavioural intention.** • **Technology-assessment fit affects teachers' perceived usefulness** • **No moderating factors were mentioned**
• "Younger generations prefer it more than the older generation" – 3 • "Younger people prefer using technology more" – 4 • "The generation we are teaching now are all digital natives" – 5 • "They know how to use technology, but they don't know how to use it for their learning" – 5 • "Age could be a factor" – 5 • "For old teachers, I mean colleagues, who are already used to pen-and-paper" – 5 • "When we talk to older teachers saying, you know, there is a better way to do this, they would say, just tell me this much" – 5 • "Students are more comfortable now, especially, I am talking about, if I am comparing year 4 with year 1" – 10 • "Younger students prefer using technology more" – 10	**5**	**43. Teachers' age**
• "If the same teacher prepares another exam now, he will not make the same mistake" – 6 • "Every time you are creating and e-assessment, you learn from the previous assessments" – 6 • "Then you will - of course - get more familiar" – 8 • ""the time you spent in using e-assessments" – 12	**6**	**44. Teachers' experience**

[9] Further details about Technology-Assessment Fit are provided in the next sections in this chapter.

Units of Relevant Meaning (Codes)	No. of participants	Clusters of Units of Relevant Meaning (Themes)
• "Because I'm a CIS teacher it was so easy for me" – 2 • "CIS teachers would be more keen than the others" – 3 • "Those teachers who are not CIS teachers" – 4 • "Being an IT teacher makes it easier for you to run e-assessments" – 5 • "when it comes to CIS teachers, somehow, they don't need the technical support as much" – 6 • "Being an IT faculty gives you more advantage compared to other teachers." – 7 • "if you are a CIS teacher, things would be easier" – 8 • "I don't see that being a CIS teacher or a teacher in any other major is a factor because this is related to basic computer literacy" – 9 • "Since we are technology teachers," – 10 • "Being a CIS teacher is one of the main reasons I tried to use the e-assessments" - 12	**9**	**45. Teachers' specialty**
• "I don't see the gender playing any role here" – 3 • "Even the female CIS teachers are different. The image that guys like computers and girls hate computers is not very accurate anymore" – 4 • "teachers' gender is not important" - 12	**3**	**46. Gender (*NOT a factor*)**
• "When we talk to older teachers saying, you know, there is a better way to do this, they would say, just tell me this much" – 5 • "Because I'm a CIS teacher it was so easy for me" – 2 • "CIS teachers would be more keen than the others" – 3 • "Being a CIS teacher is one of the main reasons I tried to use the e-assessments" • "I don't see the gender playing any role here" – 3		• **The influence of computer anxiety will be moderated by *age*** • **The influence of perceived-ease-of-use will be moderated by specialty** • **The influence of the perceived usefulness, perceived ease-of-use, computer anxiety, and social influence will NOT be moderated by *gender*.**

Upon the analysis of the themes that appear in the second column of Table 11, clusters of themes were gathered together creating what Hycner (1985) terms as "central themes" that express the essence of these themes. The clusters (themes) and the developed central themes are presented in Table 12. In this table, the left column contains the central themes, the second column represents the themes, and the third column represents the number of participants that mentioned or discussed this particular theme. In addition to that, the last row corresponding to each one of the central themes (highlighted with a *green* background) shows the relationships that were discussed by the participants. The text in black shows the relationships that were discussed, the text in white shows the moderating factor that the participants referred to during the qualitative interviews, and finally, the text in red "(-)" shows an inverse relationship between the emerged factors. For example, the relationship CA (-) → BI means that the Computer Anxiety negatively affects the behavioural Intention. This means that the more the computer anxiety of a CIS teacher, the less intention to use e-assessments.

In the last set of rows of this table, moderators are discussed. Therefore, both agreements and disagreements of the effect were considered. The reason being that these do not represent factors by themselves. More details about moderatos are provided later in this chapter.

Table 12: Central Themes

Central Themes	Clusters of Units of Relevant Meaning (Themes)	No. of participants
Perceived Usefulness (PU)	1. Facilitates the analysis of students' results	8
	2. Saves time	11
	3. Central repository system	7
	4. Punctuality	6
	5. Availability of question banks	7
	6. Enhanced examination security	12
	7. Personalising of questions based on the learning profile	1
	8. Getting instant feedback	5
	9. Allows students to practice tests	3
	10. Ability to access students' work from anywhere	7
	11. Less students' complaints about their marks	5
	12. Easier to read students' responses	3
	13. Fostering sustainability	1
	14. Accuracy	1
	15. A possibility of facing technical issues	8
	• **PU → BI** **No moderating factors were mentioned**	
Perceived Ease-of-Use (PEoU)	16. Ease-of-using e-assessments	8
	17. Ease-of-control and troubleshooting	5
	18. Ease-of-archiving and access	5
	• **PEoU → BI**	
Perceived Self-Efficacy (PSE)	19. Students' ability to use e-assessments	5
	20. Teachers' technical skills and experience	7
	21. Team members' competency level	1
	• **PSE (-)→ CA** • **PSE → PEoU** **No moderating factors were mentioned**	
Computer Anxiety (CA)	22. Teachers' resistance to change	6
	23. Students' resistance to change	4
	24. E-assessment anxiety	2
	• **CA (-)→ BI** **The influence of CA on the BI will be moderated by age**	
Facilitating Conditions (FC)	25. The provided technical support	10
	26. The provided network infrastructure	5
	27. The provided training	4
	28. Need to support a wide variety of devices and platforms	2
	29. Need to have a reliable wireless connection and good bandwidth	3
	30. Need to have ready devices	3
	31. Need for dedicated testing labs	4
	32. Need for ready invigilators	1
	• **FC → BI** **No moderating factors were mentioned**	
Social Influence (SI)	33. Encouraged by the team and the digital age students.	4
	34. Institutional encouragement	4
	35. Institutional compliance	7
	36. Everyone wants to go green	1
	• **SI → BI** **No moderating factors were mentioned**	

Central Themes	Clusters of Units of Relevant Meaning (Themes)	No. of participants
Technology-assessment fit (TAF)	37. Richness of the features of the e-assessment tool	8
	38. Richness of the archiving features	2
	39. Nature of the course, the assessment and the questions	8
	40. Number of students, sections, and colleges	6
	41. Suitability of the assessment tool	6
	42. Suitability of the assessment and the questions	4
	• **TAF → BI** • **TAF → PU** **No moderating factors were mentioned**	
Moderators	43. Age (teachers' age and students' age)	5 agree 1 disagrees
	44. Teachers' experience	6 agree
	45. Teachers' specialty	9 agree 1 disagrees
	46. Gender (NOT A FACTOR)	3 disagree
	• The influence of CA will be moderated by *age* • The influence of PEoU will be moderated by *specialty* • The influence of PU, PEoU, CA and SI will NOT be moderated by *gender*	

4.2.3.5: Distinguishing general and unique themes

Following Hycner's (1985) recommended list of steps describing the phenomenological analysis of interview data, themes that are common to most or all the interviews were identified. Subsequently, themes that are unique to a single interview were also distinguished. Finally, general and unique themes were placed back into the overall context from which they emerged (Hycner, 1985). The resulted general and unique themes for the interviews are discussed in Section 4.2.5. They are also shown in Table 12.

4.2.4: The Study Results

As a result of following the steps in the data collection and explicitation process, the following qualitatively different central themes emerged:

1. Perceived Usefulness (PU)
2. Perceived Ease-of-Use (PEoU)

3. Perceived Self-Efficacy (PSE)
4. Computer Anxiety (CA)
5. Facilitating Conditions (FC)
6. Social Influence (SI)
7. Technology-Assessment Fit (TAF)
8. Moderators

These central themes are described in more details in the following sections:

4.2.4.1: Perceived Usefulness (PU)

As mentioned in Section 2.2.3, perceived usefulness is one of the main factors that have an influence on users' decisions when introduced to a new technology. According to Davis (1989) and Davis et al. (1989), PU is "the degree to which a person believes that using a particular system would enhance his or her job performance".

The data collected during the interviews indicated that CIS teachers believe that "perceived usefulness" is one of the factors that have affected their intention to use e-assessments. They stated that using e-assessments helped them reduce the time needed for marking, allowing them to spend their time in dealing with other critical work. This was demonstrated by the following comments made by the interviewees:

> *"Teachers don't have to waste a lot of time in marking" ... (Participant-1)*
>
> *"I think that there are different reasons for that. One would be definitely to make it easier on my side in terms of saving some time and effort." ... (Participant-4)*
>
> *"Correcting the students' work can be done instantly." ... (Parricipant-8)*

Additionally, some teachers believe that using e-assessments facilitates the analysis of students' results. This was evident by the following comments made in the interviews:

> *"Aligning the questions to the learning outcomes in order to analyse them later." ... (Participant-1)*
>
> *"You can do statistics and analysis of the results and the grade distribution and all. All of this can be easily automated." ... (Participant-9)*
>
> *"I tried to analyse some of the students' answers, and according to the Bb learn, I got some results, and it showed me that in some cases, the questions were fair, or were complicated, so this was really good." ... (Participant-9)*

Furthermore, some teachers mentioned that using e-assessments allows them to have a central repository system. This allowed them to have the work of their students stored in one place. This was exhibited in the following comments made by some participants:

> *"All the assignments are in one place. I won't worry about losing the email. And I'm sure that Bb learn is backed up. So, if something happened it's backed up" ... (Participant-2)*
>
> *"I have everything I need in one place. If a student comes to me saying that her grade is not correct, I can directly go back to the grade centre and check the test that she is referring to" ... (Participant-3)*
>
> *"We can use Bb learn as a data bank; all the students' work can be stored and then copied from one course to another, so I find that this is less time consuming than having to copy papers" ... (Participant-10)*

Punctuality is another benefit that some CIS teachers have discussed during the interviews. Some of these comments are listed below:

> *"It helps you control the time of submission of the assignments" ... (Participant-4)*
>
> *"Students will start the exam at the same time and finish at the same time. So if we are doing the exam in more than one class at the same time, we can control the start and the end time of the exam" ... (Participant-7)*
>
> *"Enforce students to stick to the deadline of the assignments" ... (Participant 10)*

Likewise, some teachers talked about the availability of question banks as another benefit of using e-assessments. They see this as a very important benefit as it helps them to use professionally-written questions that have been already tested and verified before. Some of these comments are listed below:

> *"If you use e-assessments, the questions will be reusable and you just do it once and then reuse it in the future" ... (Participant-4)*

> *"Availability of test banks from publishers and from other teachers." ... (Participant-6)*

> *"When you get some questions from publishers, I can export them easily to Bb learn, I can choose any questions I want, I can change the questions the way I want" ... (Participant-11)*

Another area that many teachers have considered during the interviews was the security of assessments. They believe that using e-assessments enhances the examination security and eliminates cheating incidents. This could be easily done when utilising the security-related features that are available with the e-assessment management system. This is demonstrated in the following comments that were made in the interviews:

> *"Using computer reduces the chances of cheating, randomizing questions is easier to do it in computers" ... (Participant-1)*

> *"You want to randomise the questions, and you want to have multiple passwords and you want to randomise answer choices. You also want to make sure that students are not browsing the Internet during the exam so you need to use something like the Lockdown browser." ... (Participant-5)*

> *"Plagiarism check helps you to check if students are copying from each other or from some sources without proper citation." ... (Participant-6)*

In addition, one teacher believes that using e-assessments helps him to personalise the examination questions based on the students' learning profile. See the comment below:

> *"You can personalize even the questions based on the learning profile of the students" ... (Participant-1)*

Other teachers discussed how e-assessments helped them to provide their students with instant feedback after finishing their assessments. Some of these comments are listed below:

> *"Once they finish the assessment, they get instant feedback as well about their performance" ... (Participant-4)*
>
> *"Students see explanations about their marks and what they were supposed to write as an answer" ... (Participant-5)*
>
> *"And you can also give instant feedback to your students. In other words, students do not have to wait for hours, or sometimes days waiting for you to correct their assessments" ... (Participant-8)*

In addition, three participants stated that e-assessments allowed their students to review concepts and practice tests. Following are some of the comments these participants made in the interview:

> *"Where students are given some of these questions to review concepts through doing practice tests and stuff like that" ... (Participant-4)*
>
> *"You can create practice tests and you can create the actual test questions from the same pool" ... (Participant-5)*
>
> *"Good source for practice exams that you give to your students where you encourage them to study and be prepared for the exams" ... (Participant-6)*

Furthermore, many CIS teachers stated that using e-assessments has allowed them to access students' work from anywhere and at any time. They believe that this is a very helpful feature, as it allowed them to mark their students' work remotely. Some of the comments made in the interviews are listed below:

> *"I can access students work from anywhere at any time." ... (Participant-2)*
>
> *"You will always have access" ... (Participant-3)*
>
> *"You can access that from anywhere; you have a digital copy that you can access at anytime from anywhere" ... (Participant-8)*

Five CIS teachers also assured that using e-assessments have reduced the students' complaints about their marks. This was obvious in the following comments that were made in the interviews:

> *"Students come back to me and argue about their marks, especially because they get an instant feedback once they finish the exam. This was happening a lot more when we were using paper-based exams" ... (Participant-7)*

> *"It will reduce the students' complaints. From my experience, no student had complaint about a mark that is corrected by a computer" ... (Participant-8)*

> *"The mark is there, the students accept, whereas in the traditional exam, they would ask something like: Why did you give me this mark?" ... (Participant-11)*

Moreover, three CIS teachers referred to some of their students' bad handwriting. They believe that e-assessments made it easier for them as it became easier for them to read students' responses. This is evident in the following comments:

> *"Easier to read their handwriting" ... (Participant-6)*

> *"The clarity of students' handwriting" ... (Participant-9)*

> *"Solves the bad handwriting problem for some students" ... (Participant-11)*

One CIS teacher also talked about sustainability and how using e-assessments helped her to be more environment-friendly. Following is one of this teacher's comments that she made in the interview:

> *"I try to convince them by saying that this is more environment-friendly [...] We are all trying to be more sustainable environment. We would like to achieve sustainability." ... (Participant-3)*

Accuracy in the calculation of the total marks of each student was another point that was mentioned by one CIS teacher as well. She said:

> *"Will add all the marks together and give you the final mark, and this is more accurate and has less chances to have mistakes" ... (Participant-8)*

Although there seems to be concrete evidence that e-assessments allow teachers to enjoy many benefits, the data gathered shows that there is a possibility that teachers face some technical issues while using e-assessments. As a result, some teachers had to mark some of the essay questions manually. This was evident by many comments such as the following:

> *"You don't want your co-teachers to be involved more in the technical issues of the system" ... (Participant-1)*
>
> *"Technical issues with the machines, or to a lesser extent, to worry about technical issues with Bb Learn itself, or the lockdown browser and the related settings" ... (Participant-2)*
>
> *"I can say that some teachers are afraid that their students face some technical issues. For example, when some students start their computers, they may have a hardware problem or an internet connection problem" ... (Participant-7)*
>
> *"If they have a problem then you have to fix the problem before the assessment" ... (Participant-8)*

4.2.4.2: Perceived Ease-of-Use (PEoU)

This theme considers the likelihood of using e-assessments because of the perceived ease-of-use of the e-assessments management system that they are currently using in HEIME. As mentioned is Section 2.2.3, PEoU is another factor that has an influence on users' decisions when introduced to a new technology. According to Davis (1989) and Davis et al. (1989), PEoU is "the degree to which a person believes that using a particular system would be free of effort".

The data collected in the qualitative interviews indicate that CIS teachers perceive that e-assessments are easy to use. This had a positive effect on their behavioural intention to use the e-assessments system that they are currently adopting in a higher education

institution. This was clear in the following comments that are made by some participants:

> *"Because it is easier for me to learn how to use it, I think, it encourages me more to use it" ... (Participant-2)*
>
> *"Definitely to make it easier on my side" ... (Participant-4)*
>
> *"Actually I prefer e-assessments as it is very easy to create them online using the LMS" ... (Participant-5)*
>
> *"Because of the students' awareness and their feelings towards the ease of using technology, and you as a teacher, you realise how easy and practical is the use of e-assessments" ... (Participant-10)*

Participants also commented on how e-assessments are easy to control and troubleshoot. Five of the participants stated that one of the reasons they like to use e-assessments is that it facilitates the control of the examination and the troubleshooting of problems related to some of the examination settings. This was evident by the following comments made in the interviews:

> *"But in e-assessments, it became easier to control and troubleshoot as I just went back to the grade centre, and I went back to the duplicated questions and I found out which other students have answered it and with just a click I managed to solve this problem." ... (Participant-3)*
>
> *"In e-assessments, you can do that in one click. If you have a wrong question, you can easily delete it" ... (Participant-6)*
>
> *"In a bb learn-based exam, it is easy to control the start and end time of the exam. We can guarantee that the time is the same for all" ... (Participant-7)*

Some participants also mentioned that they were encouraged to use e-assessments because they are easy to archive and access. This was obvious in some of the participants' comments in the interviews:

> *"If you have such a system, you can come after 10 years and find the files you are looking for without much of effort" ... (Participant-6)*

"You don't have to store it as physical copies. You don't need to scan these copies and store them as softcopies. You have these answers stored and ready for you for the archival purposes" ... (Participant-8)

"So we need to have something that helps us to do this storing of files automatically where instead of having exams on papers and then scan them and so, we have all of this done easily on something like Bb learn" ... (Participant-9)

4.2.4.3: Perceived Self-Efficacy (PSE)

This central theme refers to the perceived self-efficacy which has been proposed as important to the analysis of individual behaviour toward information technology. Compeau and Higgins (1995) define computer self-efficacy as the judgment of one's capability to use an information technology system.

This was highlighted during the interviews as some of the participants pointed out that the ability to configure, manage, and use the e-assessment management system plays a major role in their choice of the type of assessment, that being a paper-based or computer-based assessment. On the one hand, they talked about the students' ability to use e-assessments. For instance, one of participants stated that having students that are not trained to use the e-assessments system is a problem by itself. This was evident in the comments made in the interviews:

"Another problem sometimes is with the students themselves not being able to use Bb learn itself" ... (Participant-2)

"Students in class B are not so encouraged, this changes my decision to use or not to use e-assessments" ... (Participant-5)

"Our students are digital students and are very much familiar with all types of technology" ... (Participant-10)

On the other hand, some participants declared that they consider their own technical skills and expertise in using e-assessments is another important factor that affects their willingness to use it. Some of these participants gave the following comments:

> *"Teachers other than CIS teachers who are more reluctant to use, especially at the Arabic department. They don't have experience using Bb learn so I had to help a lot in that case" ... (Participant-2)*

> *"if they have the skills they might take an active decision saying: I know how to use the tool, there are some benefits, why I don't utilise it" ... (Participant-4)*

> *"Because if the teacher doesn't have a clue about the product, then he will not be able to run it with the students." ... (Participant-5)*

Additionally, one CIS teacher stated that the competency level of the team members might affect him in deciding to use or not to use e-assessments. Following is the comment he made in the interview:

> *"The competency level of the team members might affect me." ... (Participant-3)*

4.2.4.4: Computer Anxiety (CA)

This theme reflects on the nervousness, worrying of the unknown and the fear of being out of control that may happen as a result of changing from using papers to using computers. Venkatesh (2000) defined computer anxiety as "an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers". Additionally, computer anxiety is defined as "concern and fear experienced by an individual when he/she thinks that he/she is using computer technology or he/she is really using a computer" (Celik & Yesilyurt, 2013; Maurer, 1994).

The data investigation shows that some participants see the teachers' resistance to change – which is related to computer anxiety - as an important factor that has a negative effect on their intention to use e-assessments. This was evident in the following comments:

> *"You still have people, evaluators who still want to see papers in their hands" ... (Participant-6)*
>
> *"They will prefer to keep doing what they used to do" ... (Participant-5)*
>
> *"When we talk to older teachers saying, you know, there is a better way to do this, they would say, just tell me this much" ... (Participant-5)*
>
> *"You might resist; you might feel more at ease of whatever you have" ... (Participant-10)*

On the other hand, four teachers also believe that students' resistance to change – also related to computer anxiety - is an important factor as well. They stated that they get affected by their students' preferences and resistance to change. This was evident in the following comments made in the interviews:

> *"And when you see some resistance, you know, sometimes to introduce the technology or as specific app to your students, you tend to use a different thing" ... (Participant-10)*
>
> *"If they are given an option, a minority of them may say I want the exam to be on paper. They just prefer it that way. Some of them feel that they need to see the question in front of them" ... (Participant-4)*
>
> *"Still have some students saying we don't want the exams to be on Bb learn, can you make it on papers?" ... (Participant-10)*

4.2.4.5: Facilitating Conditions (FC)

As indicated in Section 2.2.4, facilitating conditions is one of the four core direct determinants of usage intention that are related to the UTAUT model. Venkatesh et al.

(2003) defined FC as "objective factors in the environment that observers agree make an act easy to do, including the provision of computer support". The data gathered during the interviews showed that CIS teachers consider this factor "facilitating conditions" as one of the factors that have affected their intention to use e-assessments. Some of them talked about the provided technical support as a very important facilitating condition. This was demonstrated by the following comments made by the interviewees:

> *"If I know that the help and support is around, I will have more confidence, especially if I am trying new things. I will be somehow relaxed that if anything goes wrong, somebody will be there to help" ... (Participant-3)*
>
> *"Help and support for the technical services department [...] if the support is good that is positive, otherwise it is negative" ... (Participant-5)*
>
> *"When it goes to other teachers, they are not expected to have the same level of technical skills, so for them, the technical support is very crucial" ... (Participant-6)*

Other participants consider the provided network infrastructure as another kind of support that is needed for a successful implementation of e-assessments. This was clear in the following comments:

> *"Network infrastructure is better in the city campus because it is more stable" ... (Participant-5)*
>
> *"Network infrastructure and technical support are very important" ... (Participant-6)*
>
> *"The technology we have in the UAE in general and HCT specifically allows you to do that because we need a broadband connection, you need a fast and secure Internet connection, you need a good infrastructure, and all of these are available here" ... (Participant-9)*

The provided training is another kind of the facilitating conditions that was mentioned by some of the participants. Following are some of the comments that the participates made during the interviews:

> *"I feel it is a good tool, a very good tool for teachers. If we just were taught about how to use it" ... (Participant-2)*

> *"They might feel that they need to have some training. Some of them don't know enough about what we are using here, so they have to take the training." ... (Participant-3)*

> *"They can just attend a PD session about the use of e-assessments and that will make it easy for them. Because every big institution should have a learning technology department that can help and support all the teachers with their training needs." ... (Participant-5)*

Although there seems to be a strong evidence that many facilitating conditions are provided by the HE institutions in general, the data collected shows that there are still many needs. One of them is the need to support a wide variety of devices and platforms. This was evident in the comments of two participants. See below:

> *"Using students' own devices may cause problems." ... (Participant-4)*

> *"Should be able to support all the devices because it's BYOD environment now and students come with their own device." ... (Participant-5)*

Another need that participants mentioned was the need to have a reliable wireless connection with a good bandwidth. This was evident in the comments of three of the participants:

> *"Having a good and reliable wireless connection with good bandwidth are also other factors that have to be taken into account." ... (Participant-5)*

> *"The technology we have in the UAE in general and HCT specifically allows you to do that because we need a broadband connection, you need a fast and secure Internet connection." ... (Participant-9)*

> *"I must have a good infrastructure. I mean the internet connection should be*

fast." … (Participant-11)

The need to have ready devices was another one of the needs that were mentioned during the interviews. Following are some of the comments related to this point:

> *"This applies when students use their laptops. You know, we cannot always guarantee to have good configurations in the students' laptops." … (Participant-7)*
>
> *"We assume that the students will have the lockdown browser in their machines but students may not have that" … (Participant-8)*

4.2.4.6: Social Influence (SI)

This theme reflects on social influence, which refers to the individual's internalisation of the reference group's subjective culture (Thompson, Higgins, & Howell, 1991). Social Influence also refers to the specific interpersonal agreements that the individual has made with others, in specific social situations. Venkatesh et al. (2003) defined it as "the degree to which an individual perceives that important others believe he or she should use the new system".

The data investigation shows that some participants see the encouragement by the other team members and the digital age students as part of the social influence that had an effect on their decision to adopt e-assessments. This was evident in the following comments:

> *"Teachers in the CIS department were encouraging me to use e-assessments" … (Participant-2)*
>
> *"Because of the students' awareness and their feeling towards the ease of using technology" … (Participant-10)*
>
> *"Being a CIS teacher is one of the main reasons I tried to use the e-assessments" … (Participant-12)*

Participants also listed the institutional encouragement as another form of the social influence that was affecting their intention to use e-assessments. This was evident in the following comments made by the participants:

> *"It is highly recommended by the institution to do the exam in Bb learn" ... (Participant-6)*
>
> *"We are encouraged by the management to use Bb learn" ... (Participant-8)*
>
> *"We are moving almost everything into an electronic portfolio" ... (Participant-9)*

One participant also talked about the willingness of people around her to live in an environment-friendly setting as another kind of social influence. She stated that everyone wants to go green. Following is the comment that she made in the interview:

> *"Everybody wants to go green and to save the environment" ... (Participant-3)*

In addition, most of the participants talked about the institutional compliance as another sort of social influence that has affected their intention to use e-assessments. This is clear in the following comments:

> *"We have to follow what the management says" ... (Participant-2)*
>
> *"Probably they will be complying with the institutional policies and procedures but not more" ... (Participant-4)*
>
> *"If it is a requirement from the management, then teachers will definitely use it" ... (Participant-5)*
>
> *"I am using it because it is part of the guidelines and the rules here in the college" ... (Participant-12)*

4.2.4.7: Technology-assessment fit (TAF)

This central theme focuses on how much the features and the support of the e-assessment tool 'fits' the requirements of the assessments that CIS teachers are using.

This construct is similar to the task technology fit (TTF) model in which it is argued that individuals will adopt a technology based on the fit between the technology characteristics and task requirements (Goodhue, 1995; Goodhue & Thompson, 1995). In this study, this term refers to the features provided by the employed technology and the actual experience of utilising these features (Goodhue & Thompson, 1995). Technology characteristics is also used in the Task-Technology Fit (TTF) model that is a broadly used theoretical model for assessing how information technology results in performance and usage impacts. For an information system to supportively affect technology use, the technology must suit the task it supports to have an impact (Lu & Yang, 2014).

In this study, technology refers to the e-assessment management system that is being used in HEIME. One item related to the technology characteristics is the richness of the features provided by the e-assessment tool. This was evident in the following sample of the comments made in the interviews:

> *"Richness of the features in the assessment tool" ... (Participant-2)*
>
> *"Your life will be easier using the built-in features in Bb learn" ... (Participant-8)*
>
> *"With the options that come with bb learn, I believe that it is more secure." ... (Participant-9)*
>
> *"I discovered that we can analyse the answers of the students using e-assessments, so I found that this feature was really really great." ... (Participant-12)*

Two participants have also talked about the richness of the archiving features that are available in the e-assessment tool currently used. The two comments are listed below:

> *"In Bb learn, students' work is automatically backed up by the system. So, we can always find their work" ...* (Participant-2)

"I have everything I need in one place. This is a great benefit. If a student comes to me saying that her grade is not correct, I can directly go back to the grade centre and check the test that she is referring to" ... (Participant-3)

This central theme is also related to the type of questions that are being asked in the assessment. Some participants talked about the nature of the course, some of them talked about the learning outcomes of the course, while others talked about the nature of questions and the design of these questions. This was evident in the following comments made in the interviews:

"The remaining 10% of questions are of different nature like drawing diagrams and other tasks that are easier to be done using a pen-and-paper" ... (Participant-3)

"When there is drawing, it is better to have the exam as pen and paper" ... (Participant-4)

"An assessment can be valid or not valid based on the course itself. It differs from course to course. You can even measure the validity of the assessment type based on the learning outcomes you are covering in this particular assessment" ... (Participant-6)

"But I don't see it effective if you ask students to write the answers or write an essay" ... (Participant-7)

Other participants focused on other issues like the number of students, the number of sections, and the number of colleges that are taking the assessment at the same time. Following are some comments related to this theme:

"If the exam is being taken by students from around the whole colleges, 15 minutes before the end of the exam, you find that all of the students are uploading their files at the same time. This makes the response very slow" ... (Participant-3)

"But if you have the responsibility of running the assessment in so many colleges in the system and you don't know what the lab setup is in each one of these colleges, then that will be something that the person who is responsible needs to consider" ... (Participant-5)

"When we talk about the first type of assessments that is CBA, it is very logical to use e-assessments" ... (Participant-6)

"Having more students encourages me to use e-assessments" ... (Participant-11)

In addition, some participants discussed the suitability of the assessment tool to run particular assessments, while others talked about the suitability of the assessments themselves and the questions used in these assessments. Following are some of the comments that participants made in relation to these two points:

"Like drawing diagrams and other tasks that are easier to be done using a pen-and-paper" ... (Participant-3)

"When there is drawing, better to have the exam as pen and paper" ... (Participant-4)

"For this type of assessments, I mean the theory-based, of course my first choice will be to use e-assessments" ... (Participant-8)

"Their assessment is not suitable to be given as a Bb learn exam" ... (Participant-11)

4.2.4.8: Moderators

This central theme examines the moderating factors that play a significant role in the adoption of e-assessments. The inclusion of moderators is expected to enhance the explanatory power of the proposed model, making investigating moderating effects worthwhile. This section defines each of the key moderators (age, experience, specialty, and gender), and provides the theoretical justification for the hypotheses. Following is a list of these moderators:

(1) Age

The first moderating factor that some participants have discussed is "age". This refers to both the teachers' ages and the students' ages. The literature shows that age is

considered to play a moderating role. For instance, research on work-related attitudes proposes that younger workers may place more importance on extrinsic rewards (Hall & Mansfield, 1975; Porter, 1962).

This is evident in the following comments that were made in the interviews:

> *"May be younger generations prefer it more than the older generation" ...* (Participant-3)
>
> *"This is normal. Younger people prefer using technology more than older people" ...* (Participant-4)
>
> *"But for old teachers, I mean colleagues, who are already used to pen-and-paper, I find it hard to ask them to use technology in the preparation of some assessments" ...* (Participant-5)
>
> *"Younger students prefer using technology more than older students because they are more into the era of technology" ...* (Participant-10)

(2) Teachers' Experience

The second moderating factor that CIS teachers mentioned in the interviews was the teachers' experience. Experience is one of the moderators that was suggested (either implicitly or explicitly) in the literature (Davis, 1989; Karahanna & Straub, 1999; S. Taylor & P. Todd, 1995; Thompson et al., 1991; Venkatesh et al., 2003).

Following are some of the experience-related comments that some participants made in the interviews:

> *"For me, teachers other than CIS teachers who are more reluctant to use, especially at the Arabic department, they don't have experience using Bb learn so I had to help a lot in that case" ...* (Participant-2)
>
> *"Every time you are creating and e-assessment, you learn from the previous assessments. But the problem is that until you reach a level where you have a good experience, this will cost a lot of time and effort" ...* (Participant-6)
>
> *"You will be surprised to see how some faculty members are not sure about*

how to do import, export of the assessments between Bb learn and Respondus" ... (Participant-11)

(3) Teachers' Specialty

The third moderating factor that participants mentioned during the interviews was the teachers' specialty. Although this was not one of the moderating factors that other models have listed, it emerged in this study as a moderator, and was discussed by nine different participants. However, since the data were collected from CIS teachers only, it was not possible to test the effect this moderator may have on the adoption model. Hence it was excluded in the final model. Following are some of these comments:

"Because I'm a CIS teacher it was so easy for me" ... (Participant-2)

"CIS teachers would be more keen than the others who are doing other things like health or business or anything else that is not as close to technology" ... (Participant-3)

"Being an IT teacher makes it easier for you to run e-assessments" ... (Participant-5)

(4) Gender

Although gender was listed as a moderating factor in many previous studies (Davis, 1989; Karahanna & Straub, 1999; Taylor & Todd, 1995; Thompson et al., 1991; Venkatesh et al., 2003), the data collected shows that gender is not seen as a moderator. This is evident in the following comments made in the interviews:

"I don't see the gender playing any role here" ... (Participant-3)

"Even the female CIS teachers are different. The image that guys like computers and girls hate computers is not very accurate any more. So for CIS teachers in particular, I cannot see any difference. For others, there might be a difference but not because of gender" ... (Participant-4)

"Teachers' gender is not important" ... (Participant-3)

4.2.5: General and Unique Themes

In order to understand and explore the participants' awareness of the phenomenon under investigation that is "*the use of e-assessments to assess their students' work while teaching CIS courses*", the researcher started by identifying the similarities and differences between the experiences of the teachers who participated in this research. He looked for the themes that were common for all or most, i.e. more than half, of the interviews, and then the themes that were exclusive to less than half of the interviewees were noted. The outcomes of this phase of the analysis are depicted in Table 12 Part 1 and Part 2.

4.2.5.1: Common Themes (all or more than half of the participants)

Not all the emerged themes were common amongst all or most of the interviewees. As presented in Table 12, the common ones amongst all or most of the interviewees were centred on *facilitating the analysis of students' results, saving time, having a central repository system, punctuality, the availability of question banks, the enhanced examination security, the ability to access students' work from anywhere, the ease-of-using e-assessments, the teachers' technical skills and experience, the teachers' resistance to change, the provided technical support, the institutional compliance, the richness of the features of the e-assessment tool, the nature of the course, the assessment and the questions, the number of students, sections, and colleges, the suitability of the assessment tool, the teachers' experience,* and *the teachers' specialty.*

Additionally, less than half of the participants (5 out of 12 participants) believed that using e-assessments allowed their students to *get instant feedback*. The same number of participants also pointed out that this kind of automation of assessments *reduced students' complaints about their marks*. Furthermore, 5 participants believed that using

e-assessments is *easy to control and troubleshoot, easy to archive and access students' work*, and it *requires students to have specific computer skills.* Another 5 participants also claimed that the decision to adopt e-assessments depends on the *students' ability to use this tool*. And finally, 5 participants mentioned that adopting e-assessments depends on *the provided network infrastructure*.

Likewise, 4 of the participants believed that the intention to use e-assessments is affected by the *students' resistance to change*. Another 4 participants mentioned that *the provided training* affects their decision to adopt or not to adopt e-assessments. Four other participants also talked about how they get *encouraged by both the team members and the management of their institution*. And finally, 4 different participants talked about *the suitability of the assessments* and the questions used in these assessments.

4.2.5.2: Unique Themes (One, two, or three participants)

The analysis of the collected data shows that some of the emerged themes were discussed by a minority of the participants (only one, two, or three participants). For example, the themes focusing on the *team members' competency level*, the *need for ready invigilators*, and the belief that *everyone wants to go green* were expressed by one participant only. Likewise, themes related to the *need to support a wide variety of devices and platforms* and the *richness of the archiving features* provided by the e-assessment tool were only expressed by two participants. In addition to that, themes related to the *need to have a reliable wireless connection and good bandwidth*, the *need to have ready devices*, and the *gender* were voiced by three participants only, and these themes are considered unique themes.

Table 13: Common and Unique Themes (Part 1)

Perceived Usefulness (PU)	Perceived Ease-of-Use (PEoU)	Perceived Self-Efficacy (PSE)	Computer Anxiety (CA)	Facilitating Conditions (FC)	Social Influence (SI)	Technology-assessment fit (TAF)	Moderators
Facilitates the analysis of students' results (Most of the participants) (COMMON THEME)	Ease-of-Using e-assessments (Most of the participants) (COMMON THEME)	Students' ability to use e-assessments (Less than half) (UNIQUE THEME)	Teachers' resistance to change (Most of the participants) (COMMON THEME)	The provided technical support (Most of the participants) (COMMON THEME)	Encouraged by the team and the digital age students. (Less than half) (UNIQUE THEME)	Suitability of the assessment tool (Most of the participants) (COMMON THEME)	Age (teachers' age and students' age) (Most of the participants) (COMMON THEME)
Saves time (Most of the participants) (COMMON THEME)	Ease-of-control and troubleshooting (Less than half) (UNIQUE THEME)	Teachers' technical skills and experience (Most of the participants) (COMMON THEME)	Students' resistance to change (Less than half) (UNIQUE THEME)	The provided network infrastructure (Less than half) (UNIQUE THEME)	Institutional encouragement (Less than half) (UNIQUE THEME)	Suitability of the assessment and the questions (Less than half) (UNIQUE THEME)	Teachers' Experience (Most of the participants) (COMMON THEME)
Central Repository System (Most of the participants) (COMMON THEME)	Ease-of-archiving and access (Less than half) (UNIQUE THEME)	Team members' competency level (1 participant) (UNIQUE THEME)	E-assessment Anxiety (2 participants) (UNIQUE THEME)	The provided training (Less than half) (UNIQUE THEME)	Institutional Compliance (Most of the participants) (COMMON THEME)	Richness of the features of the e-assessment tool (Most of the participants) (COMMON THEME)	Teachers' Specialty (Most of the participants) (COMMON THEME)
Punctuality (Most of the participants) (COMMON THEME)				Need to support a wide variety of devices and platforms (2 participants) (UNIQUE THEME)	Everyone wants to go green (1 participant) (UNIQUE THEME)	Richness of the archiving features (2 participants) (UNIQUE THEME)	Gender (NOT A FACTOR) (3 participants) (UNIQUE THEME)
Availability of question banks (Most of the participants) (COMMON THEME)				Need to have a reliable wireless connection and good bandwidth (3 participants) (UNIQUE THEME)		Nature of the course, the assessment and the questions (Most of the participants) (COMMON THEME)	
Enhanced Examination Security (All of the participants) (COMMON THEME)				Need to have ready devices (3 participants) (UNIQUE THEME)		Number of students, sections, and colleges (Most of the participants) (COMMON THEME)	
Personalising of questions based on the learning profile (1 participant) (UNIQUE THEME)				Need for dedicated testing labs (Less than half) (UNIQUE THEME)			

Table 13: Common and Unique Themes (Part 2)

Perceived Usefulness (PU)	Perceived Ease-of-Use (PEoU)	Perceived Self-Efficacy (PSE)	Computer Anxiety (CA)	Facilitating Conditions (FC)	Social Influence (SI)	Technology-assessment fit (TAF)	Moderators
Getting instant feedback (Less than half) **(UNIQUE THEME)**				**Need for ready invigilators** (1 participant) **(UNIQUE THEME)**			
Allows students to practice tests (3 participants) **(UNIQUE THEME)**							
Ability to access students' work from anywhere (Most of the participants) **(COMMON THEME)**							
Less students' complaints about their marks (Less than half) **(UNIQUE THEME)**							
Easier to read students' responses (3 participants) **(UNIQUE THEME)**							
Fostering Sustainability (1 participant) **(UNIQUE THEME)**							
Accuracy (1 participant) **(UNIQUE THEME)**							
A possibility of facing technical issues (Most of the participants) **(COMMON THEME)**							

As argued by Tesch (1944), identifying the common themes is one way of recognising the "invariants", the shared experiences that do not vary across the participants, and therefore, can be seen as the essence of the phenomenon or the phenomenon's constituents. However, the minority voices or unique themes cannot be neglected. They are as important as commonalities with regard to the phenomenon researched. These unique themes are seen as individual ways in which the phenomenon reveals itself. They can make us aware of the range of distinctiveness in the shared experience (Groenewald, 2004; Hycner, 1985; Tesch, 1944) . Hence, both the common and the unique themes have been analysed carefully, and both of them will be taken into consideration while constructing the proposed e-assessment adoption model.

4.2.6: Discussion

An important point to mention here is the nature of e-assessments that the teacher population has developed and used. CIS teachers reported that they have developed and used both the computer-based assessment and the computer-assisted assessments in different (CIS) courses. They stated that in some of their assessments, the actual evaluation of students' responses was performed entirely by a computer. In other assessments, the computer role was simply facilitating taking the examination and mediating between students and the human evaluator (who is the "CIS teacher" in this case).

At the end of the qualitative part of this study, the researcher rated his findings for a degree of match with the specified expectations in literature. His findings are different from his expectations in that some expectations remained unconfirmed and some findings were not anticipated. For example, it became evident from the analysis of the emerged central themes that the factors affecting the behavioural intention to use e-

assessments are divided into two groups. The first group represents the factors that play a significant role as *direct determinants* of the behavioural intention to use e-assessments; and the second group represents the factors that play an important role as *indirect determinants* of the behavioural intention to use e-assessments. Some of these factors (direct as well as indirect) are theorised to be motivators, while the others are theorised to play the role of an inhibitor. Additionally, most of the factors in the first group are hypothesised to be affected by a number of *moderators* that explain the dynamic influences of the experiences, specialty, and demographic characteristics of the CIS teachers. These factors are presented in Table 14.

Table 14: Direct and Indirect Determinants of the Teachers' Behavioural Intention to Use E-Assessments

	Independent Variable	Dependent Variable	Motivator OR Inhibitor	Relationship	Moderators	Explanation
CENTRAL THEMES SHOWING THE DIRECT DETERMINANTS	1. Perceived Usefulness (PU)	Behavioural Intention (BI)	Motivator	PU → BI	None	***The emerged themes show that:*** • PU has a positive impact on BI. • The effect of PU is not moderated by any moderator
	2. Perceived Ease-of-Use (PEoU)	Behavioural Intention (BI)	Motivator	PEoU → BI	Specialty	***The emerged themes show that:*** • PEoU has a positive impact on BI. • The effect of PU is moderated by Specialty
	3. Computer Anxiety (CA)	Behavioural Intention (BI)	Inhibitor	CA (-) → BI	Age	***The emerged themes show that:*** • CA has a negative impact on BI. • The effect of PU is moderated by age
	4. Technology - Assessment Fit (TAF)	Behavioural Intention (BI)	Either Motivator or Inhibitor	TAF → BI	None	***The emerged themes show that:*** • TAF has a positive impact on BI. • TAF has a positive impact on PU • The effect of TAF is not moderated by any moderator
		Perceived Usefulness (PU)	Either Motivator or Inhibitor	TAF → PU	None	***The emerged themes show that:*** • TAF has a positive impact on PU • The effect of TAF is not moderated by any moderator

	Independent Variable	Dependent Variable	Motivator OR Inhibitor	Relationship	Moderators	Explanation
	5. Social Influence (SI)	Behavioural Intention (BI)	Motivator	SI → BI	None	***The emerged themes show that:*** • SI has a positive impact on BI. • The effect of SI is not moderated by any moderator
	6. Facilitating Conditions (FC)	Behavioural Intention (BI)	Motivator	FC → BI	None	***The emerged themes show that:*** • FC has a positive impact on BI. • The effect of FC is not moderated by any moderator
CENTRAL THEMES SHOWING THE INDIRECT DETERMINANTS	1. Perceived Self-Efficacy (PSE)	Computer Anxiety (CA)	Inhibitor	PSE (-) → CA	None	***The emerged themes show that:*** • PSE has a negative impact on CA. • The effect of PSE on CA is not moderated by any moderator
		Perceived Ease-of-Use (PEoU)	Motivator	PSE → PEoU	None	***The emerged themes show that:*** • PSE has a positive impact on PEoU. • The effect of PSE on PEoU is not moderated by any moderator

As seen in Table 14, after conducting a thorough analysis of the collected data, seven constructs appeared to be significant constructs. Of these, the researcher theorises that six constructs are significant direct determinants of the behavioural intention to use e-assessments: *perceived usefulness*, *perceived ease-of-use*, *computer anxiety*, *technology-assessment fit*, *social influence* and *facilitating conditions*. The other construct (*perceived self-efficacy*) is theorised to be an indirect determinant. Both the direct (light background) and the indirect (dark background) determinants are presented in the proposed e-assessment adoption model in Section 4.3.

Following is an explanation of each one of the variables (both the direct and the indirect determinants). A literature review related to the common and unique themes listed under each one of these variables is provided as well.

4.2.6.1: Perceived Usefulness (PU)

After analysing the data demonstrated in Table 13, it is clear that the common theme that all the interviewees were able to identify was the *enhanced examination security*. This theme is consistent with the recommendation of Csapó, Ainley, Bennett, Latour, and Law (2012) who studied a range of security issues in CBA. They recommended using computers to randomise the given questions or automate the delivery of different sets of questions. Nevertheless, they still believe that the questions should be systematically selected because randomisation of items poses other problems related to fairness that might disadvantage or advantage some students;

Under this category, other themes mentioned by most of the interviewees were related to: first, *facilitating the analysis of students' results*; second, *saving time*; third, *the ability to archive assessments and student's work easily and securely*; fourth, *students' punctuality while dealing with due dates and submission deadline*; fifth, *the availability of question banks*; sixth, *teachers' ability to access their students' work from anywhere;* seventh, *a possibility of facing technical issues*.

The first theme is consistent with the findings of Ridgway, McCusker, and Pead (2004) who affirmed that assessment data are collected in a way that facilitates quick and detailed analysis, at the level of responses to whole questions or even parts of questions. The second theme is in line with Peat and Franklin (2002) and Ricketts and Wilks (2001) who listed the 'reduction of marking load for staff' as one of the main benefits of using CBA. They believe that the time taken for marking and giving back the results compromises the time that can be utilised for general help and guidance. Similarly, Terzis, Moridis, and Economides (2012) listed time reduction as one of the advantages of using CBA.

The third theme is in harmony with the findings of Amelung, Krieger, and Rosner (2011) who assured that storing assignments and students' work centrally is very helpful, especially if they can be accessed quickly and easily. Likewise, the fourth theme is coherent with the results of Littlejohn's (2002) study who found that students were extremely positive about adherence to strict deadlines. This was due to the fact that this has made them more focused. The fifth theme is one of the benefits that earlier studies have listed as one of the main advantages of the use of e-assessments. For instance, Marais, Argles, and von Solms (2006) stated that having a large question bank makes it easier for teachers to create more secured e-assessment with different versions in which it becomes difficult for two students sitting next to each other to copy from each other. The sixth theme is of no difference; it is in line with many earlier studies. According to Morrow, Pulido, Smith, McDaniel, and Willcox (2014), having access from school, home, or elsewhere is one of the reasons why teachers use e-assessments. They believe that giving the faculty members the ability to access e-assessments from anywhere, allows them to access the list of daily graded projects, which is a great benefit as it allows for easier tracking of the student's progress. And lastly, the seventh theme is in agreement with some earlier studies; for example, Baleni (2012) declared that facing technical issues like Internet disruptions is one of the barriers of using e-assessments. As well, Lightstone and Smith (2009) discussed the negative effect technical difficulties and glitches may have on e-assessments.

Under the same category, the themes that were mentioned by less than half of the participants were related to: first, *getting instant feedback*; and second, *reducing students' complaints about their marks*. The first theme is in line with the findings of many previous studies. For example, Thelwall (2000) asserted that "the most obvious way in which computerisation of assessment can be a virtue is through instant marking

and feedback". He believed that instant feedback is often more effective than when given after a delay. The second theme is seen as an obvious result of the immediate presentation of different types of feedback that provides students with an analysis and explanation of their marks.

Furthermore, the themes that were stated by 3 participants were about: first, *allowing students to take practice tests;* and second, the *ease-of reading students' responses*. An example of a study that is consistent with the first theme comes from the work of Baleni (2012) who listed the increase of the number of practice tests as one of the advantages of e-assessments, especially if it is used formatively. Similarly, Bull and McKenna (2004) identified the increased frequency of assessment and the fact that students benefit by getting a better chance to practise skills as another advantage of using e-assessment. The second theme is coherent with the findings of the study conducted by Mogey et al. (2008). The authors of this study provided an evidence for computers facilitating an increase in the clarity of students' responses. They also claimed that "part of the examination process to change significantly is that students no longer handwrite their answers".

The themes that were mentioned by only one participant were: first, *the ability to personalise questions based on the students' learning profiles*; second, *fostering sustainability*; and third, *the accuracy of calculating students' results*.

In conclusion, based on the emerged themes and the related literature review listed above, and as seen in Table 13, the researcher proposes that individual's perception of usefulness of e-assessments has significant influence in explaining his intention to use e-assessments. In other words, the collected data shows that there is a significant relationship between the perceived usefulness and the behavioural intention to use e-

assessments amongst CIS teachers. Thus, depending on the emerged themes, the researcher hypothesises that:

H1a: Perceived usefulness has a positive impact on behavioural intention.[10]

4.2.6.2: Perceived Ease-of-Use (PEoU)

Under this central theme, the only common theme most of the interviewees were able to identify was related to the *ease-of-using e-assessments*. This central theme is correspondent with the findings of Al-Amri (2007) who stated that CBA made it easier for the test developers to set the same test conditions for all the participants regardless of the test's population size. He also mentioned that using e-assessments made it is easier for test developers to create different test formats and present different types of feedback.

Then again, the themes that were mentioned by less than half of the participants were related to the *ease-of-control and troubleshooting*; and the *ease-of-archiving and access.* These two themes are in agreement with the findings of Cook and Jenkins's (2010) study in which they asserted that it is so easy to edit, change, reproduce, reshuffle, and reuse the assessment questions when they are stored in a central database.

In summary, the themes emerged during this part of the study and the related literature led the researcher to propose that an individual's perception of the degree of ease associated with the use of e-assessments has significant influence in explaining his intention to use e-assessments. In other words, the collected data and the related

[10] Later on in this chapter, the researcher will compare this hypothesis with the relationships that were validated in the extant user acceptance models.

literature indicate that there is a significant relationship between the perceived ease-of-use and the behavioural intention to use e-assessments amongst CIS teachers. Thus, the researcher hypothesises that:

H2a: Perceived ease-of-use has a positive impact on behavioural intention.

4.2.6.3: Computer Anxiety (CA)

Under the Computer Anxiety central theme, the theme that was common amongst all the interviewees was the *teachers' resistance to change.* This matches the finding of Hargreaves (2005) who studied emotional responses to educational change. He states that understanding how teachers go through and react to educational change is essential if improvement efforts are to be more effective. He believes that fear of change may possibly develop as a result of spending many years in always doing the same thing.

On the other hand, one theme was mentioned by less than half of the participants. This theme is about the *students' resistance to change* which is not directly related to teachers. However, some of the participants see it as one of the factors that might affect their decision to adopt or not to adopt e-assessments. Some studies have revealed that students require some degree of computer literacy (Alderson, 2000). Students' resistance to change is seen as an obvious result of their lack of computer skills that is needed to take e-assessments.

Additionally, two participants talked about the e-assessment anxiety. Concerns about e-assessment anxiety or discomfort with taking tests using computers are acknowledged in the existing international literature. For example, Cassady and Gridley (2005)

asserted that e-assessments will induce increased levels of students' anxiety over the test. This may lead to performance levels that undervalue students' true ability.

Finally, the themes emerged during this part of the study guided the researcher to theorise that individual's apprehension, or fear, when she/he is faced with the possibility of using computers has a noteworthy direct influence in explaining his intention to use e-assessments. Alternatively stated, the collected data indicate that there is a significant negative relationship between computer anxiety and the behavioural intention to use e-assessments amongst CIS teachers. Thus, the researcher theorises that:

H3a: Computer anxiety has a negative impact on behavioural intention.

4.2.6.4: Perceived Self-Efficacy (PSE)

In this category, the only common theme that most of the participants talked about was *the teachers' technical skills and experiences*. Similarly, some studies have revealed that for a successful implementation of CBA, some degree of computer literacy is required (Alderson, 2000). Difficulties related to the lack of computer skills and other technical issues are acknowledged in the existing international literature (Moule, 2006).

Still, the only theme that was mentioned by less than half of the participants was related to *the students' ability to use e-assessments*. This theme is consistent with the findings of Alderson's (2000) study in which the author declares that students need some degree of computer literacy in order to avoid the mode effect on e-assessments. Similarly, Al-Amri (2007) affirms that the existing computer knowledge of test-takers should be examined to maximise the benefits offered by computer-based testing.

To summarise, based on the themes that emerged while analysing the collected data, the researcher proposes that the judgment of one's capability to use an information technology has an indirect influence in explaining his intention to use e-assessments. Particularly, the collected data indicate that there is a negative relationship between the perceived self-efficacy and computer anxiety. It also shows that there is a positive relationship between self-efficacy and the perceived ease-of-use. Thus, the researcher hypothesises that:

H4a: Perceived self-efficacy has a negative impact on computer anxiety.

H4b: Perceived self-efficacy has a positive impact on perceived ease-of-use.

4.2.6.5: Facilitating Conditions (FC)

The only theme that was common amongst all the participants is the *provided technical support.* Concerns about technical issues or discomfort with computer technology and the provided technical support are recognised in the existing literature. For example, Lightstone and Smith (2009) discussed the negative effect technical difficulties and glitches may have on assessments.

In addition, less than half of the participants talked about three themes which are *the provided network infrastructure*, the *provided training*, and the *need for dedicated testing laboratories.* These three themes are consistent with some of the international guidelines on computer-based and internet-delivered examinations that were developed by the International Test Commission (The International Test, 2006). This paper provides a set of internationally developed guidelines that highlight the most important issues in computer-based testing and e-assessments. Some of these guidelines are

related to the need to have a technically-appropriate test-taking environment. This is normally realised by the use of dedicated testing laboratories, where there is a good level of control over the security, access, and technical support staff. This paper also focuses on the need for the test providers and test-takers to attend appropriate training events to ensure an appropriate level of knowledge of the e-assessments. In the same category, Spotts (1999, p. 8) indicates: "If equipment is readily available to develop instructional material and classroom facilities are available for using the material, an instructor might be motivated to use the technology".

Furthermore, three participants talked about the *need to have a reliable wireless connection and good bandwidth*, and the *need to have ready devices*. These two technical needs are also harmonious with the internationally developed guidelines listed in The International Test (2006). It is clearly mentioned that the computer-based assessments should be supported by evidence of their technical adequacy. In a study by Scheuermann and Pereira (2008), it was also found that when e-assessments are deployed, a number of aspects need to be considered, such as reliable networks, the quality of the used software, the capacities of devices, and the provided support and maintenance.

In addition to that, two participants talked about the *need to support a wide variety of devices and platforms*, and one participant talked about the need for well-trained and ready invigilators. These two themes are also consistent with the findings of Scheuermann and Pereira's (2008) study in which the authors talked about these needs as part of the aspect that need to be taken into account when using computer-based assessments.

Conclusively, based on the themes that emerged while analysing the collected data, the researcher believes that "the factors in the environment that can make e-assessments easy to do" has a significant influence in explaining the intention to use e-assessments. Put differently, the collected data indicate that there is a positive relationship between the facilitating conditions and the behavioural intention. Thus, the researcher theorises that:

H5a: Facilitating conditions have a positive impact on behavioural intention.

4.2.6.6: Social Influence (SI)

The only theme that was common amongst most of the participants is the *institutional compliance.* Concerns about the institutional compliance and the need to follow the directions coming from the higher management of the institution are acknowledged in the existing international literature. For instance, Spotts (1999) highlighted the importance of understanding the environmental influences and institutional policies while studying the factors affecting faculty use of instructional technology. Furthermore, Venkatesh and Davis (2000) maintain that when important people in someone's environment believe he/she should adopt the system, he/she tends to agree with these opinions and adopt the system. This mechanism, which they call the compliance effect, occurs only in mandatory situations, and this is related to HEIME as it is considered a mandatory environment (i.e., CIS teachers have to use e-assessments to test their students' performance).

In addition, less than half of the participants talked about the *encouragement from the team members and the digital age students*. This is consistent with the findings of Fishbein and Ajzen's (1975) study in which they talked about a factor called subjective

norm. They defined subjective norm as the person's perception that most people who are important to him think he/she should or should not perform the behaviour in question.

Besides, the theme that was mentioned by one participant only was about the belief that everyone wants to go green. This is consistent with the findings of a study conducted by De Bonis and De Bonis (2011). The authors of this study highlighted some of the benefits of having paperless classrooms and e-assessments. They see "not having to generate hard copies of the assessments" as a contribution to the sustainability efforts of their university. Another study categorised the cost savings in paper usage as another benefit of applying the concept of paperless classes (Arney, Jones, & Wolf, 2012).

In conclusion, grounded on the themes that emerged while analysing the collected data, it is believed that "the degree to which an individual perceives that important others believe he or she should use e-assessments" has a significant influence in explaining the intention to use e-assessments. In simple terms, the collected data indicate that there is a positive relationship between the social influence and the behavioural intention. Thus, the researcher hypothesises that:

H6a: Social Influence has a positive impact on behavioural intention.

4.2.6.7: Technology-Assessment Fit (TAF)

Under this central theme, the themes that were common amongst most of the participants are: first, *the richness of the features of the e-assessment tool*; second, *the nature of the course, the assessment and the questions*; third, *the number of students, sections, and colleges*; and fourth, *the suitability of the assessment tool*. These themes

discuss the characteristics of the technology used, the nature and requirements of the task (assessing students' work in this context), and the suitability of the technology in use (the e-assessment management system). Some explored literature examined something similar, that is the effect of technology characteristics on the intention of the users to adopt this technology. For example, the Task Technology Fit (TTF) model claims that people adopt a technology depending on the level of suitability between the technology features and requirements of the task (Goodhue, 1995; Goodhue & Thompson, 1995). Goodhue (1995) claims that having an advanced technology that is rich of features does not necessarily mean that users will adopt it. This technology must fit the task requirements. Users may not adopt it, simply because they think this technology is unsuitable.

In addition, less than half of the participants talked about the *suitability of the assessment and the questions,* and *the richness of the archiving features*. Similar to the themes listed in the previous paragraph, these two themes are in harmony with the findings of Goodhue (1995) and Goodhue and Thompson (1995) as they discuss the suitability of the assessments and the question types and the richness of the tool's features.

To conclude, based on the themes that emerged while analysing the collected data, it is believed that the fit between the technology characteristics and task requirements has a significant influence in explaining the intention to use e-assessments. Alternatively stated, the collected data indicate that there is a positive relationship between the technology-assessment fit and the behavioural intention. Additionally, it has a positive impact on the perceived usefulness. Therefore, the researcher theorises that:

H7a: Technology-assessment fit has a positive impact on behavioural intention.

H7b: Technology-assessment fit has a positive impact on perceived usefulness.

4.2.6.8: Moderators

Under this central theme, the themes that were common amongst most of the participants are: *age*, *experience*; and *specialty*. The participants who talked about these three themes believe that they are important. They believe that their intention to use e-assessments is affected by these themes. Hence, they see them as moderating factors.

In contrast, only three participants talked about *the teachers' gender*. These three participants believe that gender is not important in the context of this study as it does not affect their decision to adopt – or not to adopt – e-assessments.

After preparing a list of the themes that emerged in the qualitative interviews, the researcher deemed it necessary to conduct a literature review in which he compared the emerged moderating factors with the ones validated in the existing theoretical models. Some of these models have identified key moderating variables that were found to have an effect on the behavioural intention of individuals. Table 15 presents the role of these moderators in some of the existing technology adoption models.

Table 15: Role of the Moderating Variables in the Existing Theoretical Models

Model	Experience	Age	Speciality	Gender
TRA	Experience was not explicitly included	N/A	N/A	N/A
TAM and TAM2	Experience was not explicitly included	N/A	N/A	Venkatesh and Morris (2000) found that Perceived usefulness was more noticeable for men and perceived ease-of-use was more salient for women

Model	Experience	Age	Speciality	Gender
TPB	Experience was as not explicitly included	Morris and Venkatesh (2000) found that attitude was more significant for younger workers and that perceived behavioural control was more salient for older workers	N/A	Venkatesh, Morris, and Ackerman (2000) found that attitude was more salient for men. They also found that perceived behavioural control and subjective norm were more salient for women
Model of PC utilization	Thompson, Higgins, and Howell (1994) found that factors like facilitating conditions, social factors and complexity were all more significant with less experience	N/A	N/A	N/A
UTAUT	Social influence is contingent on experience	*Performance expectancy is more significant for younger workers* *Effort expectancy is more significant for older workers* *Social influence is contingent on age* *Facilitating conditions only matter for older workers in later stages of experience*	N/A	*Performance expectancy is more significant for men* *Effort expectancy is more significant for women* *Social influence is contingent on gender* *Facilitating conditions only matter for older workers in later stages of experience*

To conclude, based on the findings of the phenomenological study and the effects of the moderating factors that were confirmed in the existing theoretical models (see Table 14), the proposed model suggests that the relationships between the emerged factors (PU, PEoU, CA, PSE, FC, SI, and TAF), and the behavioural intention can be moderated by a number of moderators. Thus, the researcher proposes the following moderator-related hypotheses:

(1) Perceived Usefulness

H1b: The influence of perceived usefulness on behavioural intention will be moderated by age, such that the effect will be stronger for younger CIS teachers.

H1c: The influence of perceived usefulness on behavioural intention will be moderated by experience.

Hypotheses H1b and H1c are based on the literature review only (not on the emerged themes). Hence, both of them are tested in the quantitative part of this study to see if this is supported by the data.

(2) Perceived Ease-of-Use

H2b: The influence of perceived ease-of-use on behavioural intention will be moderated by age, such that the effect will be stronger for older CIS teachers.

H2c: The influence of perceived ease-of-use on behavioural intention will be moderated by specialty, such that the effect will be stronger for CIS teachers as compared with other teachers.

Hypothesis H2b is based on the literature review only, while Hypothesis H2c is based on the emerged themes. Nevertheless, H2c will be excluded as this research focuses on CIS teachers only, and comparing the CIS specialty with other specialities is out of the scope of this study.

(3) Computer Anxiety

H3b: The influence of computer anxiety on behavioural intention will not be moderated by any moderator.

Hypothesis H3b is based on both the literature review and the emerged themes. This hypothesis will be tested in the quantitative part of this study to see if this is supported by the data.

(4) Perceived Self-Efficacy

H4c: The influence of perceived self-efficacy on computer anxiety and perceived ease-of-use will not be moderated by any moderator.

H4c is based on both the literature review and the emerged themes. This will not be tested in the quantitative part of this study as it is not a direct determinant of the behavioural intention.

(5) Facilitating Conditions

H5b: The influence of facilitating conditions on behavioural intention will be moderated by age, such that the effect will be stronger for older CIS teachers.

H5c: The influence of facilitating conditions on behavioural intention will be moderated by experience, such that the effect will be stronger for CIS teachers with less experience.

Hypotheses H5b and H5c are based on the literature review only (not on the emerged themes). Hence, both of these hypotheses will be tested in the quantitative part of this study to see if this is supported by the data.

(6) Social Influence

H6b: The effect of social influence on behavioural intention will be moderated by age, such that the effect will be stronger for older CIS teachers.

H6c: The effect of social influence on behavioural intention will be moderated by experience, such that the effect will be stronger for CIS teachers in the early stages of experiences.

Both of the above listed hypotheses (H6b and H6c) are based on the literature review only and not on the emerged themes. Hence, they will be tested in the quantitative part of this study to see if this is supported by the data.

(7) Technology-Assessment Fit

H7b: The influence of technology-assessment fit on behavioural intention will NOT be moderated by any moderator.

This hypothesis is based on both the literature review and the emerged themes. It will also be tested in the quantitative part of this study.

4.3: Chapter Conclusion

After making a list of the constructs that emerged in the qualitative interviews, the researcher deemed it necessary to conduct a literature review in which he compares the emerged constructs (PU, PEoU, CA, TAF, SI, FC, and PSE) with the ones in other relevant models like TRA, TPB, TAM, TAM2, and UTAUT. Table 16 shows a comparison between the constructs emerged in this study and the theorised determinants of intention in the other relevant models and theories.

Table 16: Relevant Models and Theories of Technology Adoption

Emerged Construct	Relevant Study	Theorised Construct	Definitions
Perceived Usefulness (PU)	Technology Acceptance Model (TAM) and Technology Acceptance Model 2 (TAM2) (Davis, 1989; Davis et al., 1989)	Perceived Usefulness	"The degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320)
	Computer Self-Efficacy Measurement (Compeau & Higgins, 1995; Compeau, Higgins, & Huff, 1999)	Outcome Expectations	This is divided into two categories: performance expectations (task related), and personal expectations (individual objectives)
	User Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)	Performance Expectancy	"The degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003)
Perceived Ease-of-Use (PEoU)	Technology Acceptance Model (TAM) and Technology Acceptance Model 2 (TAM2) (Davis, 1989; Davis et al., 1989)	Perceived Ease of Use	"The degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320)
	User Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)	Effort Expectancy	"The degree of ease associated with the use of the system" (Venkatesh et al., 2003)
	Adoption of Information Technology Innovation (Moore & Benbasat, 1991)	Ease of Use	"The degree to which using an innovation is perceived as being difficult to use" (Moore & Benbasat, 1991)
	Model of PC Utilization (MPCU) (Thompson et al., 1991)	Complexity	"The degree to which a system is perceived as relatively difficult to understand and use" (Thompson et al., 1991)

Emerged Construct	Relevant Study	Theorised Construct	Definitions
Computer Anxiety (CA)	Social Cognitive Theory (SCT) (Compeau & Higgins, 1995)	Anxiety	Feelings of anxiety surrounding computers are expected to negatively influence computer use. (Compeau & Higgins, 1995). This is based on Bandura's (1977) findings that individuals are found to experience anxiety in attempting to perform behaviours they do not feel experienced to perform.
Technology-Assessment Fit (TAF)	Model of PC Utilization (MPCU) (Thompson et al., 1991)	Job-Fit	"the extent to which an individual believes that using [a technology] can enhance the performance of his or her job" (Thompson et al., 1991, p. 129)
Social Influence (SI)	Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975)	Subjective Norm	"The person's perception that most people who are important to him think he should or should not perform the behaviour in question" (Fishbein & Ajzen, 1975, p. 302)
	Technology Acceptance Model (TAM) and Technology Acceptance Model 2 (TAM2) (Davis, 1989; Davis et al., 1989)	Subjective Norm	Adapted from TRA. See the reference to TRA above
	Theory of Planned Behaviour (TPB) (Ajzen, 1991)	Subjective Norm	Adapted from TRA. See the reference to TRA above
	Model of PC Utilization (MPCU) (Thompson et al., 1991)	Social Factors	"the individual's internalisation of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations" (Thompson et al., 1991, p. 126)
	User Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)	Social Influence	"The degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003)
Facilitating Conditions (FC)	Model of PC Utilization (MPCU) (Thompson et al., 1991)	Facilitating Conditions	"Provision of support for users of PCs may be one type of facilitating condition that can influence system utilisation" (Thompson et al., 1991, p. 129)
Perceived Self-Efficacy (PSE)	Social Cognitive Theory (SCT) (Compeau & Higgins, 1995)	Self-efficacy	"The belief that one has the capability to perform a particular behaviour" (Compeau & Higgins, 1995). Bandura (1977) believes that it is one of the main constructs in social psychology. It has been found to affect decisions about the behaviours individuals undertake

After the emerged constructs have been listed and defined, and on the basis of the consulted literature, the researcher built the model that represents all of these hypotheses. This study's model and the related hypotheses are presented in Figure 8.

To make sure that the proposed model represents what research participants have expressed during the phenomenological interviews, the researcher printed the proposed model on a large size paper and discussed this model with a number of the CIS teachers that were interviewed at the beginning of this study. He arranged short meetings with 8 CIS teachers in which all of the constructs of this model as well as the relationships between these constructs were discussed thoroughly. All of these teachers confirmed that the model represents what they expressed during the interviews.

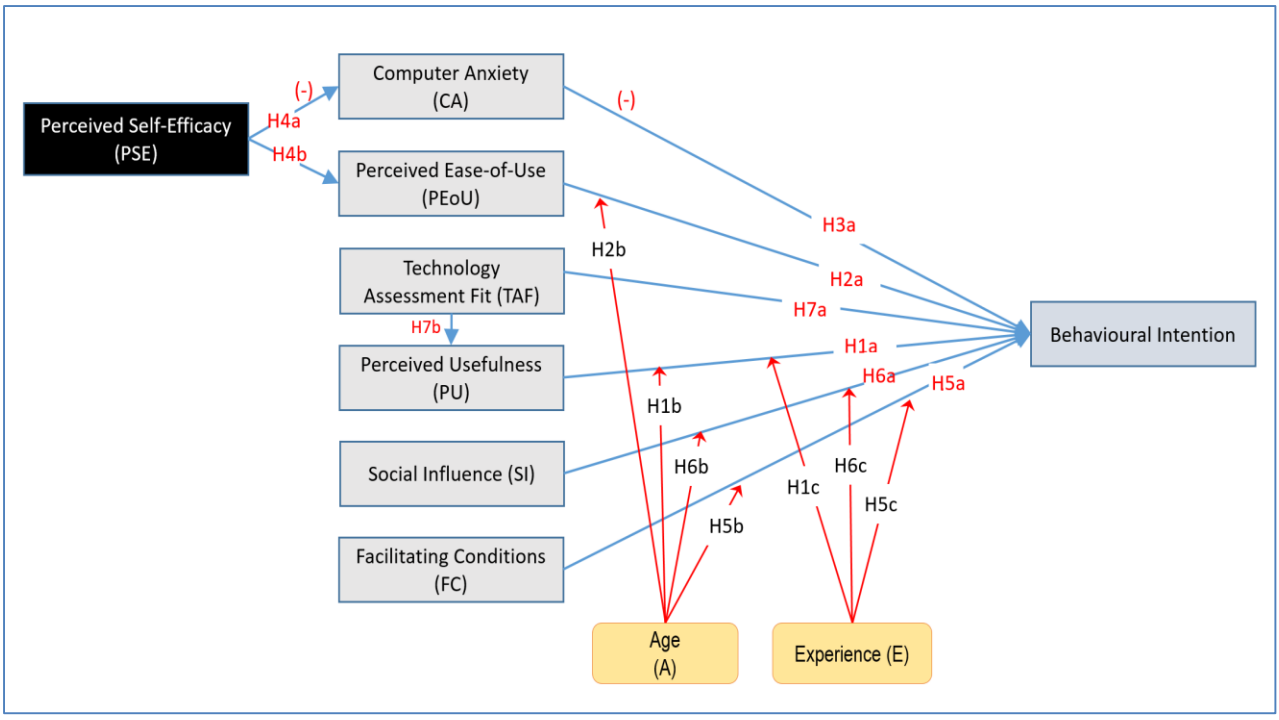


Figure 8: The Proposed E-Assessment Adoption Model

To better understand the hypotheses listed in the above figure, and to have an idea on whether these hypotheses were supported in the literature review, the researcher offers a complete list of these hypotheses in Table 17.

Table 17: A Complete List of the Proposed Hypotheses (Based on Both the Emerged Themes and the Literature Review)

Construct	code	Related hypothesis	Listed in the emerged themes?	Supported in the literature review?
PU	H1a	Perceived usefulness has a positive impact on behavioural intention	☑	☑
	H1b:	The influence of perceived usefulness on behavioural intention will be moderated by age, such that the effect will be stronger for younger CIS teachers	☐	☑
	H1c:	The influence of perceived usefulness on behavioural intention will be moderated by experience	☐	☑
PEoU	H2a:	Perceived ease-of-use has a positive impact on behavioural intention	☑	☑
	H2b:	The influence of perceived ease-of-use on behavioural intention will be moderated by age, such that the effect will be stronger for older CIS teachers	☐	☑
	H2c	The influence of perceived ease-of-use on behavioural intention will be moderated by specialty, such that the effect will be stronger for CIS teachers as compared with other teachers. (Based on the emerged themes) *Note: This will be excluded as this research only focuses on CIS teachers.*	☑	☐
CA	H3a	Computer anxiety has a negative impact on behavioural intention	☑	☑
	H3b	The influence of computer anxiety on behavioural intention will NOT be moderated by any moderator	☑	☑
PSE	H4a	Perceived self-efficacy has a negative impact on computer anxiety.	☑	☑
	H4b	Perceived self-efficacy has a positive impact on perceived-ease-of-use	☑	☑
	H4c	The influence of perceived self-efficacy on computer anxiety and perceived ease-of-use will NOT be moderated by any moderator	☑	☑
FC	H5a	Facilitating conditions have a positive impact on behavioural intention	☑	☑
	H5b	The influence of facilitating conditions on behavioural intention will be moderated by age, such that the effect will be stronger for older CIS teachers	☐	☑
	H5c	The influence of facilitating conditions on behavioural intention will be moderated by experience, such that the effect will be stronger for CIS teachers with less experience	☐	☑

Construct	code	Related hypothesis	Listed in the emerged themes?	Supported in the literature review?
SI	H6a	Social Influence have a positive impact on behavioural intention	☑	☑
	H6b	The effect of social influence on behavioural intention will be moderated by age, such that the effect will be stronger for older CIS teachers	☐	☑
	H6c	The effect of social influence on behavioural intention will be moderated by experience, such that the effect will be stronger for CIS teachers in the early stages of experiences.	☐	☑
TAF	H7a	Technology-assessment fit has a positive impact on behavioural intention	☑	☑
	H7b	Technology-assessment fit has a positive impact on perceived usefulness	☑	☑
	H7c	The influence of technology-assessment fit on behavioural intention will NOT be moderated by any moderator	☑	☑

Chapter 5 Quantitative Study

5.1: Introduction

This chapter analyses the outcomes of testing the hypotheses proposed in relation to the e-assessment adoption model discussed in the preceding chapters. It then exhibits the findings, comparing them to the relevant literature. Before proceeding to present the results and the findings, it will first provide a few additional characteristics of the quantitative study mentioned in Chapter 3 (Research Design)

5.2: Collecting Data Using Online Surveys

The past decades have seen a massive increase in the use of the Internet and computer-facilitated communication. As a result, there has been a significant increase in primary research that was based on online surveys (Andrews, Nonnecke, & Preece, 2003). The technology needed for conducting online surveys for different types of research is still evolving. Until lately, it was time-consuming to conduct an online survey. It required familiarity with Hypertext Markup Language (HTML) code, web authoring techniques and some scripting skills. Nowadays, online survey software and services make research using online surveys faster, more economic, and much easier (Couper, 2000; Ilieva, Baron, & Healey, 2002).

An online survey through the use of self-completion questionnaires was deemed the most appropriate method to collect the required quantitative data on the e-assessment adoption phenomenon in the HEIME colleges, and to examine the effects of the independent constructs and their hypothesised relationships on the e-assessment adoption. Self-completion questionnaires are known to be easy and low-cost (Hak, Van der Veer, & Jansen, 2004). All the researcher had to do is decide what questions to ask

and provide space for the participants to respond. The simplicity of such a survey also made it easy to distribute by email and in some cases in person at some major events organised by the college. The design of the online survey self-completion questionnaire was supported by the literature review and the qualitative interview responses.

On the word of Williams et al. (2009), the employment of empirical quantitative techniques and survey research methods seems to be the most commonly used data collection strategy over other available alternatives for technology adoption research. The reason is that using surveys helps to investigate relationships between variables and to produce models of these relationships (Saunders, 2012). Using surveys also helps to contact a sizable population in order to collect data about the same issues.

5.3: Research Population and the Sample Frame

This section will provide details about the following elements: (1) the research target population; (2) the sampling frame; and (3) the selection of the research sample, including justification for the sampling method.

5.3.1: The Research Target Population

In statistics, the target population is the set of individuals or the group that the survey applies to. This is related to the individuals who are being studied or the ones that should answer the survey questions (Kitchenham & Pfleeger, 2002). In the context of this study, the target population is all the individuals that are currently working as CIS teachers in the HEIME colleges located in the United Arab Emirates. The total number of the CIS teachers at the time the data was collected was 142 CIS teachers.

5.3.2: The Research Sampling Frame

After establishing the scope of the target population (which is 142 CIS teachers), the researcher started preparing a list of all the individuals in the research population. This is a list of everyone the researcher would like to contact and ask him/her to answer the questions in the online survey. The difference between a population and a sampling frame is that the population is general and the sampling frame is specific. Hence, the researcher prepared a list with the names of all the CIS teachers that are currently working in the HEIME colleges. To make sure that the developed sampling frame is adequate, the researcher: (1) included all participants in the target population; (2) excluded all participants not in the target population; (3) collected correct contact details that can be used to contact the chosen participants. The list also contained valuable information about the participants' experience, gender, telephone numbers, and email addresses. These details were collected from HEIME portal and through communicating with the executive assistant in the CIS executive dean's office.

5.3.3: Selection of the Research Sample

Kitchenham and Pfleeger (2002) stated that a useable sample is a representative subgroup of the target population. They mentioned that the most important part of their definition of a sample is the word "representative". They believe that the research results cannot be generalised to a target population unless the sample is representative, so researchers must ensure that the selected sample is representative. In addition to that, they even claimed that, if at all possible, "a target population should be represented as a finite list of all its members." They explicitly acknowledged that if a researcher is dealing with a small population, he/she possibly should try to obtain responses from all individuals in the target population. Accordingly, due to the fact that this study is

dealing with a small population, the researcher has prepared a list of all the CIS teachers in the HEIME colleges. Everyone in the list was contacted and asked to complete the survey. The targeted number of participants was simply all the individuals in the target population. This has the following advantages: first, to ensure that the sample is a representative subset of the target population; second, to maximise the number of participants as much as possible. This is important to meet the actual sample size needed for the chosen research design and analysis. This is particularly important since the sample size can affect several aspects of the Structural Equation Modelling (SEM) technique including parameter estimates, model fit, and statistical power (Shah & Goldstein, 2006).

After inspecting all the gathered responses, and excluding those that have too many empty fields, and those that have the same response to all the questionnaire items, the researcher obtained 112 valid responses (which represents an excellent response rate [78.8%]). In other words, of the 142 CIS teachers originally asked to participate in this study, only 112 usable data sets were used for the statistical analysis. The demographic characteristics collected from these 112 valid responses are shown in Table 18. This includes the respondents' gender, their age, their experience in using e-assessments, and their sub-specialisation within CIS.

Table 18: Demographic Characteristics of the Sample

Demographic Variable	Sample Composition (N^a=112)
Gender	
Male	79 (70.5%)
Female	33 (29.5%)
Age	
Less than 30	2 (1.8%)
30 to 39	26 (23.2%)
40 to 49	57 (50.9%)
50 to 59	24 (21.4%)
60 or over	3 (2.7%)

Demographic Variable	Sample Composition (N[a]=112)
Experience in using e-assessments	
Less than 1 year	8 (7.1%)
1 to 2 years	20 (17.9%)
2 to 3 years	17(15.2%)
3 to 5 years	35 (31.3%)
More than 5 years	28 (25.0%)
CIS sub-specialisation	
Information Security and Forensics	28 (25.0%)
Application Development	24 (21.4%)
Business Solutions	22 (19.6%)
General CIS courses	20 (17.9%)
Networking	10 (8.9%)
Interactive Multimedia	6 (5.4%)

a. *N: The usable data sets that were used for the statistical analysis in this chapter, which is 112 valid responses.*

5.4: Questionnaire Design

In this part of the study, the researcher aimed to test and quantify hypotheses and then analyse the collected data statistically. Hence a formal standardised questionnaire was designed. Details about the type of the questionnaire adopted and the items used in this questionnaire are provided in the following two sections (Section 5.4.1 and Section 5.4.2).

5.4.1: Questionnaire Type

The type of the questionnaire adopted in this research is the self-administered questionnaire. According to Bourque and Fielder (2003), self-administered questionnaires are instruments used to collect information from research respondents who complete the questionnaire themselves. Bourque and Fielder declare that there are two types of self-administered questionnaires: the first type is when people answer all the questions in the presence of the surveyor; and the second type is when the

questionnaire is completed by respondents outside the presence of the surveyor or other monitoring personnel.

This research adopted the second type in which research respondents have completed the survey by themselves without the presence of the researcher or other monitoring personnel. For this reason, the researcher ensured that the instrument was clear and easy to understand. Very careful consideration was paid to the structure and construction of the questionnaire. On that basis, the researcher took the following points into consideration:

1) The questionnaire was shorter than questionnaires administered in other ways (other than self-administered questionnaires). The questionnaire length is particularly important because of its influence on response rate.
2) The questionnaire was made up of closed-ended questions.
3) The questions were organised and articulated in a way to encourage respondents to provide truthful, unbiased and accurate information.
4) The questions were written using simple wording to make it easy to read and understand.
5) All unnecessary questions were eliminated.
6) All the information the participants need to answer the questions were provided.
7) The general format and layout of the questionnaire were clear and not complex. This was done using the excellent design features provided by Qualtrics (Qualtrics, 2016). These features allowed the researcher to create a clear and professional layout.

8) A cover letter containing the needed details about the research was added to the beginning of the questionnaire. It helped the participants to review the aim of the study in details.

5.4.2: Questionnaire Items

A number of questionnaire items were chosen based on the central themes (constructs) that emerged in the phenomenological study that was conducted in the qualitative part of this research. All of these items were adopted from prior research. However, the items were not used without modifications. They were minimally adjusted to match the scenario of the adoption of e-assessments. The items of the developed questionnaire and the studies these items were adopted from are listed in Table 19 below. This table shows the serial number of the construct, the item code, the questionnaire item, and the studies from which this item was adopted.

Table 19: The Items of the Developed Questionnaire

#	Construct	Item Code	Questionnaire items	Related studies
1	Perceived Self-Efficacy (PSE)	PSE1	1. I could use the e-assessments management system If there was no one around to tell me what to do as I go	Adopted from (Bandura, 1977; Betz & Hackett, 1981; Venkatesh et al., 2003)
		PSE2	2. I could use the e-assessments management system if I could call someone for help if I got stuck	Adopted from (Bandura, 1977; Betz & Hackett, 1981; Venkatesh et al., 2003)
		PSE3	3. I could use the e-assessments management system if I had a lot of time to prepare the e-assessment and configure it	Adopted from (Bandura, 1977; Betz & Hackett, 1981; Venkatesh et al., 2003)
		PSE4	4. I could use the e-assessments management system if I had just the built-in help facility for assistance	Adopted from (Bandura, 1977; Betz & Hackett, 1981; Venkatesh et al., 2003)
2	Perceived Usefulness (PU)	PU1	1. I would find e-assessments useful to test my students	Adopted from (Davis, 1989; Davis et al., 1989; Venkatesh et al., 2003)
		PU2	2. Using e-assessments enables me to accomplish tasks more quickly	Adopted from (Davis, 1989; Davis et al., 1989; Venkatesh et al., 2003)

#	Construct	Item Code	Questionnaire items	Related studies
		PU3	3. Using e-assessments increases my productivity	Adopted from (Davis, 1989; Davis et al., 1989; Venkatesh et al., 2003)
		PU4	4. Using e-assessments enhances the assessment security	Adopted from (Davis 1989; Davis et al, 1989) with adjustments to fit the emerged central themes in this study
		PU5	5. If I use e-assessments, I will be able to analyse the students results in a better way	Adopted from (Davis, 1989; Davis et al., 1989) with adjustments to fit the emerged central themes in this study
3	Perceived Ease-of-Use (PEoU)	PEoU1	1. My interaction with the e-assessment management system would be clear and understandable	Adopted from (Davis, 1989; Davis et al., 1989; Moore & Benbasat, 1991; Venkatesh et al., 2003)
		PEoU2	2. It would be easy for me to become skilful at using the e-assessment management system	Adopted from (Venkatesh et al., 2003)
		PEoU3	3. I would find the e-assessment management system we are currently using easy to use.	Adopted from (Moore & Benbasat, 1991; Venkatesh et al., 2003)
		PEoU4	4. Learning to operation the e-assessment management system is easy for me	Adopted from (Moore & Benbasat, 1991; Venkatesh et al., 2003)
		PEoU5	5. I would find the system to be flexible to interact with	Adopted from (Davis, 1989; Davis et al., 1989)
4	Technology-Assessment Fit (TAF)	TAF1	1. Use of e-assessments will have no effect on the type of questions (Reverse Scored)	Adopted from (Goodhue, 1995; Goodhue & Thompson, 1995; Thompson et al., 1991)
		TAF2	2. Use of e-assessments can decrease the time needed for marking my assessments	Adopted from (Goodhue, 1995; Goodhue & Thompson, 1995; Thompson et al., 1991)
		TAF3	3. Use of e-assessments can significantly increase the quality of my assessments	Adopted from (Goodhue, 1995; Goodhue & Thompson, 1995; Thompson et al., 1991)
		TAF4	4. Use of e-assessments can increase the effectiveness of running my assessments	Adopted from (Goodhue, 1995; Goodhue & Thompson, 1995; Thompson et al., 1991)
		TAF5	5. Use of e-assessments can help students answer questions in an easier way	Adopted from (Goodhue, 1995; Goodhue & Thompson, 1995; Thompson et al., 1991)

#	Construct	Item Code	Questionnaire items	Related studies
5	Computer Anxiety (CA)	CA1	1. I feel apprehensive about using the e-assessment system	Adopted from (Venkatesh et al., 2003)
		CA2	2. It scares me to think that I could make a huge mistake using e-assessments by setting some wrong configuration	Adopted from (Venkatesh et al., 2003)
		CA3	3. I hesitate to use e-assessments for fear of making mistakes that may affect the security of the assessment	Adopted from (Venkatesh et al., 2003)
		CA4	4. The e-assessment system is somewhat intimidating to me	Adopted from (Venkatesh et al., 2003)
6	Social Influence (SI)	SI1	1. People who influence my behaviour think that I should use e-assessments	Adopted from (Bandura, 1977; Stumpf, Brief, & Hartman, 1987; Venkatesh et al., 2003)
		SI2	2. People who are important to me think that I should use e-assessment	Adopted from (Bandura, 1977; Stumpf et al., 1987; Venkatesh et al., 2003)
		SI3	3. The senior management of this higher education institution has been helpful in the use of e-assessment	Adopted from (Bandura, 1977; Stumpf et al., 1987; Venkatesh et al., 2003)
		SI4	4. In general, the organization has supported the use of e-assessments	Adopted from (Bandura, 1977; Stumpf et al., 1987; Venkatesh et al., 2003)
7	Facilitating Conditions (FC)	FC1	1. I have the resources necessary to use e-assessments	Adopted from (Venkatesh et al., 2003)
		FC2	2. I have the knowledge necessary to use e-assessments	Adopted from (Venkatesh et al., 2003)
		FC3	3. The e-assessments management system is not compatible with other systems I am using in the college (Reverse Scored)	Adopted from (Venkatesh et al., 2003)
		FC4	4. A specific person (or group) is available for assistance with the difficulties of the e-assessments management system	Adopted from (Venkatesh et al., 2003)
		FC5	5. I have the resources necessary to use e-assessments	Adopted from (Venkatesh et al., 2003)
8	Behavioural Intention (BI)	BI1	1. I intend to use the system in the next semester	Adopted from (Davis et al., 1989; Venkatesh et al., 2003)
		BI2	2. I predict I would use the system in the next semester	Adopted from (Davis et al., 1989; Venkatesh et al., 2003)
		BI3	3. I plan to use the system in the next semester	Adopted from (Davis et al., 1989; Venkatesh et al., 2003)

The answers for all the above listed questions were given on a seven-point Likert-like scale varying from “strongly agree” (7) to “strongly disagree” (1). In addition to these questions, the questionnaire included a section that is designed to gather the respondents’ identification data, including: age, gender, campus and years of experience in using e-assessments.

5.5: Procedures

The first step the researcher performed was pre-testing the questionnaire. This was done by asking for feedback from two professionals. The first professional is a statistician who has deep knowledge and experience in designing and administering surveys. The second professional is a researcher who has expertise in factor analysis and model building. Their feedback was very beneficial as it helped the researcher shape the contents and the design of the online survey.

After that, the researcher conducted a pilot study during which ten of his colleagues who have good knowledge and expertise in using e-assessments were asked to take the survey and give their comments and suggestions on the item contents and the instrument structure. This helped the researcher work out some of the procedural mistakes. Some of these mistakes were related to the wording of questions. Others were related to the order of the items. A good advice was to show only one question in each screen. All of the provided comments and advices were analysed, and the important ones were taken into account while creating the final version of the online survey.

Next, the researcher informed the Institutional Review Board (IRB) in the HEIME colleges about starting the quantitative part of this study. After gaining the IRB’s approval, the researcher started the collection of the quantitative data. CIS teachers received an e-mail from the researcher forwarded by their direct supervisor (see

Appendix D). The email served to inform CIS teachers about the study and the availability of the online instrument. The email was used to explain that CIS teachers were requested to complete the voluntary, anonymous web-based survey within a two- to three-week period. This period of time was given to ensure that participants had a reasonable amount of time to access the instrument and to complete the online survey. One follow-up e-mail was sent as a reminder (see Appendix E). No financial incentive was offered to complete the online survey. The original email sent to CIS teachers explained the importance of the study for improving e-assessments practices in the HEIME colleges. The anonymity of the web-based survey was employed to eliminate apprehension. According to Granello and Wheaton (2003), the research participants may have been more honest and felt safer revealing their opinions or feelings from the comfort and privacy of their homes, thus reducing the threats introduced by self-report measures such as the potential bias resulting from dishonest reporting.

5.6: Quantitative Research Method

5.6.1: What is Structural Equation Modelling?

One of the most important methods used for multivariate data analysis is the Structural Equation Modelling (SEM) technique. This is due to its ability to test theoretically supported linear and additive causal models (Haenlein & Kaplan, 2004). SEM can be viewed as a combination of factor analysis and regression or path analysis. It is a very powerful multivariate analysis technique that comprises a number of other analysis methods such as special cases (Hox & Bechger, 1998). It is believed that this technique is suitable to this study as it is generally used when there is a need to construct theoretical models where the building blocks of these models are the latent factors. The

relationships or links between these theoretical constructs are represented by regression or path coefficients between the factors.

According to Wong (2013) and Sarstedt, Ringle, Smith, Reams, and Hair (2014), the two major techniques for estimating structural equation models are Covariance-Based SEM (CB-SEM) (Jöreskog, 1978, 1982) and Partial Least Squares SEM (PLS-SEM) (Wold, 1985). The technique that was chosen for the estimation of this study's model is PLS SEM.

5.6.2: Why PLS-SEM was Chosen for the Estimation of This Study's Model?

Although researchers' initial application of SEM incorporated a covariance-based approach (CB-SEM) (Haenlein & Kaplan, 2004), many studies implemented the variance-based PLS method (PLS-SEM). PLS-SEM was originally built by Wold (1980) who stated that "The PLS approach to path models with latent variables is primarily intended for multidisciplinary and other applications where the problems explored are complex and theoretical knowledge is scarce". He also declared that PLS is used when the following three characteristics are involved: "(a) causal predictive analysis, (b) complexity of the problems explored, and (c) scarcity of prior theoretical knowledge". According to Fornell and Bookstein (1982), PLS is a structural equation modelling technique that is centred on an iterative process that increases the explained variance of endogenous constructs. PLS executes an iterative set of rules in which the needed statistical values are computed with a series of least squares regressions after creating construct statistical results by weighting the sums of items related to each construct (Chin, 1998). Some of the reasons for the increased usage of PLS-SEM are: (1) the ability to use this technique in applied research projects when the sample size is small. In other words, when there are limited research participants (Wong, 2013).

Additionally, Vinzi, Trinchera, and Amato (2010) declared that PLS is a modelling approach to structural equation modelling that has no assumptions about data distributions; (2) the PLS-SEM method's ability to handle difficult modelling concerns that normally occur in social sciences (Hair, Ringle, & Sarstedt, 2013).

To summarise, both approaches to SEM (CB-SEM and PLS-SEM) have individual features that make them suitable for different types of research studies. PLS in particular is seen as a very useful approach to structural equation modelling due to its ability to explain the variance in the dependent variables when examining the model (Hair, Ringle, & Sarstedt, 2012; Sarstedt, Ringle, Smith, Reams, & Hair, 2014).

Based on the details listed above, PLS-SEM technique is seen as a good approach that is capable of handling modelling and data issues related to the e-assessment adoption model. Hence, PLS was used in this study to analyse the hypotheses that were proposed in Chapter 4 (Qualitative Study).

5.7: Data Analysis

As mentioned in Section 5.6, to analyse the research model, the researcher used the PLS-SEM approach. Similar to the way other methods are used, the implementation of PLS-SEM depends on a set of rules and guidelines that are employed to assess the results of the model statistical estimation (Garson, 2016; Hair, Hult, Ringle, & Sarstedt, 2016). These rules depend on the way the latent variables are linked (as defined in the structural model), and the type of the measurement scale of the model, that being reflective or formative (as defined in the measurement model). Details about the structural and the measurement models are provided in the next sections.

5.7.1: The Structural Model and the Measurement Model of the Study:

Both the structural and the measurement models of this study are shown in Figure 9.

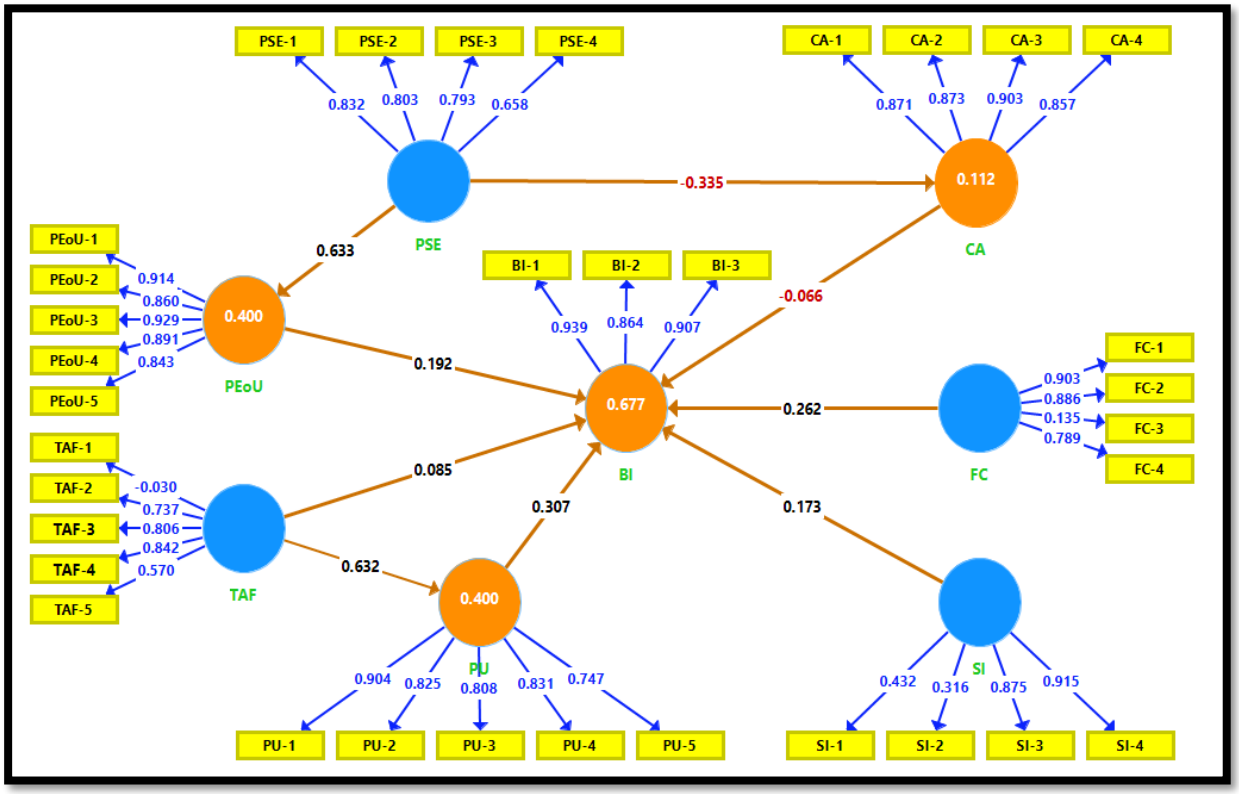


*Figure 9: **PLS-SEM Results of the Initial Model**. Latent Variables are displayed in circles and Moderators (measurement variables) are displayed in yellow boxes*

Details about each one of these models are provided in the following subsections:

5.7.1.1: The Structural Model

In the structural model (also called the inner model), the Latent Variables[11] (LVs) (displayed in circles in Figure 9) are linked with each other according to the results of the qualitative study that was conducted in Chapter 4. These LVs are divided into two categories, endogenous and exogenous. Exogenous LVs do not have any predecessor in the structural model, whereas the endogenous variables have at least one other latent

[11] Latent variables are sometimes called constructs or factors (Garson, 2016).

variable that plays the role of a predecessor. Details about the exogenous as well as the endogenous LVs of this study's structural model are provided below:

The Exogenous Variables[12]***:***

There are eight LVs in the model exhibited in Figure 9. Four of them are exogenous and the rest are endogenous. The four endogenous variables (displayed in circles with a blue background) are:

- Perceived Self-Efficacy (PSE),
- Technology-Assessment Fit (TAF),
- Facilitating Conditions (FC),
- Social Influence (SI).

As shown in Figure 9, CA mediates the relationship between the PSE and BI. Likewise, PEoU mediates the relationship between PSE and BI. Additionally, PU mediates the relationships between TAF and BI.

The Endogenous Variables[13]:

The four endogenous variables in this model (displayed in circles with an orange background) are:

- Perceived Ease-of-Use (PEoU),
- Computer Anxiety (CA),
- Perceived Usefulness (PU),
- Behavioural Intention (BI).

---

[12] "A latent variable is exogenous if it is not an effect of any other latent variable in the model (there are no incoming arrows from other latent variables)" (Garson, 2016)

[13] "A latent variable is endogenous if it is an effect of at least one other latent variable (there is at least one incoming arrow from another latent variable)" (Garson, 2016)

As shown in Figure 9, each one of these endogenous variables has a value in the middle of the orange circle. This value is the coefficient of determination, R^2. This value shows how much (in percentage) the exogenous latent variables explain this endogenous variable.

5.7.1.2: The Measurement Model

In the measurement model (also called the outer model), the Measurement Variables[14] (MVs) (displayed in yellow boxes) are linked with their latent variables. The measurement variables are also referred to as indicators. In PLS, one measurement variable can only be related to one latent variable (Monecke & Leisch, 2012). The way measurement variables are related to latent variables determine the type of the measurement scale of the model. This can be either reflective (see Figure 10) or formative (see Figure 11).

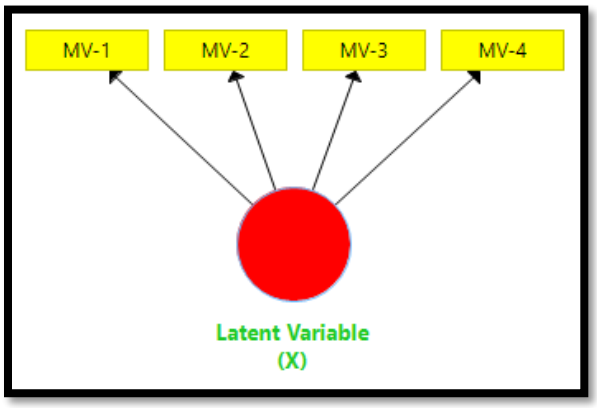


*Figure 10: **Reflective Measurement Scale**: The latent variable (X) is measured by four measurement variables MV-1, MV-2, MV-3 and MV-4 in a reflective way.*

[14] Measurement variables are sometimes referred to as: observed variables, manifest variables, or indicators (Monecke & Leisch, 2012).

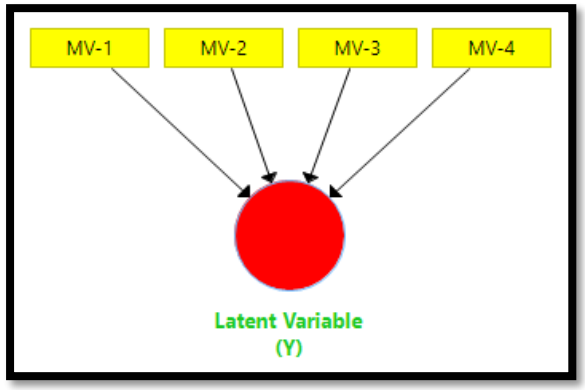


Figure 11: Formative Measurement Scale: The latent variable (Y) is measured by four measurement variables MV-1, MV-2, MV-3 and MV-4 in a formative way.

Some information is provided about each one of these types in the following sections:

Reflective Measurement Scale:

As displayed in Figure 10, in the case of reflective measured constructs, the measurement variables (indicators) are highly correlated and interchangeable. In other words, the measures are expected to have high inter-correlations. In this case, the indicators' validity and reliability should be carefully assessed (Haenlein & Kaplan, 2004; Hair et al., 2013). In a reflective measurement scale, the arrow direction goes from the latent variable to each one of the indicators. In addition, changes in the latent variable directly cause changes in the assigned indicators.

Formative Measurement Scale:

On the other hand, as seen in Figure 11, formative measures are not expected to correlate. It is believed that the formative indicators have "formed" the latent variable. In the case of formatively-measured constructs, the indicators can have negative, positive, or even no correlation among them (Haenlein & Kaplan, 2004). In a formative measurement scale, the arrow direction goes from the formative indicators to the latent variable. Additionally, changes in one or more of the indicators cause changes in the latent variable.

It is worth mentioning here that the proposed model only contains reflectively measured constructs (see Figure 9). More details about these constructs will be provided in the next sections (Section 5.7.2 and Section 5.7.3).

5.7.2: Explanation of the Target Endogenous Variance of the Initial Model

By looking at the initial model that is displayed in Figure 9, the following observations can be made:

- The coefficient of determination, R^2, for the BI endogenous latent variable is 0.677. This means that the latent variables (PSE, CA, PEoU, TAF, PU, SI, and FC) of the initial model substantially[15] explain 67.7% of the variance in BI.
- PSE explains 40.0% of the variance of PEoU.
- TAF explains 40.0% of the variance of PU.
- PSE explains 11.2% of the variance of CA.
- PU and CA act as both independent and dependent variables in this model. They are considered to be endogenous variables as they have arrows pointing from other latent variables (TAF and PSE) to them.
- The structural (inner) model shows numbers on the arrows. These numbers are called path coefficients. Path coefficients explain how strong the effect of one latent variable is on another latent variable. In the model of this study, the path (CA→ BI) has a coefficient of negative 0.066. The path from (FC → BI) has a coefficient of positive 0.262. Additionally, the path from PEoU to BI has a coefficient of positive 0.192. The coefficients of the other paths of the model are displayed in Table 20.

[15] R^2 values above 0.67 are considered "substantial", values above 0.33 are considered "moderate", and values above 0.19 are considered "weak" (Chin, 1998).

Table 20: Path Coefficients of the Initial Model (Direct Effects)

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI								
CA	-0.066							
FC	0.262							
PEoU	0.192							
PSE		-0.335		0.633				
PU	0.307							
SI	0.173							
TAF	0.085					0.632		

- As seen in the above table, there is no direct effect between PSE and BI. However, the indirect effect of the model can be easily calculated using SmartPLS. The following table (Table 21) shows that there is an indirect effect[16] between these two LVs. It can also be noticed that there is another indirect effect between TAF and BI.

Table 21: Path Coefficients of the Initial Model (Indirect Effects)

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI								
CA								
FC								
PEoU								
PSE	0.143							
PU								
SI								
TAF	0.194							

- SmartPLS 3.0 can also calculate the total effects, which are "the sum of the direct and indirect effects of each one of the latent variables" on the other LVs. Total effects of each one of the latent variables are exhibited in Table 22.

[16] Indirect effects are the effects of one latent variable on an endogenous latent variable mediated through one or more additional latent variables (Garson, 2016)

Table 22: Path Coefficients of the Initial Model (Total Effects)

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI								
CA	-0.066							
FC	0.262							
PEoU	0.192							
PSE	0.143	-0.335		0.633				
PU	0.307							
SI	0.173							
TAF	0.279					0.632		

- The initial structural model suggests that each one of the seven variables (CA, FC, PEoU, PSE, PU, SI, and TAF) has an effect on BI. However, PU has the strongest effect (0.307), followed by TAF (0.279), FC (0.262), PEoU (0.192), SI (0.173), PSE (0.147), and lastly CA (negative 0.066).
- The significance of each one of these relationships is discussed in Section 5.7.3.3 (this is based on running the bootstrapping procedure that is one of the features available in SmartPLS 3.0).

5.7.3: Evaluation of PLS-SEM Output of the Model:

In accordance with Sarstedt et al. (2014), evaluating PLS-SEM involves carrying out two stages. As seen in Figure 12, the first stage (Stage A) investigates the measurement model and examines the measurement theory. This investigation depends on whether the model contains reflective measures (see Stage A.1), formative measures (see Stage A.2), or both. Once the investigation of the measurement model concludes with acceptable results, the researcher starts Stage B in which he/she investigates the structural model and examines the structural theory to decide whether the structural relationships are having an important effect and are noteworthy. Next is an explanation of how the proposed model of this study has been examined.

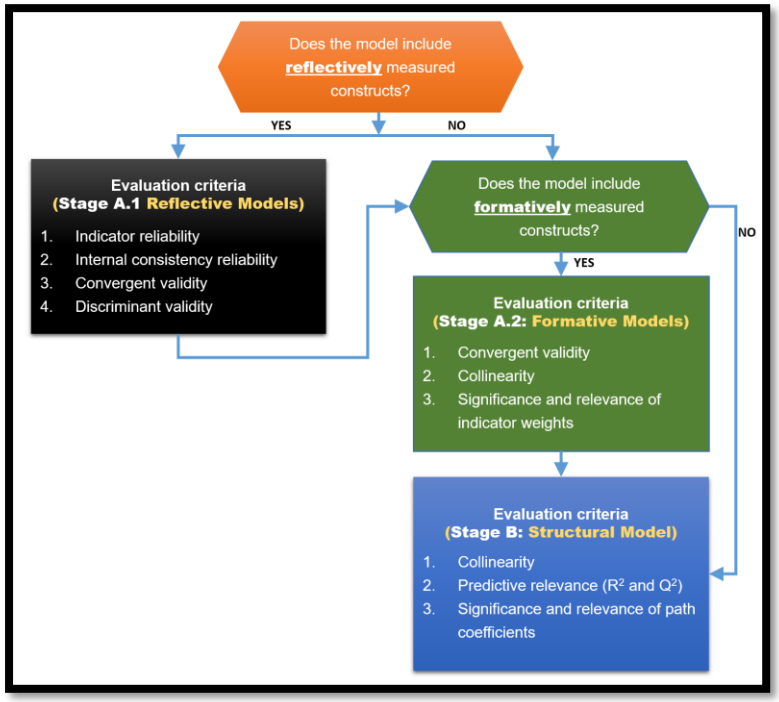


Figure 12: PLS-SEM Evaluation Stages. Source: Sarstedt et al. (2014)

5.7.3.1: Stage A.1: Assessing the reflective model

The measurement model shown in Figure 9 relies on 34 reflective items/indicators. To analyse this model, the study used SmartPLS 3.0 (Ringle, Wedne, & Becker, 2015). The analysis of the reflective model was conducted through applying the following:

1. Outer model loadings and the indicator reliability
2. Internal consistency reliability
3. Convergent validity
4. Discriminant validity

Following is how each one of the above-listed tests has been conducted:

First. Outer model loadings and the indicator reliability

The outer model loadings or measurement loadings are the path weights connecting the latent variables to the indicators. These values are used to view the correlations between the LVs and the indicators. Outer model loadings range from 0.0 to 1.0. The calculated

outer model loadings are used to calculate the indicator reliability which is equal to the square of the measurement loading (Hair Jr et al., 2016). As a general rule, the higher the loadings, the better and more reliable the outer model. More specifically, it is preferred to have values equal to or higher than 0.70 (Hulland, 1999). Table 23 shows the outer loadings of this study's initial model:

Table 23: Outer Model Loadings of the Initial Model

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI-1	0.939							
BI-2	0.864							
BI-3	0.907							
CA-1		0.871						
CA-2		0.873						
CA-3		0.903						
CA-4		0.857						
FC-1			0.903					
FC-2			0.886					
FC-3			0.135					
FC-4			0.789					
PEoU-1				0.914				
PEoU-2				0.860				
PEoU-3				0.929				
PEoU-4				0.891				
PEoU-5				0.843				
PSE-1					0.832			
PSE-2					0.803			
PSE-3					0.793			
PSE-4					0.658			
PU-1						0.904		
PU-2						0.825		
PU-3						0.808		
PU-4						0.831		
PU-5						0.747		
SI-1							0.432	
SI-2							0.316	
SI-3							0.875	
SI-4							0.915	
TAF-1								-0.030
TAF-2								0.737
TAF-3								0.806
TAF-4								0.842
TAF-5								0.570

As exhibited in the table above, the outer loadings of all of the indicators are more than 0.7 except for six loadings: FC-3 (0.135), PSE-4 (0.658), SI-1 (0.432), SI-2 (0.316), TAF-1 (negative 0.030), and TAF-5 (0.570). These indicators were removed from the initial model because they exhibited outer loadings clearly under 0.70. All other loadings were kept as they had loadings above 0.70. Table 24 provides a summary of the final set of items used.

Table 24: Outer Model Loadings of the Updated Model (After Removing 6 Indicators)

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI-1	0.939							
BI-2	0.862							
BI-3	0.908							
CA-1		0.873						
CA-2		0.872						
CA-3		0.901						
CA-4		0.859						
FC-1			0.908					
FC-2			0.881					
FC-4			0.798					
PEoU-1				0.914				
PEoU-2				0.861				
PEoU-3				0.929				
PEoU-4				0.890				
PEoU-5				0.843				
PSE-1					0.871			
PSE-2					0.806			
PSE-3					0.774			
PU-1						0.905		
PU-2						0.823		
PU-3						0.814		
PU-4						0.829		
PU-5						0.741		
SI-3							0.879	
SI-4							0.928	
TAF-2								0.781
TAF-3								0.816
TAF-4								0.845

After removing the indicators that exhibited loadings below 0.70, the loadings of some indicators were slightly changed as a result. Table 25 shows that all loadings are above 0.7. This indicates that each of the LVs explain over 50% of its indicator's variance (Henseler, Ringle, & Sarstedt, 2012, p. 269). The value (0.7) is the level at which explained variance is more than error variance. As a rule of thumb, in a reflective model, path loadings should be above 0.70 (Henseler et al., 2012, p. 269).

Figure 13 shows the updated model and how this model was changed as a result of removing the FC-3, PSE-4, SI-1, SI-2, TAF-1, and TAF-5 indicators. The R^2 and the path coefficients of the different paths of the model were slightly changed as well.

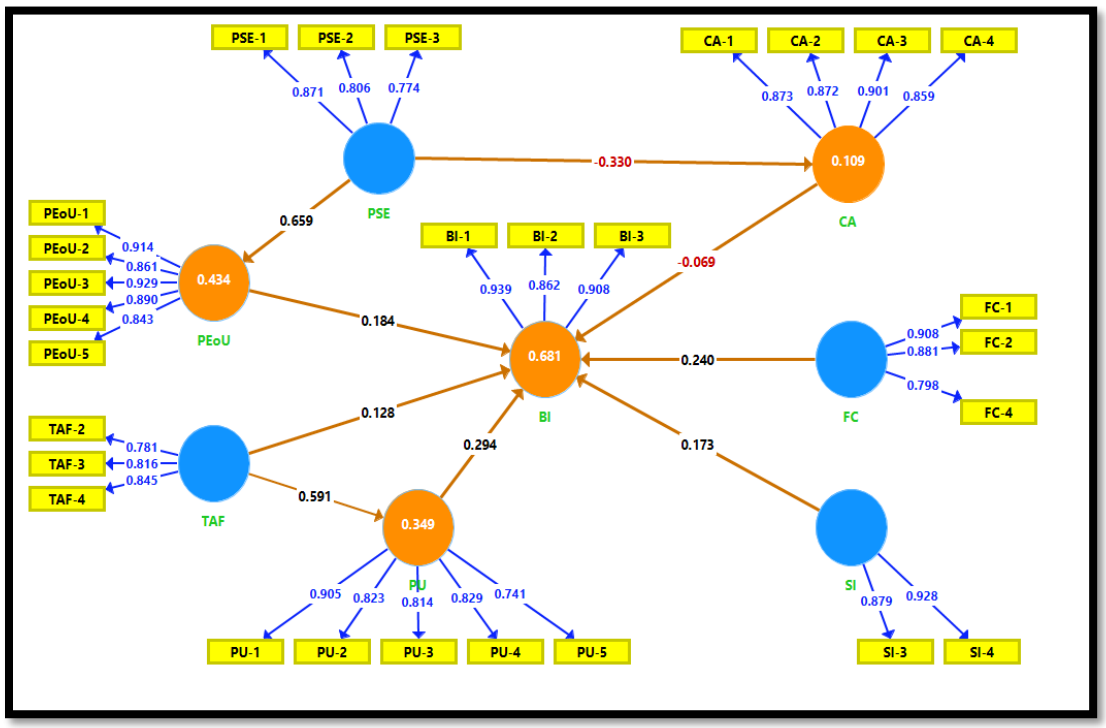


Figure 13: ***PLS-SEM Results of the Updated Model*** *(After removing the 6 indicators)*

Second. Internal consistency reliability:

After checking the indicator loadings and making sure that each one of the latent variables in the updated model explained over half of its indicators' variance, the researcher conducted an assessment of the latent variables' internal consistency

reliability. Usually, internal consistency reliability is evaluated using "Cronbach's alpha". However, this measure tends to provide a conservative measurement in PLS-SEM (Garson, 2016). Earlier literature recommended the use of "Composite Reliability" to check the internal consistency reliability and considered it as a better alternative measure (Bagozzi & Yi, 1988; Hair et al., 2012). As a general rule, the higher the values of the composite reliability, the better and higher the levels of reliability. According to Bagozzi and Yi (1988), values greater or equal to 0.6 and less than 0.7 are considered "acceptable", while values greater than or equal to 0.7 and less than 0.95 are considered "satisfactory to good". Moreover, values more than 0.95 are considered problematic. These values (the ones greater than 0.95), may signal our intention that the multiple indicators are redundant rather than being truly demonstrative measures of the latent variable (Hair Jr et al., 2016, pp. 101, 102). The 5th column in Table 25 below shows the values of the composite reliability (the values in bold) to be greater than 0.7 and at the same time less than 0.95.

Table 25: Construct Reliability and Validity of the Updated Model

Latent Variable	Indicator	Loadings	Indicator Reliability (Loadings)^2	Composite Reliability	Average Variance Extracted (AVE)
Behavioural Intention (BI)	BI-1	0.939	0.881	**0.930**	0.816
	BI-2	0.862	0.743		
	BI-3	0.908	0.825		
Computer Anxiety (CA)	CA-1	0.873	0.762	**0.930**	0.768
	CA-2	0.872	0.761		
	CA-3	0.901	0.813		
	CA-4	0.859	0.738		
Facilitating Conditions (FC)	FC-1	0.903	0.815	**0.898**	0.746
	FC-2	0.886	0.784		
	FC-4	0.789	0.623		
Perceived Ease-of-Use (PEoU)	PEoU-1	0.914	0.835	**0.949**	0.788
	PEoU-2	0.861	0.741		
	PEoU-3	0.929	0.863		
	PEoU-4	0.890	0.793		
	PEoU-5	0.843	0.710		
Perceived Self-Efficacy (PSE)	PSE-1	0.871	0.758	**0.858**	0.669
	PSE-2	0.806	0.649		
	PSE-3	0.774	0.599		

Latent Variable	Indicator	Loadings	Indicator Reliability (Loadings)^2	Composite Reliability	Average Variance Extracted (AVE)
Perceived Usefulness (PU)	PU-1	0.905	0.820	**0.913**	0.679
	PU-2	0.823	0.677		
	PU-3	0.814	0.662		
	PU-4	0.829	0.688		
	PU-5	0.741	0.548		
Social Influence (SI)	SI-3	0.879	0.773	**0.899**	0.817
	SI-4	0.928	0.861		
Technology-Assessment Fit (TAF)	TAF-2	0.781	0.609	**0.855**	0.663
	TAF-3	0.816	0.665		
	TAF-4	0.845	0.714		

This demonstrates high levels of internal consistency reliability amongst all the eight reflective latent variables. Hence, the internal consistency reliability is confirmed.

Third. Convergent validity

The next step after evaluating the internal consistency reliability involved the assessment of the convergent validity of the reflectively measured latent variables. As stated by Bagozzi and Yi (1988) and Garson (2016), convergent validity is the degree to which the indicators used to measure the same latent variable are in agreement. Bagozzi and Yi (1988) advised that the researcher can make use of the Average Variance Extracted (AVE)[17] to assess convergence validity. Following this recommendation, the AVE of each latent variable was calculated and assessed. After analysing the calculated figures demonstrated in Table 25, the researcher found that all the AVE values are greater than 0.50 which is the acceptable minimum value for convergent validity (Bagozzi & Yi, 1988; Chin, 1998). Hence, convergent validity is confirmed. This means that on average, each one of the latent variables explains over half of the variance of its indicators.

[17] Average Variance Extracted (AVE) is calculated as the mean of squared loadings for all indicators related to the latent variable. The acceptable AVE threshold is 0.5 (Bagozzi & Yi, 1988).

Fourth. Discriminant validity

The discriminant validity valuation has the goal to ensure that a reflective latent variable has the strongest association with its own indicators. According to Sarstedt et al. (2014), discriminant validity examines the degree to which a latent variable is empirically different from other latent variables in the model. This is determined through: (1) calculating how much the latent variable correlates with other latent variables; and (2) determining how particularly the indicators represent only this single latent variable. The Fornell and Larcker (1981) criterion is one of the most important measures for testing discriminant validity. In this method, the square root of AVE for each latent variable is evaluated. The recommended guideline is that the square root of the AVE for each latent variable should be higher than its correlation with any other latent variable (Garson, 2016). The bold text on the diagonal of Table 25 represent the square root of AVE of each one of the latent variable. For example, the latent variable FC's AVE is found to be 0.7462 (from Table 26). Thus, its square root becomes 0.864. This value is higher than the correlation values in the column of FC (0.710, 0.633, 0.372, 0.711, 0.515) and also higher than the values in the row of FC (0.687, -0.268). Similar analysis is also conducted for the other latent variables (BI, FC, PEoU, PSE, PU, SI, and TAF).

Table 26: Discriminant Validity Using Fornell-Lacker Criterion

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI	**0.904**							
CA	-0.303	**0.876**						
FC	0.687	-0.268	**0.864**					
PEoU	0.661	-0.303	0.710	**0.888**				
PSE	0.636	-0.330	0.633	0.659	**0.818**			
PU	0.634	-0.241	0.372	0.464	0.538	**0.824**		
SI	0.630	-0.114	0.711	0.499	0.501	0.422	**0.904**	
TAF	0.613	-0.180	0.515	0.492	0.523	0.591	0.492	**0.814**

The result indicates that because the square root of AVE (highlighted in bold) in all latent variables columns is higher than the correlations (the numbers below it), discriminant validity is well-established.

Another approach researchers implemented to assess discriminant validity is to evaluate the cross-loadings. According to Garson (2016) and Hair Jr et al. (2016), cross-loadings are an alternative to AVE as a discriminant validity valuation technique for reflective models. The recommended guideline is that at a minimum, no indicator variable should have a higher correlation with another latent variable than with its own latent variable (Garson, 2016; Hair Jr et al., 2016). Otherwise discriminant validity is not established. Table 27 shows that this condition is met. Each one of the indicator variables exhibit a greater loading on its latent variable than on any other latent variable included in the model.

Table 27: Discriminant Validity Using Cross-Loadings

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI-1	0.939	-0.277	0.677	0.703	0.643	0.657	0.619	0.645
BI-2	0.862	-0.270	0.526	0.509	0.486	0.524	0.503	0.406
BI-3	0.908	-0.275	0.646	0.559	0.579	0.525	0.576	0.586
CA-1	-0.300	0.873	-0.273	-0.311	-0.313	-0.303	-0.188	-0.217
CA-2	-0.188	0.872	-0.175	-0.178	-0.192	-0.255	-0.025	-0.094
CA-3	-0.308	0.901	-0.254	-0.326	-0.384	-0.163	-0.085	-0.183
CA-4	-0.217	0.859	-0.207	-0.180	-0.187	-0.118	-0.064	-0.088
FC-1	0.605	-0.259	0.908	0.618	0.501	0.336	0.618	0.419
FC-2	0.665	-0.329	0.881	0.658	0.630	0.356	0.607	0.520
FC-4	0.492	-0.070	0.798	0.555	0.498	0.260	0.626	0.381
PEoU-1	0.563	-0.270	0.642	0.914	0.635	0.415	0.468	0.473
PEoU-2	0.592	-0.215	0.646	0.861	0.554	0.360	0.446	0.403
PEoU-3	0.616	-0.331	0.656	0.929	0.598	0.430	0.422	0.437
PEoU-4	0.544	-0.290	0.613	0.890	0.496	0.265	0.391	0.332
PEoU-5	0.611	-0.240	0.590	0.843	0.626	0.563	0.478	0.517
PSE-1	0.635	-0.350	0.598	0.679	0.871	0.560	0.448	0.575
PSE-2	0.489	-0.177	0.509	0.459	0.806	0.310	0.412	0.307
PSE-3	0.388	-0.246	0.417	0.417	0.774	0.398	0.362	0.332
PU-1	0.554	-0.206	0.325	0.379	0.515	0.905	0.376	0.522

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
PU-2	0.375	-0.128	0.151	0.198	0.287	0.823	0.271	0.314
PU-3	0.642	-0.258	0.436	0.402	0.540	0.814	0.443	0.579
PU-4	0.571	-0.252	0.353	0.498	0.475	0.829	0.352	0.529
PU-5	0.362	-0.084	0.152	0.367	0.295	0.741	0.226	0.397
SI-3	0.493	-0.078	0.571	0.357	0.437	0.321	0.879	0.395
SI-4	0.632	-0.124	0.701	0.526	0.468	0.430	0.928	0.486
TAF-2	0.543	-0.284	0.455	0.412	0.431	0.482	0.361	0.781
TAF-3	0.404	-0.032	0.386	0.305	0.393	0.370	0.403	0.816
TAF-4	0.526	-0.099	0.409	0.457	0.444	0.559	0.437	0.845

5.7.3.2: Stage A.2: Assessing the formative model

Formatively measured latent variables are examined and evaluated differently from reflectively measured latent variables. However, the model in this study does not include any formative latent variables. Hence, assessing the formative model is not needed in this study.

5.7.3.3: Stage B: Assessing the structural model

After checking the indicator reliability, the internal consistency reliability, the convergent validity, and the discriminant validity of the measurement model, the researcher found out that the quality of the measurement model is satisfactory. Depending on that, he started Stage B where he assessed the structural model. This involved conducting the following steps:

1. Testing the structural model for potential collinearity issues.
2. Assessing the model's ability to predict the endogenous latent variables. To facilitate this assessment, the researcher used: (a) the Coefficient of determination (R^2); (b) Cross-validated redundancy (Q^2).
3. Checking the structural model significance in bootstrapping.

Following is an explanation of each one of the three points listed above:

First. Testing the structural model for potential collinearity issues

According to Garson (2016), the multicollinearity problem appears when two or more independent variables are highly inter-correlated. Garson declared that having the problem of multicollinearity makes it hard for the researcher to assess the relative importance of one independent variable judged against another. For this reason, the first step the researcher performed to assess the structural model was examining the structural model for collinearity. The reason is that the estimation of the path coefficients is based on Ordinary Least Squares (OLS) regressions (Mooi & Sarstedt, 2011), and having the multicollinearity problem in OLS regression inflates the standard errors. This would make the significance tests of independent variables unreliable (Garson, 2016; Hair, Ringle, & Sarstedt, 2011; Hair Jr et al., 2016).

As a general guideline, the structural model is considered having multicollinearity problems when the Variance Inflation Factor (VIF) coefficient is higher than 4.0 (Garson, 2016, pp. 71). The researcher used this general guideline to examine the collinearity between the exogenous latent variables. The results of this test are shown in Table 28.

Table 28: Inner Model VIF Values

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI								
CA	1.149							
FC	3.240							
PEoU	2.285							
PSE		1.000		1.000				
PU	1.736							
SI	2.237							
TAF	1.852					1.000		

As exhibited in Table 28, the resulted VIF values of the exogenous variables that are directly connected with BI (CA, FC, PEoU, PU, SI, and TAF) ranged between 1.149 (CA) and 3.240 (FC), which means that all the VIF coefficients are less than 4.0. Similarly, the VIF values of the exogenous variables that are connected to the following endogenous variables (CA, PEoU, and PU) are also less than 4.0. This confirms that there is no indication of collinearity between each set of exogenous latent variables. Hence, the structural model results are not negatively affected by collinearity.

Second. Assessing the ability of the model to predict the endogenous latent variables

To assess the ability of the updated structural model to predict the endogenous constructs, the researcher used the values of both the coefficient of determination (R^2) and the cross-validated redundancy (Q^2). Following is an explanation of each one of these two assessments:

Coefficient of determination (R^2)

The R^2 value is used to assess the model's predictive accuracy. R^2 is an overall effect size measure for the structural model. Chin (1998, p. 323) explains the results above the value 0.67 to be "substantial", the values above 0.33 to be "moderate", and the values above 0.19 to be "weak". The calculated R^2 values of the endogenous latent variables of the updated model are exhibited in Table 29 below:

Table 29: R^2 Values of the Endogenous Latent Variables

	R Square	Prediction Power
BI	0.681	Substantial
CA	0.109	Weak
PEoU	0.434	Moderate
PU	0.349	Moderate

As seen in Table 29 and based on Chin's (1998) explanation of the R^2 values, the researcher examined the predictive power of the endogenous latent variables. It was

obvious that the Behavioural Intention (BI), which is the primary outcome measure of the model, has a substantial prediction power (R^2 = 0.681), whereas the prediction power of PEoU and PU is lower with a moderate R^2 value of 0.434 and 0.343 respectively. Furthermore, the R^2 value of CA is comparably week (R^2 = 0.109).

Cross-validated redundancy (Q^2)

Cross-validated redundancy measures (Q^2), also called blindfolding was employed to assess the predictive relevance of all the endogenous latent variables in the updated model of this study. As stated by Garson (2016), blindfolding is a sample re-use procedure that is used to compute the Q^2 value (Geisser, 1974, p. 33). This procedure is only applied to the reflectively measured latent variables. A more detailed description of how Q^2 values are calculated was provided by Garson (2016):

> "Blindfolding is a sample re-use technique that starts with the first data point and omits every d^{th} data point in the endogenous construct's indicators. Then, the procedure estimates the PLS path model parameters by using the remaining data points. The omitted data points are considered missing values and treated accordingly when running the PLS-SEM algorithm (e.g., by using mean value replacement). The resulting estimates are then used to predict the omitted data points. The difference between the true (i.e., omitted) data points and the predicted ones is then used as input for the Q^2 measure" (p. 116)

It is worth mentioning here that SmartPLS 3.0 provides two approaches for calculating Q^2 values: the first is cross-validated redundancy; and the second is cross-validated communality. The researcher used the cross-validated redundancy approach as it is

recommended by Hair Jr et al. (2016). According to Garson (2016) and Hair Jr et al. (2016), having Q^2 values that are greater than zero for the endogenous latent variables confirms the structural model's predictive relevance. As presented in Table 30, performing the blindfolding procedure with an Omission Distance (OD) of six[18] returned Q^2 values that are above zero. This was for all endogenous latent variables (BI: 0.480, CA: 0.061, PEoU: 0.294, PU: 0.196). Hence, the model's predictive relevance for the endogenous latent variables is confirmed.

Table 30: Latent Variables' Cross-Validated Redundancy (Q^2)

	SSO	SSE	Q^2 (=1-SSE/SSO)
BI	336.000	174.761	**0.480**
CA	448.000	420.768	**0.061**
FC	336.000	336.000	
PEoU	560.000	395.268	**0.294**
PSE	336.000	336.000	
PU	560.000	450.158	**0.196**
SI	224.000	224.000	
TAF	336.000	336.000	

Third. Checking the significance and relevance of the structural paths

a. <u>The significance of the model:</u>

The final step of structural model analysis considers the strengths and significance of the path coefficients (the relationships hypothesised between the latent variables). SmartPLS 3.0 (Ringle et al., 2015) provides a procedure called bootstrapping that is a technique used to generate *t-statistics* for testing the significance of both the inner and the outer models. This procedure uses resampling methods to compute the significance of PLS coefficients. In this techniques, a large number of bootstrap subsamples (for example: 5,000 subsamples) are taken from the initial sample with replacement. This is

[18] The recommended value of the Omission Distance (OD) for most types of research is 5 to 10 (Hair Jr, Sarstedt, Ringle, & Mena, 2012)

performed in order to produce bootstrap standard errors, which will then generate approximate *t-values* that are used to determine the structural path significance. Following the recommendations of Hair Jr et al. (2016), the bootstrapping procedure was conducted with a significance level of 5%. The results of running this procedure are displayed in Table 31. As displayed in this table, path coefficients of the updated structural model are highlighted in bold and listed under the *T-Statistics* column.

Table 31: T-Statistics of Path Coefficients [Structural (Inner) Model]

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
CA -> BI	-0.069	-0.059	0.082	**0.836**	0.403
FC -> BI	0.240	0.238	0.125	**1.924**	0.054
PEoU -> BI	0.184	0.181	0.095	**1.927**	0.054
PSE -> BI	0.144	0.143	0.082	**1.747**	0.081
PSE -> CA	-0.330	-0.348	0.079	**4.199**	0.000
PSE -> PEoU	0.659	0.665	0.078	**8.477**	0.000
PU -> BI	0.294	0.302	0.094	**3.143**	0.002
SI -> BI	0.173	0.168	0.081	**2.130**	0.033
TAF -> BI	0.302	0.306	0.088	**3.442**	0.001
TAF -> PU	0.591	0.602	0.069	**8.559**	0.000

After analysing the path coefficients presented in the *T-statistics* column, it is evident that some of these path coefficients are significant and some of them are not. As a rule of thumb, all *t-statistics* values above 1.65 are significant at the 0.10 significance level, all *t-statistics* values above 1.96 are significant at the 0.05 significance level, and all *t-statistics* values above 2.58 are significant at the 0.01 significance level (Garson, 2016). By applying this rule of thumb we can conclude that:

- The (TAF → PU) linkage (8.559), the (PSE → PEoU) linkage (8.477), the (PSE →CA) linkage (4.199), the (TAF – BI) linkage (3.442), and the (PU → BI) linkage (3.143) are all statistically significant at the **0.01** significance level.

- Additionally, the (SI → BI) linkage (2.130) is significant at the **0.05** significance level[19].
- Likewise, the (FC → BI) linkage (1.924), the (PEoU → BI) linkage (1.927), and the (PSE → BI) linkage "This is an indirect effect" (1.747) are all significant at the **0.10** significance level.
- Finally, it is statistically proven that the (CA → BI) linkage (0.836) is not statistically significant.

After analysing the path coefficient for the inner (structural) model, the researcher evaluated the significance level of the outer model. This was conducted by checking the *t-statistic* related to the outer model loadings. As demonstrated in Table 32, the values of the t-statistics of all loadings are greater than 1.96. Hence, all the outer model loadings are significant at the 0.01 significance level.

Table 32: T-statistics and P Values of the Outer Model Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
BI-1 <- BI	0.939	0.939	0.013	**73.039**	0.000
BI-2 <- BI	0.862	0.857	0.057	**15.248**	0.000
BI-3 <- BI	0.908	0.904	0.040	**22.790**	0.000
CA-1 <- CA	0.873	0.871	0.043	**20.333**	0.000
CA-2 <- CA	0.872	0.865	0.046	**18.990**	0.000
CA-3 <- CA	0.901	0.901	0.033	**26.927**	0.000
CA-4 <- CA	0.859	0.850	0.045	**19.021**	0.000
FC-1 <- FC	0.908	0.908	0.021	**42.782**	0.000
FC-2 <- FC	0.881	0.881	0.030	**29.117**	0.000
FC-4 <- FC	0.798	0.780	0.085	**9.360**	0.000
PEoU-1 <- PEoU	0.914	0.909	0.029	**31.090**	0.000
PEoU-2 <- PEoU	0.861	0.853	0.050	**17.363**	0.000
PEoU-3 <- PEoU	0.929	0.927	0.017	**53.623**	0.000
PEoU-4 <- PEoU	0.890	0.881	0.056	**15.815**	0.000
PEoU-5 <- PEoU	0.843	0.842	0.039	**21.831**	0.000
PSE-1 <- PSE	0.871	0.876	0.023	**37.762**	0.000

[19] All of the relationships listed in the above bullet point would be included at a 0.05 significance level, but the (SI → BI) linkage (2.130) is only valid at this level.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
PSE-2 <- PSE	0.806	0.789	0.085	**9.447**	0.000
PSE-3 <- PSE	0.774	0.764	0.077	**10.043**	0.000
PU-1 <- PU	0.905	0.901	0.026	**35.136**	0.000
PU-2 <- PU	0.823	0.809	0.069	**11.885**	0.000
PU-3 <- PU	0.814	0.812	0.044	**18.440**	0.000
PU-4 <- PU	0.829	0.829	0.039	**21.446**	0.000
PU-5 <- PU	0.741	0.724	0.097	**7.632**	0.000
SI-3 <- SI	0.879	0.872	0.044	**19.928**	0.000
SI-4 <- SI	0.928	0.930	0.019	**49.506**	0.000
TAF-2 <- TAF	0.781	0.771	0.079	**9.886**	0.000
TAF-3 <- TAF	0.816	0.805	0.062	**13.129**	0.000
TAF-4 <- TAF	0.845	0.850	0.039	**21.756**	0.000

b. The relevance of the structural model

In regards to relevance, the researcher used the values of the path coefficients. These values explain how strong the effect of one latent variable is on another latent variable. The values of the path coefficient range from -1 to +1. Values closer to +1 signify strong positive relationships and values closer to -1 signify strong negative relationships.

Table 33 and Table 34 exhibit the path coefficients of the updated model. Table 33 shows the direct effects and Table 34 shows the indirect effects on each one of the latent variables on other latent variables.

Table 33: Path Coefficients of the Updated Model (Direct Effects)

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI								
CA	-0.069							
FC	0.240							
PEoU	0.184							
PSE		-0.330		0.659				
PU	0.294							
SI	0.173							
TAF	0.128					0.591		

Table 34: Path Coefficients of the Updated Model (Indirect Effects)

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI								
CA								
FC								
PEoU								
PSE	0.144							
PU								
SI								
TAF	0.174							

As a final point, the valuation of structural model path coefficients should not be limited to direct effects only. Hence, the researcher considered the total effects as well. The total effects are displayed in Table 35.

Table 35: Path Coefficients of the Updated Model (Total Effects)

	BI	CA	FC	PEoU	PSE	PU	SI	TAF
BI								
CA	-0.069							
FC	0.240							
PEoU	0.184							
PSE	0.144	-0.330		0.659				
PU	0.294							
SI	0.173							
TAF	0.302					0.591		

Considering the total effects helped the researcher examine the influence of each of the exogenous latent variables on a target latent variable using all mediating latent variables. As a result, this is expected to give a clearer idea about the different relationships of the structural model.

Analysing the values displayed in Table 35 shows that the strongest relationship is between PSE and PEoU (0.659), followed by the relationship between TAF and PU (0.591), then the link between PSE and CA (negative 0.33). However, the latent variable that has the strongest effect on BI is TAF (0.302), followed by PU (0.294),

then FC (0.240), then PEoU (0.184), then SI (0.173), then PSE (0.144), and lastly CA (- 0.069).

The results presented in Figure 14 highlight the important role of TAF and PU on BI with path coefficients 0.302 and 0.294.

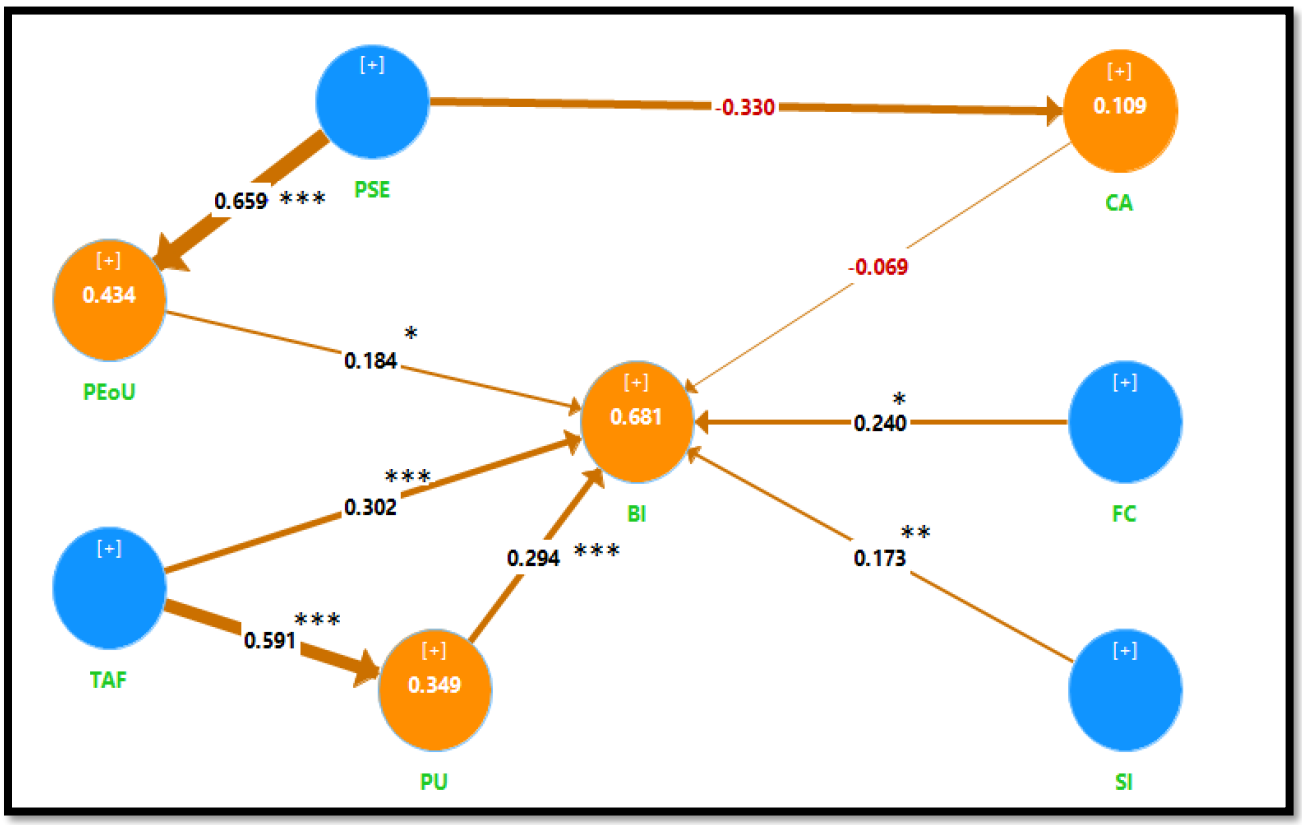


Figure 14: ***Path Model and PLS-SEM Estimates of the Updated Model****. Notes: *** p<=0.01; ** p <= 0.05; * p <= 0.10; Thickness of lines shows how strong is the effect of each LV on the other LVs.*

c. Significance and Relevance Conclusion

As summarised in Table 36, some of the structural model relationships are significant and some of them are not. The relationships that are significant confirm the corresponding hypotheses that were proposed in the qualitative part of this study, whereas the hypotheses related to the rest of these relationships are rejected. The *t-values* and the *p-values* of these relationships were obtained using the bootstrapping procedure that is available in SmartPLS. Based on the calculated PLS structural model

results, it is obvious that TAF has the strongest effect on BI (0.302) (with a significance level of 0.01), followed by PU (0.294) (with a significance level of 0.01), then FC (0.240) (that is not significant[20]), then PEoU (0.184) (that is not significant), then SI (0.173) (with a significance level of 0.05), then PSE (0.144) (that is not significant), and lastly CA (- 0.069) (that is not significant). Determining whether the hypothesis is significant or not is based on the significance level 0.05 which is the usual significance level for considering a result significant (Garson, 2016, p. 125).

Table 36: Significance Testing Results of the Structural Model Path Coefficients

Hypotheses	Path		Path Coefficients	*t-Values*	*p-Values*	Accepted or Rejected (0.05 Significance Level)
H1a	PU → BI	Perceived usefulness has a positive impact on behavioural intention	0.294	**3.143**	0.002	Accepted
H2a	PEoU → BI	Perceived ease-of-use has a positive impact on behavioural intention	0.184	**1.927**	0.054	Not Accepted
H3a	CA →(-) BI	Computer anxiety has a negative impact on behavioural intention	-0.069	**0.836**	0.403	Not Accepted
H4a	PSE → (-) CA	Perceived self-efficacy has a negative impact on computer anxiety	-0.330	**4.199**	0.000	Accepted
H4b	PSE → PEoU	Perceived self-efficacy has a positive impact on perceived ease-of-use	0.659	**8.477**	0.000	Accepted
H5a	FC → BI	Facilitating conditions have a positive impact on behavioural intention	0.240	**1.924**	0.054	Not Accepted
H6a	SI → BI	Social Influence have a positive impact on behavioural intention	0.173	**2.130**	0.033	Accepted
H7a	TAF → BI	Technology-assessment fit has a positive impact on behavioural intention	0.302	**3.442**	0.001	Accepted
H7b	TAF → PU	Technology-assessment fit has a positive impact on perceived usefulness	0.591	**8.559**	0.000	Accepted

[20] "Critical t-values for a two-tailed test are 1.65 (significance level = 10 percent), 1.96 (significance level = 5 percent), and 2.58 (significance level = 1 percent)" (Hair et al., 2011)

5.7.4: Examining the Role of the Moderating Variables

In the qualitative part of this study, it was hypothesised that the influence of some latent variables is moderated by some moderating factors like “age” and “experience”. Hence, a multi-group analysis (PLS-MGA) was used to decide if the structural model significantly differs between known groups of interest. PLS-MGA is one of the tests that are available in SmartPLS 3.0 in which the standard deviation of path coefficients of different groups is calculated using bootstrapping. On the word of Sarstedt, Henseler, and Ringle (2011), this method is an extension of the original nonparametric MGA method described by Henseler, Ringle, and Sinkovics (2009) and is the most commonly used test. This is the main reason the researcher has chosen this method.

The following two sections show how the multi-group analysis (PLS-MGA) procedure was applied on the hypothesised moderating factors “experience” and “age”.

5.7.4.1: Multi-group Analysis (PLS-MGA) - Experience

In order to examine if there is any moderating effect of the CIS teachers’ experience (i.e., “long experience” versus “short experience”) on the findings of this study, the researcher divided the collected data into two groups: Group-1 represents the CIS teachers with long experience in using e-assessments (3 years or more); and Group-2 represents the CIS teachers with short experience (less than 3 years). After that, the PLS-MGA test was conducted to find the total effects difference and the *p-value* between Group-1 and Group-2. The results of running this test is exhibited in Table 37 below.

Table 37: PLS-MGA Calculated Results (Long Experience versus Short Experience)

	Total Effects-difference (| Long Experience - Short Experience |)	p-Value (Long Experience vs Short Experience)	Significance level
CA -> BI	0.071	0.640	Not significant
FC -> BI	0.164	0.708	Not significant
PEoU -> BI	0.173	0.238	Not significant
PSE -> BI	0.158	0.203	Not significant
PSE -> CA	0.161	0.711	Not significant
PSE -> PEoU	0.083	0.290	Not significant
PU -> BI	0.020	0.461	Not significant
SI -> BI	0.057	0.382	Not significant
TAF -> BI	0.278	0.935	Not significant
TAF -> PU	0.249	**0.969**	**significant**

According to Henseler et al. (2009), the general rule to evaluate the significance level is to consider the difference of group-specific path coefficients as "significant" if the *p-value* is less than 0.05) or more than 0.95. By examining the *p-value* column, it is clear that the difference is not significant for any path except for the path (TAF → PU). This implies that the same PLS structural path model applies to both the CIS teachers with "a lot of experience" and those with "little experience" in all cases except for the (TAF→PU) relationship. In other words, the effect of Technology-Assessment Fit (TAF) on behavioural intention will be moderated by "experience", such that the effect will be stronger for CIS teachers in the early stages of experiences. Hence, the three hypotheses related to the moderating effects of "experience" on different paths (H1c, H5c, and H6c) are rejected (see Table 38).

Table 38: Hypotheses Related to "Experience" as a Moderating Variable

Code	Hypothesis	Accepted/Rejected?
H1c:	The influence of perceived usefulness on behavioural intention will be moderated by experience	Rejected
H5c	The influence of facilitating conditions on behavioural intention will be moderated by experience, such that the effect will be stronger for CIS teachers with less experience	Rejected
H6c	The effect of social influence on behavioural intention will be moderated by experience, such that the effect will be stronger for CIS teachers in the early stages of experiences.	Rejected

To have a clearer picture of the difference of group-specific path coefficients between Group-1 and Group-2, this difference is demonstrated visually in Figures 15 and 16.

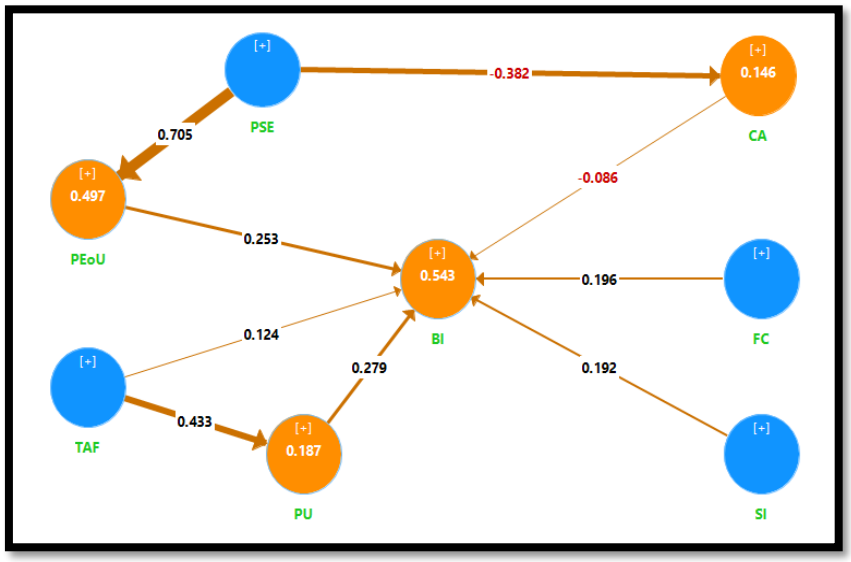


Figure 15: CIS Teachers with a Lot of Experience

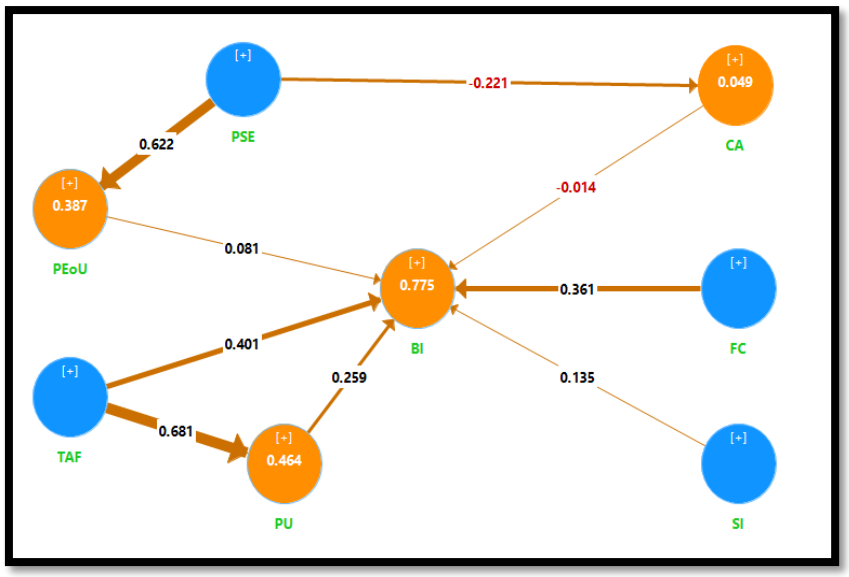


Figure 16: CIS Teachers with Little Experience

Figures 15 and 16 above show the path coefficients for two models, Figure 15 represents the model for "the CIS teachers with a lot of experience", and Figure 16 shows the model for "the CIS teachers with little experience". We can see the difference in path weights, reflected in path widths. It is obvious that there is a big difference between the (TAF → PU) path coefficient in the first model (0.433) and the one in the

second model (0.681). We can also notice that there is a big difference between the (TAF → BI) path coefficient in the first model (0.124) and the one in the second model (0.401) with a *p-value* equal to 0.935 that is slightly below 0.95. For that reason, the researcher decided to accept it.

Finally, running PLS-MGA helped the researcher discover two new findings that are related to the effect of "experience" on (TAF → PU) and (TAF → BI). Details about these new findings are highlighted below:

Code	Findings	Status
New_1	"Experience" has a significant effect on the path (TAF → PU) such that the effect is stronger for CIS teachers in the early stages of experience.	*P-value* = 0.969 (>0.95). Hence, accepted and added as a new finding
New_2	"Experience" has a significant effect on the path (TAF → BI) such that the effect is stronger for CIS teachers in the early stages of experience.	*P-value* = 0.935 that is slightly lower than 0.95. Hence, added as a new finding

5.7.4.2: Multi-group Analysis (PLS-MGA) - Age

To check the moderating effect of the CIS teachers' age (i.e., "younger" versus "older") on the results of this study, the researcher separated the data collected into two groups: Group-1 represents the CIS teachers who are relatively old (40 years or more); and Group-2 represents the CIS teachers who are relatively young (less than 40 years old); To create the first group "older", the following age scales were combined: (a) 40 – 49 years; (b) 50 – 59 years; (c) more than 60 years old. In the same way, to create the second group "younger", the researcher merged the following two age scales together: (a) less than 30 years old; (b) 30 – 39 years old. Next, the PLS-MGA test was conducted

to find the total effects difference and the *p-value* between the two groups. The results of running this test is demonstrated in Table 39 below.

Table 39: PLS-MGA Calculated Results (Old versus Young)

	Total Effects-difference (| Older - Younger |)	p-Value (Older vs Younger)	Significance level
CA -> BI	0.138	0.231	Not significant
FC -> BI	0.144	0.294	Not significant
PEoU -> BI	0.076	0.598	Not significant
PSE -> BI	0.036	0.568	Not significant
PSE -> CA	0.103	0.525	Not significant
PSE -> PEoU	0.181	0.128	Not significant
PU -> BI	0.200	0.812	Not significant
SI -> BI	0.079	0.635	Not significant
TAF -> BI	0.176	0.197	Not significant
TAF -> PU	0.092	0.372	Not significant

By examining the *p-value* column, it is clear that the *p-value* is not significant for any of the paths in the model. This conclusion is based on the fact that none of the listed *p-value*s is less than 0.05 or greater than 0.95 (Henseler et al., 2009). This indicates that there is no significant categorical moderating effect of age on the model. Hence, the same PLS structural path model applies to both the young and the old CIS teachers. To have a clearer picture of the difference between Group-1 and Group-2, this difference is demonstrated visually in Figures 17 and 18.

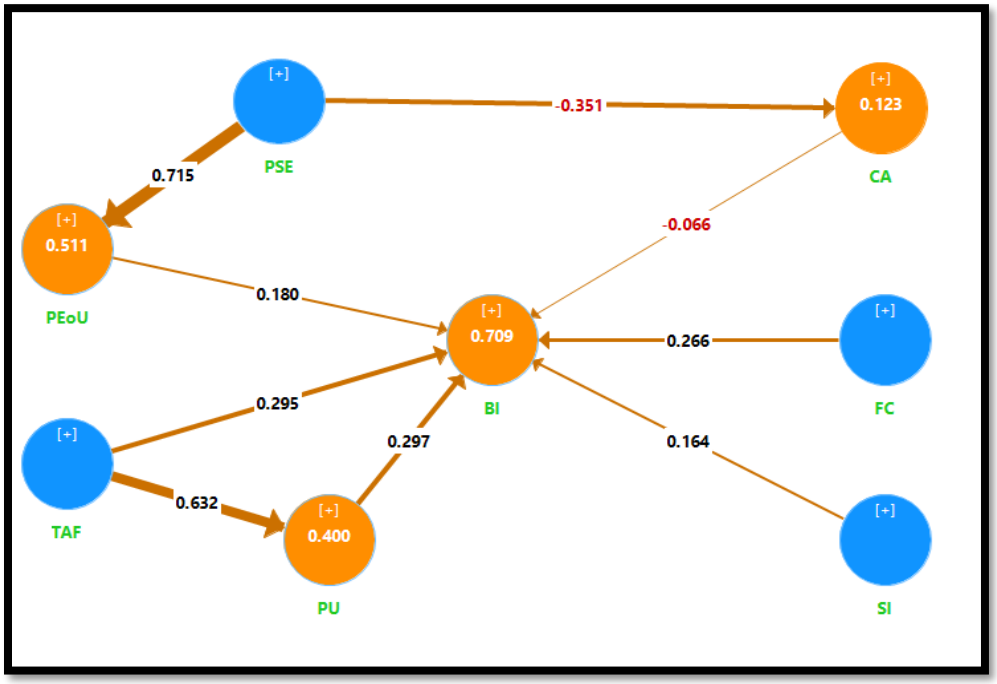


Figure 17: Path Coefficients of the Relatively Old CIS Teachers (40 Years Old or More)

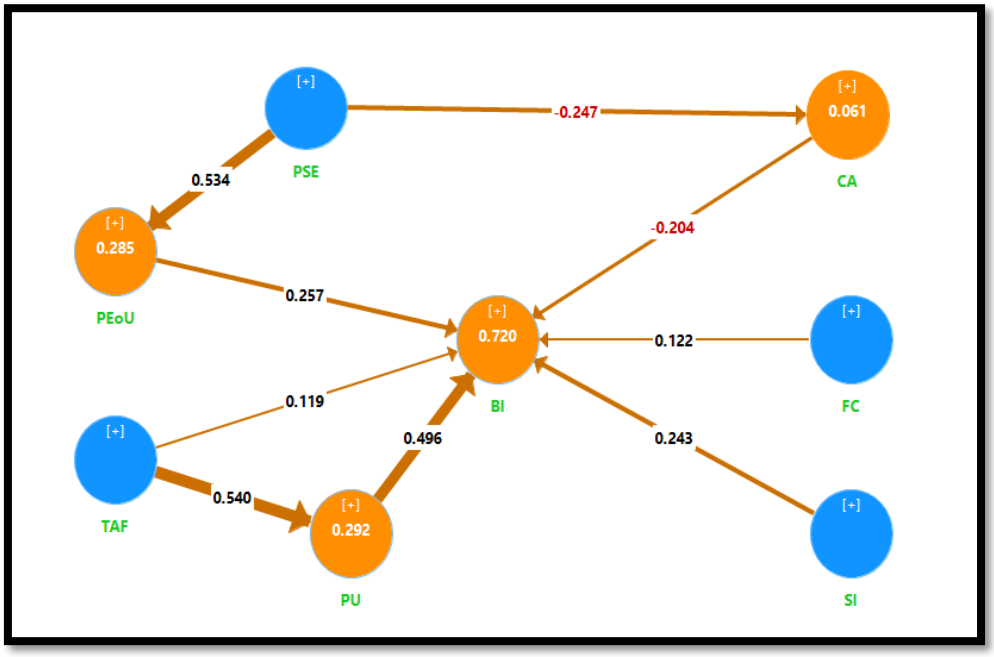


Figure 18: Path Coefficients of the Relatively Young CIS Teachers (Less Than 40 Years Old)

Figures 17 and 18 above put on view the path coefficients for two models, the first (Figure 17) represents the model for "the relatively old CIS teachers", and the second (Figure 18) shows the model for "the relatively young CIS teachers". Figures 17 and 18 point out the difference in path weights, reflected in path widths. It is obvious that

there is a very little difference between the path coefficients in the two models. Hence, we conclude that there is no significant categorical moderating effect of the teachers' age on the model. Based on that, the four hypotheses related to moderating effects of "age" on different paths (H1b, H2b, H5b, and H6c) are rejected (see Table 40).

Table 40: Hypotheses Related to the Moderating Effect of "Age"

Code	Hypothesis	Accepted/Rejected?
H1b:	The influence of perceived usefulness on behavioural intention will be moderated by **age**, such that the effect will be stronger for younger CIS teachers	Rejected
H2b:	The influence of perceived ease-of-use on behavioural intention will be moderated by **age**, such that the effect will be stronger for older CIS teachers	Rejected
H5b	The influence of facilitating conditions on behavioural intention will be moderated by **age**, such that the effect will be stronger for older CIS teachers	Rejected
H6b	The effect of social influence on behavioural intention will be moderated by **age**, such that the effect will be stronger for older CIS teachers	Rejected

5.7.4.3: Multi-Group Analysis (PLS-MGA) - Gender

During the qualitative part of this study, only three participants talked about *the teachers' gender*. These three participants believe that gender is not important in the context of this study as it does not affect their decision to adopt – or not to adopt – e-assessments. Based on this finding, the researcher decided to check if their belief is supported by the results in the quantitative part of the study. In order to examine the moderating effect of the CIS teachers' gender on the results of this study, the researcher divided the collected data into two groups: Group-1 represents the "female" CIS teachers; and Group-2 represents the "male" CIS teachers. Then, the PLS-MGA test was conducted to find the total effects difference and the *p-value* between the two groups. The results of running this test are shown in Table 41 below.

Table 41: PLS-MGA Calculated Results (Female versus Male)

	Total Effects-difference (| Gender (Female) - Gender (Male) |)	p-Value (Gender (Female) vs Gender (Male))	Significance level
CA -> BI	0.163	0.729	Not significant
FC -> BI	0.350	0.861	Not significant
PEoU -> BI	0.152	0.743	Not significant
PSE -> BI	0.068	0.653	Not significant
PSE -> CA	0.029	0.518	Not significant
PSE -> PEoU	0.198	0.924	Not significant
PU -> BI	0.189	0.189	Not significant
SI -> BI	0.244	0.183	Not significant
TAF -> BI	0.249	0.796	Not significant
TAF -> PU	0.156	0.848	Not significant

By studying the *p-value* column and analysing these values using the recommendations proposed by Henseler et al. (2009) , it is clear that the *p-value* is not significant for any of the paths in the model. This indicates that there is no significant categorical moderating effect of gender on the model. This result supports what the participants in the qualitative study believed which is "gender is not important in the context of this study as it does not affect their decision to adopt – or not to adopt – e-assessments".

5.8: Summary of the Hypotheses Testing

As exhibited in Table 42, all of the hypotheses related to the linkage between the latent variables except H2a, H3a, and H5a are accepted in this research. Technology-assessment fit is found to have significant impact on the behavioural intention (H7a). Perceived usefulness significantly influences this endogenous variable as well (H1a). It has also been found that social influence maintains a significant linkage to behavioural intention (H6a).

Conversely, there is no significant categorical moderating effect of the perceived ease-of-use, the computer anxiety, and the facilitation conditions on behavioural intention in this model. Hence, the hypotheses (H2a, H3a, and H5a) are rejected.

Table 42: Summary of the Hypotheses Testing of the Latent Variables

Hypotheses	The hypothesis	Path	Path Coefficients	*t-Values*	*p-Values*	Accepted or Rejected (0.05 Significance Level)
H1a	Perceived usefulness has a positive impact on behavioural intention	PU → BI	0.294	**3.143**	0.002	Accepted
H2a	Perceived ease-of-use has a positive impact on behavioural intention	PEoU → BI	0.184	**1.927**	0.054	Not Accepted
H3a	Computer anxiety has a negative impact on behavioural intention	CA →(-) BI	-0.069	**0.836**	0.403	Not Accepted
H4a	Perceived self-efficacy has a negative impact on computer anxiety.	PSE → (-) CA	-0.330	**4.199**	0.000	Accepted
H4b	Perceived self-efficacy has a positive impact on perceived ease-of-use.	PSE → PEoU	0.659	**8.477**	0.000	Accepted
H5a	Facilitating conditions have a positive impact on behavioural intention	FC → BI	0.240	**1.924**	0.054	Not Accepted
H6a	Social Influence have a positive impact on behavioural intention	SI → BI	0.173	**2.130**	0.033	Accepted
H7a	Technology-assessment fit has a positive impact on behavioural intention	TAF → BI	0.302	**3.442**	0.001	Accepted
H7b	Technology-assessment fit has a positive impact on perceived usefulness	TAF → PU	0.591	**8.559**	0.000	Accepted

On the other hand, Table 43 shows that all of the hypotheses related to the moderating factors except H3b, H4c, H6c and H7c are rejected in this research. Additionally, hypothesis H2c is excluded as this research only focuses on CIS teachers. Furthermore, two new findings related to the moderating effect of "experience" on the relationship TAF → PU and TAF → BI were discovered and added as new findings of this research.

Table 43: Summary of the Hypotheses Testing Related to the Moderating Factors

Hypothesis ID	The hypothesis	Accepted or Rejected (0.05 Significance Level)
H1b:	The influence of perceived usefulness on behavioural intention will be moderated by age, such that the effect will be stronger for younger CIS teachers	Not Accepted
H1c:	The influence of perceived usefulness on behavioural intention will be moderated by experience	Not Accepted
H2b:	The influence of perceived ease-of-use on behavioural intention will be moderated by age, such that the effect will be stronger for older CIS teachers	Not Accepted
H2c	The influence of perceived ease-of-use on behavioural intention will be moderated by specialty, such that the effect will be stronger for CIS teachers as compared with other teachers. (Based on the emerged themes) Note: This is excluded as this research only focuses on CIS teachers.	**Excluded**
H3b	The influence of Computer Anxiety on behavioural intention will NOT be moderated by any moderator	**Accepted**
H4c	The influence of perceived self-efficacy on computer anxiety and perceived ease-of-use will NOT be moderated by any moderator	**Accepted**
H5b	The influence of facilitating conditions on behavioural intention will be moderated by age, such that the effect will be stronger for older CIS teachers	Not Accepted
H5c	The influence of facilitating conditions on behavioural intention will be moderated by experience, such that the effect will be stronger for CIS teachers with less experience	Not Accepted
H6b	The effect of social influence on behavioural intention will be moderated by age, such that the effect will be stronger for older CIS teachers	Not Accepted
H6c	The effect of social influence on behavioural intention will be moderated by experience, such that the effect will be stronger for CIS teachers in the early stages of experiences.	**Accepted**
H7c	The influence of technology-assessment fit on behavioural intention will NOT be moderated by any moderator	**Accepted**
New_1	"Experience" has a significant effect on the path (TAF → PU) such that the effect is stronger for CIS teachers in the early stages of experience.	**Accepted** ***(added as a new finding)***
New_2	"Experience" has a significant effect on the path (TAF → BI) such that the effect is stronger for CIS teachers in the early stages of experience.	**Accepted** ***(added as a new finding)***

5.9: Findings of the Quantitative Study

While the use of e-assessments is counted as an important ICT innovation that can offer many advantages to faculty members, students, and higher education institutions, it has yet to see significant rates of adoption among colleges and universities. For example, according to Warburton (2009), the adoption of e-assessments in the higher education institutions in the UK is not as much as expected. For that reason, there is a need to understand the factors that influence e-assessment adoption in the context of Higher Education. This study built and validated an e-assessment adoption model that explains the significant contextual factors that affect the adoption of e-assessments in the HEIME.

The study established a number of key findings about the determining factors of the CIS teachers' intention to adopt e-assessments in the HEIME. It is found that the CIS teachers' behavioural intention to adopt e-assessments depends primarily on the technology-assessment fit, the perceived usefulness, and the social influence. It was also discovered that the perceived self-efficacy has a negative impact on computer anxiety, and at the same time, it has a positive impact on perceived ease-of-use.

Furthermore, it is found that the perceived ease-of-use and the facilitating conditions have a positive impact on behavioural intention. However, these two relationships are not as significant as the previous relationships. The *p-value* of both of these relationships is 0.054 which is slightly more than 0.05. This is the reason why these two relationships have been rejected on the significance level 0.05. Finally, the results indicated that computer anxiety does not play an important role in the adoption of e-assessments (*p-value* is 0.403). Further explanation of the meaning and implications of these findings is provided in Chapter 6 (Conclusions and Potential Implications).

Chapter 6 Conclusions and Potential Implications

6.1: Introduction

This study has been conducted with the aim of exploring the teaching experiences of CIS teachers in relation to the use of e-assessments, and then developing an e-assessment adoption model that highlights the key elements that were recommended by the interviewed CIS teachers to be considered before the development and the implementation of e-assessments. A conceptual model was built in order to examine the effects of seven latent factors on the behavioural intention of CIS teachers to adopt e-assessments in the HEIME. It was found that e-assessment adoption is significantly influenced by some of the hypothesised factors, whereas the influence of the rest of the factors was believed to be not very significant. These findings provide a space and time for reflection on these factors and an analysis of how these factors influence the adoption of e-assessments in particular and adoption of technology in general.

In this chapter, the main findings with regards to the research main questions are summarised and general conclusions based on these findings are described. Moreover, the theoretical contributions of this study and how it helped enhance the knowledge of the adoption of e-assessments are discussed. Furthermore, the limitations of this study are taken into account and recommendations for further research are presented. The chapter finishes off with recommendations for three types of stakeholders who play an important role in the use of e-assessments in higher education: the management of higher education institutions, higher education teachers, teacher training facilitators, and software developers of e-assessments.

6.2: Addressing the Research Questions

The main findings with regard to the research questions are listed and summarised below:

Question 1 ***"What are the factors that influence the CIS teachers' choice to adopt e-assessments on the HEIME campuses?"***

This question was initially answered in the first part of the study (the qualitative part). In this part, data were collected using semi-structured interviews with the aim to give room for open-ended replies and, therefore, CIS teachers were given the chance to talk about their perceptions of the e-assessments. The researcher analysed what was expressed during the interviews by picking up the essence of the meaning expressed in words, sentences, and non-verbal or para-linguistic cues. This helped the researcher identify possible key factors related to the adoption of e-assessments, and then use the discovered factors to build an e-assessment adoption model.

At the end of the qualitative part of this study, it was hypothesised that the factors that have a *direct* positive influence on the CIS teachers' choice to adopt e-assessments are: (1) perceived usefulness; (2) perceived ease-of-use; (3) technology-assessment fit; (4) social influence; and (5) facilitation conditions. These factors were found to have a positive impact on the CIS teachers' behavioural intention.

Furthermore, it was hypothesised that the factors that have an *indirect* positive influence on the CIS teachers' choice to adopt e-assessments are: (1) technology-assessment fit; and (2) perceived self-efficacy. Technology-assessment fit was found to have a positive impact on the perceived usefulness, and the perceived self-efficacy was hypothesised to have a positive impact on the perceived ease-of-use.

Besides, it was hypothesised that the following are the factors that have a negative influence on the CIS teachers' choice to adopt e-assessments: (1) computer anxiety; and (2) perceived self-efficacy. The first has a negative impact on the behavioural intention of the CIS teachers to adopt e-assessments, and the second negatively impacts computer anxiety.

Question 2 ***"What e-assessment model and what constructs can be suggested after investigating the factors of CIS teachers' e-assessment adoption and evaluation of the models?"***

This question was answered in the second part of this study that is the quantitative part. In the quantitative part, online surveys were used with the aim to evaluate the constructs of the e-assessment adoption model that was formed in the qualitative study. As a result, this study suggests that an e-assessment adoption decision is affected by a number of factors. Some of the hypothesised factors were accepted, while others were rejected (see the result of the hypotheses testing of the latent variables in Table 42 in Chapter 5). This study also added a new factor (Technology-Assessment Fit), which was proven to affect both the behavioural intention, and the perceived usefulness. Part of the answer to this question is related to the conclusions and suggestions that can be drawn on the final unified model. This part is discussed in the next sections.

6.3: Contribution to Knowledge

This research is unique within the field of e-assessment adoption, especially that it explores the e-assessment adoption from the teachers' perspective, which is not that common in the area of technology adoption studies (Imtiaz & Maarop, 2014). This model, grounded in empirical data collected from semi-structured interviews and a wider survey, and then statistically tested, identified the factors and relationships encouraging and hindering the adoption of e-assessments.

The findings of this research highlight the key elements that should be considered before the development and the implementation of e-assessments, as well as to support an on-going e-assessment usage, if there are perceived and/or proven issues with its adoption. In addition, the research findings can inform higher education institutions, teachers, technical support providers, e-assessments software providers, and the research community in general, when it comes to technology adoption. Besides, this model can be extended for future adoptions in different regional and international academic HE institutions, where any need to understand technology adoption is identified.

The study contributes to the technology adoption literature by studying e-assessments as an example of technology adoption. Research in other areas of technology adoption in HE institutions can benefit from this model by taking it as a base and build on it to suit other areas. This could be expanded to construct a universal model of technology adoption in the context of HE.

The developed e-assessment adoption model contributes to the literature by adding new insights in the field of e-assessment adoption and offering suggestions for future research and development. To the extent of the researcher's knowledge, there is a lack of research in the area of e-assessment adoption. The majority of technology adoption studies in the education area have been on e-learning and very few on e-assessment (Imtiaz & Maarop, 2014). The similarities of the technologies, systems (i.e. Blackboard®, Moodle™, and WebCT), and policies used in different higher education institutions around the world, should be sufficient to apply the findings of this study to higher education institutions in other geographical regions and/or countries. Nevertheless, social influence including institutional encouragement, socio-cultural,

political and economic system, the encouragement from the other team members, and institutional compliance can make a difference and should be taken into account when applying findings to other regions. The HEIME colleges were not viewed as unusual or special cases, and the factors that were identified as enablers or barriers would be expected to broadly apply to the majority of higher education institutions in the region and beyond.

As mentioned earlier, this research builds upon the most influential adoption models, and widens it by including new constructs that correspond to exclusive features of e-assessments such as "Technology-Assessment Fit". Previous studies have not emphasised the importance of this factor in the adoption of e-assessments. In the initial qualitative study, technology-assessment fit was identified as one of the central themes that emerged during the interviews. This was further confirmed in the quantitative study when it was found that this factor plays a very important role when CIS teachers decide to use e-assessments. As a result, this study broadens our knowledge of how the fit between the e-assessment tool and the requirements of an assessment affects CIS teachers' intention to adopt – or not to adopt – e-assessments. Moreover, it helps us understand how the "technology-assessment fit" factor affects CIS teachers' perceived usefulness of e-assessments. This factor is found to be different from the factors affecting previously studied e-assessment adoption models.

Moreover, the findings of this study add to a growing body of literature on how the perceived self-efficacy negatively affects the CIS teachers' computer anxiety, which in turn affects their behavioural intention of e-assessments adoption[21].

[21] This effect is not significant on 0.05 confidence level. However. It is not far away from the 0.05 confidence level as the p-value is 0.054 which is very close to 0.05.

Another set of findings is related to the moderating effects of some factors. For example, the effect of social influence on the behavioural intention of the CIS teachers to adopt e-assessments is moderated by experience, such that the effect is stronger for CIS teachers in the early stages of experiences. This confirms the findings of earlier studies (Venkatesh et al., 2003). Additionally, it was found that experience is an important moderating factor that moderates the relationship between technology-assessment fit and perceived usefulness, as well as the relationship between technology-assessment fit and behavioural intention, such that the effect is stronger for CIS teachers in the early stages of experience in both relationships. This was absent in the earlier literature. Therefore, this study has gone some way towards enhancing our understanding of the adoption of e-assessments by including this moderating factor to the model.

On the other hand, the qualitative part of this study revealed that teacher specialisation has an effect as a moderating factor on the adoption of e-assessments. This revelation, however, was not further investigated in the quantitative part of this study due to the fact that the scope was limited to CIS teachers. The researcher strongly recommends expanding this work to a wider variety of specialisations in order to investigate the role of teachers' speciality as a moderating factor.

The researcher also believes that the developed e-assessment adoption model can be integrated with different 21st century theoretical frameworks that identify knowledge areas currently required by teachers for effective incorporation of technology with teaching practices. One framework of particular interest is the Technological Pedagogical Content Knowledge (TPACK) framework. According to Koehler, Mishra, Kereluik, Shin, and Graham (2014), TPACK's main contribution was in the area of

describing the knowledge base needed for teacher education and teacher professional development in terms of technology, pedagogy, and content knowledge. Nevertheless, Alabdulaziz and Higgins (2016) stated that it is "not sufficient to explain the use and non-use of technology", or in other words, it does not define the factors that influence technology adoption. This limitation can be addressed through the integration of the factors of the proposed model influencing the adoption of e-assessments in particular and technology in general in the context of HE. Moreover, Koehler et al. (2014) listed some issues with the reliability and validity of TPACK measurement tools. The factors presented in this model may be used as a reference while reviewing the TPACK measurement tools.

The developed e-assessment adoption model considers most of the important constructs cited in the literature to explain individuals' adoption of ICT in general and e-assessments in particular. However, it is worth mentioning that this study was not designed to only select a particular adoption model and apply it to the context of e-assessments. Alternatively, the researcher started with a qualitative research study in which he identified the CIS teachers' views regarding e-assessment adoption. The data collected during the qualitative part were then used to create research hypotheses for the subsequent qualitative phase.

6.4: Practical Contributions

6.4.1: General Research Implications

This study has provided a number of insights into the use and adoption of e-assessments, especially the factors that were absent in the earlier literature. Details about different types of practical implications are provided below.

6.4.2: Implications for HE Institutions: Policy, Management, and Teachers

This research may help decision makers in higher education institutions weigh up possible e-assessment solutions and increase their understanding of the factors that influence the adoption of this type of technology. The implications of the model on the management of the HE institutions can be summarised based on the type of activities performed by the different management roles.

First, CIS teachers' behavioural intention to adopt e-assessments is influenced by many factors, two of which are related to policy and management: social influence, and to a lesser extent, facilitating conditions. Therefore, the management of the HE institution must give attention to these two factors while designing related policies. The data gathered in the qualitative part of this study show that social influence has three important parts: (1) the encouragement by the other team members and the students; (2) the institutional encouragement; and (3) the institutional compliance. Effective communication using awareness programmes and training sessions can be employed to take care of points (1) and (2). In regards to the third point (the institutional compliance), it is believed that higher education institutions need to support teachers to understand and adhere to the policy related to e-assessments. It is essential for these institutions to motivate effective policy adherence among their teachers. Management needs to identify best methods to support such behaviour, not in an imposed manner and as a burden to teachers, but in collaboration with teachers and in line with their needs and time. Indeed, according to Tyler (2004), there are two approaches for achieving policy adherence and rule following: (1) the command and control model; and (2) the self-regulatory model in which the motive to adhere to company's rules resides in the employees themselves and not in some incentives or sanctions stipulated

by the company. The findings of Tyler's (2004) study suggest that the self-regulatory model has a stronger impact on employees' rule-following and adherence to policies.

By applying that to the context of this study, we can conclude that higher education institutions need to make sure that their teachers are motivated to follow their institution's rules. In other words, they do so out of their own desires and not in response to the regulations. The best way to do that is to make sure that: (1) teachers are aware of the e-assessments policies that they are asked to comply with; (2) they understand them; (3) and they understand the reasons why this is beneficial to them and to their institution. One way forward is to design policies that encourage the adoption of e-assessment by stressing on perceived usability from a teacher's point of view, as this is a very strong factor in e-assessment adoption. Another way is to facilitate resources for training and awareness activities to encourage staff to adhere to these policies. This recommendation is in agreement with the findings of Alabdulaziz and Higgins's (2016) study, in which the authors asserted that the lack of training is one of the major obstacles teachers face when using technology.

Second, this study suggests that technology-assessment fit is the most important one, followed by perceived usefulness and then social influence. This means that the higher education institution should make the "choice of an e-assessment management system that 'fits' the requirements of what teachers want to assess" as a high priority. This implies that teachers and representatives from the management of the HE institution need to work hand-in-hand while choosing an e-assessment management system that 'fits' the teachers' assessment requirements. Additionally, management should plan to acquire and facilitate the right technical support for this system in terms of people and technology to ensure that the assessment system fulfils its purpose.

Third, suitable activities and proper resources should then be allocated to enhance the teachers' perceived usefulness of the e-assessment management system adopted. Awareness programmes and training sessions should be facilitated to effectively communicate the importance of e-assessments, and the benefits that can be achieved through using it. Teachers would need to be encouraged and supported to participate in in-house as well as external awareness activities such as workshops, conferences, and journal publications to share best practices in e-assessments in particular and the use of technology in general. This is expected to help the management of the HE institution ensure that teachers understand the worthwhileness of using e-assessments.

In addition, HE institutions must pay great attention to their choice of e-assessment software providers. They also have to ensure that the e-assessment management system chosen has the features and functionalities that meet the teachers' technical needs regarding the type of assessments they need to use based on content and pedagogy.

Fourth, in contrast to the findings of the qualitative part of this study, and against the findings of some of the earlier studies, the quantitative part of this research does not find the perceived ease-of-use and the facilitating conditions to have a significant relationship with the CIS teachers' behavioural intention to adopt e-assessments. As such, higher education institutions should first focus on the listed three factors (TAF, PU, and SI) before considering the perceived ease-of-use and the facilitating conditions provided while designing policies and assigning resources.

Fifth, this research also shows that teachers' experience significantly moderates the relationship between technology-assessment fit and the behavioural intention, such that the effect is stronger for CIS teachers in the early stages of experience. As a result, HE institutions should focus more on the teachers who are still in the early stages of

experience and adoption. This means that it is more important for the management of the institution to understand the requirements of these teachers, focus on their training needs, and keep them satisfied.

From another point of view, the involvement of the HE institution management in using this study's model to evaluate the adoption of e-assessments, can afterwards assist the management of the HE institution to use it for other types of technology. This is expected to improve their ability to take specific decisions concerning adoption of other types of technology in the future. Other than that, this model symbolises information in a layout that is easy to understand, and it is grounded on reliable empirical support. Hence, this model can help the management of a HE institution make informed decisions when it comes to evaluating possible IT solutions.

6.4.3: Implications for Teachers

The technology-assessment fit, the perceived usefulness, and the social influence play a central role in the adoption of e-assessments for teachers. In addition, as mentioned earlier, experience is considered as a strong moderating factor affecting the relation between the technology-assessment fit and behavioural intention, as well as that between the technology-assessment fit and the perceived usefulness.

As already mentioned above, the findings of this research may inform the creation of continuing professional development programmes, workshops or training to help teachers realise the importance of fully understanding the set of tools and features provided by the chosen e-assessment software and how they are used. This can help teachers ensure that the technology they are using 'fits' the requirements of their assessments. This also works in a reverse order, where teachers are encouraged to

consider technology limitations while writing e-assessments. This means to encourage teachers to start thinking in a different manner when designing a computer-based assessment question as compared to a paper-based one. For example, when designing an e-assessment that includes a set of questions related to a particular case study, the teacher will benefit from understanding the implications of the 'randomisation' feature when using a specific e-assessment tool. Not understanding these implications could result in a wrongly formatted assessment. Furthermore, while creating e-assessments, teachers can be more aware of what they do towards writing a well-designed, easy-to-understand and easy-to-use content (or questions). This will enhance the suitability of the technology used (the e-assessments software) with what is assessed in the assessment, especially that the content of the assessment is a very crucial construct in the adoption of e-assessments.

Additionally, since perceived usefulness has high influence on behavioural intention, it is predicted that when teachers are fully aware of the set of tools and features provided by the chosen e-assessment software, they will be more inclined to use the tool. This implies that facilitating and participating in teacher-focused activities to share information with regard to e-assessment usefulness will positively impact teachers' e-assessment adoption. For example, they can attend awareness sessions, join peer-to-peer training, enrol themselves in focus groups, participate in in-house and external educational technology conferences, and follow their HE e-assessment-related training plans. These activities have a direct influence on perceived usefulness. However, that influence is moderated by the experience of the teachers.

6.4.4: Implications for Software Vendors

This study also has important practical implications for software vendors and technology consultants. Assessments represent a critical part of the learning process. Consequently, developing e-assessment management systems to automate how teachers assess their students represent an important market segment for software vendors or information system providers.

Ramdani, Kawalek, and Lorenzo (2009) assert that building an adoption model that can explain the adoption process is very important for software vendors and IT solutions providers. Having an adoption model can assist software vendors in developing good marketing plans that can help them target possible adopters. Based on that, it is quite obvious that software vendors should be more focused on identifying and understanding factors affecting teachers' adoption of e-assessments. This will enable them to develop good marketing plans for the extensive adoption of their e-assessment software products. Furthermore, it might be advantageous for the e-assessment software vendors to expand their communication channels with HE institutions and teachers who are using e-assessments. This can help them create a healthy environment for e-assessment adoption, and ensure that teachers' requirements and preferences are reflected in the e-assessments software solutions they provide.

In addition, teachers' self-motivation to use certain e-assessments software is not the only factor affecting the HE institution's choice of the e-assessment management system. Thus, software providers must put more effort in marketing the advantages and benefits of using their own e-assessments IT solutions. This helps them ensure that both the HE institutions and the teachers are aware of the available features, and at the same time, understand if there is a need to add new ones.

In conclusion, for e-assessments solutions providers and software vendors, using the adoption model in this research can expand their comprehension of why teachers choose to adopt or not to adopt e-assessments IT solutions. Thus, they need to enhance the technology-assessment fit, which means providing more features. However, if that affects the development costs, then they can segregate the market and offer customised services based on the teachers' needs.

6.5: Reflections and Limitations of the Thesis Research

This study constitutes an important contribution to the existing literature by investigating e-assessment adoption in higher education, following an exploratory sequential design strategy. The investigation was performed via proposing, designing, testing and developing an adoption model for e-assessment, by synthesising constructs from the most relevant technology adoption models. This was realised through the development of a broad and comprehensive list of behavioural constructs based on those models. The novelty of this study lies in the fact that not much research has been conducted on e-assessment adoption from the teachers' perspective. However, as in any other research study bound by scope and time, limitations occur. These limitations can be seen as opportunities for future work and empirical research. The following discussion reflects on the limitations.

6.5.1: Limitation of the Scope of the Study

This research was based entirely within the HEIME colleges in the UAE, which limits the scope to a localised national scale. This was the original intention of the researcher within the defined scope. However, the teachers participating in both the qualitative and quantitative phases of this study represent an international sample as their backgrounds

are from different parts of the world with attitudes reflecting different cultures. Since the adoption model was built on their perception, it can be argued that this model reflects a microcosm representation of the attitudes of teachers towards the adoption of e-assessment. Therefore, it can be related to how teachers relate to technology adoption at an international scale, especially in similar contexts, or at an early adoption stage.

Another scope limitation arises from the fact that data were collected from CIS teachers only. This is related to teachers' *specialty* or *content area*. Although this was not one of the moderating factors that other models have listed, it emerged in the qualitative part of this study as a moderator, and discussed by nine different participants. However, because of this limitation, it was not possible to test the effect this moderator may have on the adoption model. That is to say, the findings of this study can be used as the foundation of more research by examining e-assessment adoption of teachers from different disciplines and specialities. This would make more data available for comparison. Including participants from different disciplines might allow for better understanding and presentation of different views and help in taking more reliable decisions with regard to the adoption of e-assessments.

6.5.2: The Use of Phenomenological Semi-structured Interviews

As mentioned in Section 3.5.1, the qualitative part of this study used Mixed Methods Phenomenological Research (MMPR), in which the researcher combined phenomenological methods with quantitative methods within the same study. These phenomenological methods are based on phenomenological semi-structured interviews. A possible limitation is therefore that of the researcher bias recognised by Gearing (2004), who recommended that researchers should apply proper strategies to mitigate the potential negative effects of the researcher's presumptions and bias. To deal with

this possible limitation, the researcher implemented the concept of bracketing to avoid improper subjective judgment and to strengthen the reliability of the results.

Another possible limitation related to the use of mixed methods is the likelihood that the researcher does not develop a holistic sense of the phenomenon. To address this potential limitation, the researcher followed the recommendations of Hycner (1985) and Creswell (2012, p. 273) by listening to the interview recordings repeatedly. This helped him develop a holistic sense of the phenomenon that is currently studied.

6.5.3: Small Sample Size and Scaling Up

In order to meet the sample size needed for the research design and analysis of the quantitative part of this study, the researcher tried to maximise the number of participants as much as possible. He contacted all the 142 CIS teachers in the HEIME colleges. However, due to the limited time and resources, the researcher ended up having 112 valid responses. This sample size is more than the minimum number of participants required to test this model using SmartPLS where it is recommended to follow the "rule of 10" principle (Chin, 1998). This principle means that the sample size is determined by (a) 10 times the largest number of formative indicators used to measure a latent variable, or (b) 10 times the largest number of structural path directed at a particular latent variable in the structural model. By applying "the rule of 10" principle on this study's model, it is clear that having 112 responses is more than the minimum requirement.

However, in line with Chin (1998), having this small sample size has its own limitations: (1) this could affect the reliability of the PLS estimates, especially that the more the number of participants, the more reliable are the PLS calculations and

estimates; (2) the small number of participants constrained the ability to make use of highly developed statistical software like AMOS[22], and examine the causal relationships between the latent variables in the model; (3) statistical tests generally necessitate a big number of participants to guarantee that the population of the study are represented well. Thus, future studies would have an advantage through conducting this study on a wider population, and recruiting a larger number of participants.

6.5.4: Self-Reported Data

While conducting this study, the researcher used interviews and questionnaires, in which he took what the participants said and answered at face value. However, these interviews and questionnaires are both dependent on self-reported data. The main limitation of this kind of self-report measures is the possibility of being affected by some kind of bias. For instance, participants many choose not to respond honestly; this could be for representing themselves in a good manner. In addition, participants may exaggerate. They may also feel uncomfortable to reveal some details they do not like others to know about.

6.5.5: Authorships of Papers Based on This Research

Having a full-time job in a very time-consuming and demanding role and working on a PhD programme at the same time has been the most difficult experience in my life. The amount of energy, commitment, money and time required is beyond what I speculated before starting the PhD. study. This has constrained the flexibility in managing my time

[22] AMOS stands for analysis of a moment structures. It is specially used for SEM modeling. It is normally used to draw models after performing computations using the covariance and causal relationships. It is an add-on SPSS module.

and financial resources. That is why it was very difficult for me to dedicate time and financial resources to publishing papers based on this research. However, authorship of papers will be the first priority once I complete this research.

6.6: Suggestions for Further Research

More research is considered necessary to explore the factors and relationships affecting the e-assessment adoption in different HE institutions, regions and countries. A number of promising future research studies may possibly be related to identifying the exact features that must be added to an e-assessment software to fit different sets of assessment requirements. Another possible future study could relate to making a list of guidelines for assessing e-assessments software solutions and weighing the features offered by different software providers. This can help higher education institutions decide on which e-assessments software provider to choose, and which software to adopt. This list of guidelines must contain sections related to all types of assessment requirements, comprising types of questions, type of responses, security of the assessment, possible technical issues, and training requirements.

Finally, this research has touched upon e-assessment adoption within the context of the HEIME colleges in the UAE. However, the model in this study can be utilised by other scholars who would like to understand the adoption of other types of technology in other contexts. Therefore, it may be used as the bases for further investigations on other types of technology adoption.

VIII. References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211. doi: http://dx.doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2002). Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior1. *Journal of Applied Social Psychology, 32*(4), 665-683. doi:10.1111/j.1559-1816.2002.tb00236.x

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior* (Paperback ed. ed.): Englewood Cliffs, NJ : Prentice-Hall.

Al-Amri, S. (2007). Computer-based vs. Paper-based Testing: Does the test administration mode matter?

Alabdulaziz, M., & Higgins, S. (2016). Obstacles to technology use when addressing Saudi primary students' mathematics difficulties. *International journal of engineering research and technology., 5*(10), 412-417.

Alderson, J. C. (2000). Technology in testing: The present and the future. *System, 28*(4), 593-603.

Amelung, M., Krieger, K., & Rosner, D. (2011). E-assessment as a service. *Learning Technologies, IEEE Transactions on, 4*(2), 162-174.

Andrews, D., Nonnecke, B., & Preece, J. (2003). Electronic Survey Methodology: A Case Study in Reaching Hard-to-Involve Internet Users. *International Journal of Human-Computer Interaction, 16*(2), 185-210. doi:10.1207/S15327590IJHC1602_04

Arney, J., Jones, I., & Wolf, A. (2012). Going green: paperless technology and feedback from the classroom. *Journal of Sustainability and Green Business, 1*, 1.

Bagozzi, R. P. (2007). The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. *Journal of the Association for Information Systems, 8*(4), 243-254.

Bagozzi, R. P., Davis, F. D., & Warshaw, P. R. (1992). Development and Test of a Theory of Technological Learning and Usage. *Human Relations, 45*(7), 659.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the academy of marketing science, 16*(1), 74-94.

Baleni, Z. G. (2012). Why and how Academic Staff Adopt e-Assessment in a Higher Education Institution (HEI). *Proceedings of the 11th European Confernece on e-Learning*, 28.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review, 84*(2), 191.

Betz, N. E., & Hackett, G. (1981). The relationship of career-related self-efficacy expectations to perceived career options in college women and men. *Journal of Counseling Psychology, 28*(5), 399-410. doi:10.1037/0022-0167.28.5.399

Bourque, L., & Fielder, E. P. (2003). *How to conduct self-administered and mail surveys* (Vol. 3): Sage.

Bryman, A. (2006). Integrating quantitative and qualitative research: how is it done? *Qualitative Research, 6*(1), 97-113. doi:10.1177/1468794106058877

Bull, J., & McKenna, C. (2004). *Blueprint for Computer-assisted Assessment*. London: Routledge.

Cassady, J. C., & Gridley, B. E. (2005). The Effects of Online Formative and Summative Assessment on Test Anxiety and Performance. *Journal of Technology, Learning, and Assessment, 4*(1), n1.

Celik, V., & Yesilyurt, E. (2013). Attitudes to technology, perceived computer self-efficacy and computer anxiety as predictors of computer supported education. *Computers & Education, 60*(1), 148-158. doi:http://dx.doi.org/10.1016/j.compedu.2012.06.008

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern methods for business research, 295*(2), 295-336.

Clariana, R., & Wallace, P. (2002). Paper–based versus computer–based assessment: key factors associated with the test mode effect. *British Journal of Educational Technology, 33*(5), 593-602.

Compeau, D., & Higgins, C. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly, 19*(2), 189.

Compeau, D., Higgins, C. A., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS Quarterly*, 145-158.

Conner, M., & Armitage, C. J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology, 28*(15), 1429-1464.

Conole, G., & Warburton, B. (2005). A review of computer-assisted assessment. *Research in learning technology, 13*(1).

Cook, J., & Jenkins, V. (2010). Getting started with e-assessment.

Couper, M. (2000). Web surveys: a review of issues and approaches. *Public opinion quarterly, 64*(4), 464-494.

Cresswell, J. W. (1998). Qualitative inquiry and research design: Choosing among five traditions: Sage Publications.

Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (4th ed., International ed.). Boston, MA, London: Pearson.

Csapó, B., Ainley, J., Bennett, R., Latour, T., & Law, N. (2012). Technological Issues for Computer-Based Assessment. In P. Griffin, B. McGaw, & E. Care (Eds.), *Assessment and Teaching of 21st Century Skills* (pp. 143-230): Springer Netherlands.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319-340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science, 35*(8), 982-1003. doi:10.2307/2632151

De Bonis, S., & De Bonis, N. (2011). Going Green: Managing a Paperless Classroom. *Online Submission*.

Denscombe, M. (2007). *The good research guide: for small-scale social research projects* (3rd ed.). Maidenhead: Open University Press.

Deutsch, T., Herrmann, K., Frese, T., & Sandholzer, H. (2012). Implementing computer-based assessment – A web-based mock examination changes attitudes. *Computers & Education, 58*(4), 1068-1075. doi:http://dx.doi.org/10.1016/j.compedu.2011.11.013

Dillon, A., & Morris, M. G. (1996). User acceptance of new information technology: theories and models. *Annual review of information science and technology*.

Doolin, B. (1996). Alternative views of case research in information systems. *Australasian Journal of Information Systems, 3*(2).

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior : an introduction to theory and research*: Reading, Mass. : Addison-Wesley Pub. Co.

Fornell, C., & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing research*, 440-452.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing research*, 39-50.

Garson, G. D. (2016). *Partial least squares: Regression and structural equation models*: Statistical Associates Publishers.

Gearing, R. E. (2004). Bracketing in Research: A Typology. *Qualitative Health Research, 14*(10), 1429-1452. doi:10.1177/1049732304270394

Geisser, S. (1974). A Predictive Approach to the Random Effect Model. *Biometrika, 61*(1), 101-107. doi:10.2307/2334290

Goodhue, D. L. (1995). Understanding User Evaluations of Information Systems. *Management Science, 41*(12), 1827-1844.

Goodhue, D. L., & Thompson, R. L. (1995). Task-Technology Fit and Individual Performance. *MIS Quarterly, 19*(2), 213-236. doi:10.2307/249689

Grandon, E. E., & Mykytyn Jr, P. P. (2004). Theory-based instrumentation to measure the intention to use electronic commerce in small and medium sized businesses. *Journal of Computer Information Systems, 44*(3), 44-57.

Granello, D. H., & Wheaton, J. E. (2003). Using Web-Based Surveys to Conduct Counseling Research.

Groenewald, T. (2004). A phenomenological research design illustrated. *International Journal of Qualitative Methods, 3, Article 4*.

Haenlein, M., & Kaplan, A. M. (2004). A beginner's guide to partial least squares analysis. *Understanding statistics, 3*(4), 283-297.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing theory and Practice, 19*(2), 139-152. doi:10.2753/MTP1069-6679190202

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2012). Editorial-Partial Least Squares: The Better Approach to Structural Equation Modeling? *Long Range Planning, 45*(5-6), 312-319.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: rigorous applications, better results and higher acceptance| NOVA. The University of Newcastle's Digital Repository.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*: Sage Publications.

Hair Jr, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the academy of marketing science, 40*(3), 414-433.

Hak, T., Van der Veer, K., & Jansen, H. (2004). The Three-Step Test-Interview (TSTI): An observational instrument for pretesting self-completion questionnaires.

Hall, D. T., & Mansfield, R. (1975). Relationships of age and seniority with career variables of engineers and scientists. *Journal of Applied Psychology, 60*(2), 201-210. doi:10.1037/h0076549

Hargreaves, A. (2005). Educational change takes ages: Life, career and generational factors in teachers' emotional responses to educational change. *Teaching and Teacher Education, 21*(8), 967-983. doi:http://dx.doi.org/10.1016/j.tate.2005.06.007

Henseler, J., Ringle, C. M., & Sarstedt, M. (2012). Using partial least squares path modeling in advertising research: basic concepts and recent issues. *Handbook of research on international advertising*, 252.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing *New challenges to international marketing* (pp. 277-319): Emerald Group Publishing Limited.

Higgins, S., & Moseley, D. (2001). Teachers' thinking about information and communications technology and learning: Beliefs and outcomes. *Teacher development, 5*(2), 191-210.

Hox, J., & Bechger, T. (1998). An introduction to structural equation modelling. *Family Science Review, 11*(354-373).

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic management journal, 20*(2), 195-204.

Husserl, E. (1931). *Ideas: general introduction to pure phenomenology*. London : New York: London : Allen & Unwin

Hycner, R. H. (1985). Some guidelines for the phenomenological analysis of interview data. *Human Studies, 8*(3), 279-303. doi:10.1007/BF00142995

Ilieva, J., Baron, S., & Healey, N. (2002). Online surveys in marketing research: Pros and cons. *International Journal of Market Research, 44*(3), 361-376.

Imtiaz, M. A., & Maarop, N. (2014). A Review of Technology Acceptance Studies in the Field of Education. *Jurnal Teknologi, 69*(2). doi:10.11113/jt.v69.3101

Iskander, G. (2013). *A sequential exploratory design for the e-learning maturity model in Middle Eastern countries.* Middlesex University.

JISC. (2007). Effective Practice with e-Assessment: An overview of technologies, policies and practice in further and higher education: Joint Information Systems Committee London.

Johnson, P., & Clark, M. (2006). Mapping the Terrain: An Overview of Business and Management Research Methodologies *Business and management research methodologies*: London : SAGE.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). 'Mixed Methods Research: A Research Paradigm Whose Time Has Come'. *Educational researcher, 33*(7), 14-26.

Jöreskog, K. G. (1978). Structural analysis of covariance and correlation matrices. *Psychometrika, 43*(4), 443-477.

Jöreskog, K. G. (1982). The LISREL approach to causal model-building in the social sciences. *Systems under indirect observation, Part I*, 81-100.

Karahanna, E., & Straub, D. W. (1999). The psychological origins of perceived usefulness and ease-of-use. *Information & Management, 35*(4), 237-250. doi:10.1016/S0378-7206(98)00096-2

Kitchenham, B., & Pfleeger, S. L. (2002). Principles of survey research: part 5: populations and samples. *SIGSOFT Softw. Eng. Notes, 27*(5), 17-20. doi:10.1145/571681.571686

Koehler, M. J., Mishra, P., Kereluik, K., Shin, T. S., & Graham, C. R. (2014). The technological pedagogical content knowledge framework *Handbook of research on educational communications and technology* (pp. 101-111): Springer.

Konana, P., & Balasubramanian, S. (2005). The social–economic–psychological model of technology adoption and usage: an application to online investing. *Decision Support Systems, 39*(3), 505-524.

Korpelainen, E. (2011). Theories of ICT System Implementation and Adoption–A Critical.

Larsson, J., & Holmström, I. (2007). Phenomenographic or phenomenological analysis: does it matter? Examples from a study on anaesthesiologists' work. *International Journal of Qualitative Studies on Health & Well-Being, 2*(1), 55-64. doi:10.1080/17482620601068105

Lightstone, K., & Smith, S. M. (2009). Student Choice between Computer and Traditional Paper-and-Pencil University Tests: What Predicts Preference and Performance? *Revue internationale des technologies en pédagogie universitaire/International Journal of Technologies in Higher Education, 6*(1), 30-45.

Littlejohn, A. H. (2002). Improving continuing professional development in the use of ICT. *Journal of computer assisted learning, 18*(2), 166-174.

Marais, E., Argles, D., & von Solms, B. (2006). Security issues specific to e-assessments. *The International Journal for Infonomics*.

Marton, F., & Booth, S. (1997). *Learning and Awareness*. New yourk: Routledge.

Maurer, M. M. (1994). Computer anxiety correlates and what they tell us: A literature review. *Computers in Human Behavior, 10*(3), 369-376. doi:10.1016/0747-5632(94)90062-0

Maxcy, S. J. (2003). Pragmatic threads in mixed methods research in the social sciences: The search for multiple modes of inquiry and the end of the philosophy of formalism. *Handbook of mixed methods in social and behavioral research*, 51-89.

Mayoh, J., & Onwuegbuzie, A. J. (2015). Toward a conceptualization of mixed methods phenomenological research. *Journal of mixed methods research, 9*(1), 91-107.

McCann, A. L. (2009). Factors affecting the adoption of an e-assessment system. *Assessment & Evaluation in Higher Education, 35*(7), 799-818. doi:10.1080/02602930902981139

Mkansi, M., & Acheampong, E. A. (2012). Research philosophy debates and classifications: students' dilemma. *Electronic Journal of Business Research Methods, 10*(2), 132-140.

Mogey, N., Sarab, G., Haywood, J., Van Heyningen, S., Dewhurst, D., Hounsell, D., & Neilson, R. (2008). The end of handwriting? Using computers in traditional essay examinations. *Journal of computer assisted learning, 24*(1), 39-46.

Monecke, A., & Leisch, F. (2012). semPLS: structural equation modeling using partial least squares.

Mooi, E., & Sarstedt, M. (2011). A Concise Guide to Market Research The Process, Data, and Methods Using IBM SPSS Statistics: Berlin: Springer Google Scholar.

Moore, G. C., & Benbasat, I. (1991). Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. *Information Systems Research, 2*(3), 192-222.

Morgan, D. L. (2007). Paradigms lost and pragmatism regained methodological implications of combining qualitative and quantitative methods. *Journal of mixed methods research, 1*(1), 48-76.

Morris, M. G., & Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing work force. *Personnel psychology, 53*(2), 375-403.

Morrow, J. A., Pulido, M. T., Smith, P. B., McDaniel, T. F., & Willcox, A. B. (2014). Effective use of e-grading in the dental simulation clinic. *Journal of dental education, 78*(6), 829-837.

Moseley, D., Higgins, S., Bramald, R., Hardman, F., Miller, J., Mroz, M., . . . Williamson, J. (1999). Ways forward with ICT: Effective Pedagogy Using Information and Communications Technology for Literacy and Numeracy in Primary Schools.

Moule, P. (2006). E-learning for healthcare students: developing the communities of practice framework. *Journal of Advanced Nursing, 54*(3), 370-380. doi:10.1111/j.1365-2648.2006.03813.x

Moustaka, C. (1994). *Phenomenological research methods. Phenomenological research methods. SAGE Publications, Inc*. Thousand Oaks, CA: SAGE Publications, Inc.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: a review of the literature. *Journal of information technology for teacher education, 9*(3), 319-342.

Myers, M. D., & Avison, D. (2002). *Qualitative research in information systems: a reader*: Sage.

Ong, C.-S., & Lai, J.-Y. (2006). Gender differences in perceptions and relationships among dominants of e-learning acceptance. *Computers in Human Behavior, 22*(5), 816-829.

Ong, C.-S., Lai, J.-Y., & Wang, Y.-S. (2004). Factors affecting engineers' acceptance of asynchronous e-learning systems in high-tech companies. *Information & Management, 41*(6), 795-804.

Patton, M. (2002). *Qualitative Research & Evaluation Methods* (3rd ed.). Thousand Oaks, CA: Sage Publications:.

Peat, M., & Franklin, S. (2002). Supporting student learning: the use of computer–based formative assessment modules. *British Journal of Educational Technology, 33*(5), 515-523.

Porter, L. W. (1962). Job attitudes in management: I. Perceived deficiencies in need fulfillment as a function of job level. *Journal of Applied Psychology, 46*(6), 375-384. doi:10.1037/h0047808

Prosser, M., Trigwell, K., & Taylor, P. (1994). A phenomenographic study of academics' conceptions of science learning and teaching. *Learning and Instruction, 4*(3), 217-231. doi:http://dx.doi.org/10.1016/0959-4752(94)90024-8

Qualtrics. (2016). Qualtrics Research Suite. Retrieved from https://www.qualtrics.com/research-suite/

Ramdani, B., Kawalek, P., & Lorenzo, O. (2009). Predicting SMEs' adoption of enterprise systems. *Journal of Enterprise Information Management, 22*(1/2), 10-24. doi:10.1108/17410390910922796

Ricketts, C., & Wilks, S. (2001). Is computer-based assessment good for students?

Ridgway, J., McCusker, S., & Pead, D. (2004). *Literature review of e-assessment*: Futurelab.

Ringle, C. M., Wedne, S., & Becker, J.-M. (2015). SmartPLS 3: SmartPLS GmbH. Retrieved from http://www.smartpls.com

Robbins, B. D., & Vandree, K. (2009). The self-regulation of humor expression: A mixed method, phenomenological investigation of suppressed laughter. *The Humanistic Psychologist, 37*(1), 49-78.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed. ed.): New York : Free Press.

Ruddin, L. P. (2006). You Can Generalize Stupid! Social Scientists, Bent Flyvbjerg, and Case Study Methodology. *Qualitative Inquiry, 12*(4), 797-812. doi:10.1177/1077800406288622

Sarstedt, M., Henseler, J., & Ringle, C. M. (2011). Multigroup analysis in partial least squares (PLS) path modeling: Alternative methods and empirical results *Measurement and research methods in international marketing* (pp. 195-218): Emerald Group Publishing Limited.

Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., & Hair, J. F. (2014). Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. *Journal of Family Business Strategy, 5*(1), 105-115.

Saunders, M. (2012). *Research methods for business students [electronic resource]* (6th ed. ed.): Harlow : Pearson Education.

Saunders, M., Lewis, P., & Thornhill, A. (2009). Understanding research philosophies and approaches. *Research methods for business students, 4*, 106-135.

Scheuermann, F., & Pereira, A. G. (2008). Towards a research agenda on Computer-based Assessment. *Challenges and needs for European Educational Measurement. Luxembourg*.

Shah, R., & Goldstein, S. M. (2006). Use of structural equation modeling in operations management research: Looking back and forward. *Journal of Operations Management, 24*(2), 148-169.

Spotts, T. H. (1999). Discriminating factors in faculty use of instructional technology in higher education. *Educational Technology & Society, 2*(4), 92-99.

Stödberg, U. (2012). A research review of e-assessment. *Assessment & Evaluation in Higher Education, 37*(5), 591-604.

Stumpf, S. A., Brief, A. P., & Hartman, K. (1987). Self-efficacy expectations and coping with career-related events. *Journal of Vocational Behavior, 31*(1), 91-108. doi:http://dx.doi.org/10.1016/0001-8791(87)90037-6

Suri, H. (2011). Purposeful sampling in qualitative research synthesis. *Qualitative Research Journal, 11*(2), 63-75.

Tashakkori, A., & Teddlie, C. (2003). *Handbook of mixed methods in social & behavioral research*. Thousand Oaks, Calif: SAGE Publications.

Taylor, S., & Todd, P. (1995). Assessing IT Usage: The Role of Prior Experience. *MIS Quarterly, 19*(4), 561-570. doi:10.2307/249633

Taylor, S., & Todd, P. A. (1995). Understanding Information Technology Usage: A Test of Competing Models. *Information Systems Research, 6*(2), 144-176.

Terzis, V., & Economides, A. A. (2011). The acceptance and use of computer based assessment. *Computers & Education, 56*(4), 1032-1044.

Terzis, V., Moridis, C. N., & Economides, A. A. (2012). How student's personality traits affect Computer Based Assessment Acceptance: Integrating BFI with CBAAM. *Computers in Human Behavior, 28*(5), 1985-1996. doi:10.1016/j.chb.2012.05.019

Tesch, R. (1944). Emerging themes: The researcher's experience. *Phenomenology+ Pedagogy, 5*(3), 230-241.

Tharenou, P., Donohue, R., & Cooper, B. (2007). *Management research methods*: Cambridge : Cambridge University Press.

The International Test, C. (2006). International Guidelines on Computer-Based and Internet-Delivered Testing. *International Journal of Testing, 6*(2), 143-171. doi:10.1207/s15327574ijt0602_4

Thelwall, M. (2000). Computer-based assessment: a versatile educational tool. *Computers & Education, 34*(1), 37-49. doi:http://dx.doi.org/10.1016/S0360-1315(99)00037-8

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal Computing: Toward a Conceptual Model of Utilization. *MIS Quarterly, 15*(1), 125-143. doi:10.2307/249443

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1994). Influence of experience on personal computer utilization: testing a conceptual model. *Journal of management information systems, 11*(1), 167-187.

Tufford, L., & Newman, P. (2012). Bracketing in Qualitative Research. *Qualitative Social Work, 11*(1), 80-96. doi:10.1177/1473325010368316

Tyler, T. R. (2004). Promoting Employee Policy Adherence and Rule following in Work Settings-The Value of Self-Regulatory Approaches. *Brook. L. Rev., 70*, 1287.

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research, 11*(4), 342-365.

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. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, 115-139.

Venkatesh, V., Morris, M. G., & Ackerman, P. L. (2000). A longitudinal field investigation of gender differences in individual technology adoption decision-making processes. *Organizational Behavior and Human Decision Processes, 83*(1), 33-60.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view1. *MIS Quarterly, 27*(3), 425-478.

Vinzi, V. E., Trinchera, L., & Amato, S. (2010). PLS path modeling: from foundations to recent developments and open issues for model assessment and improvement *Handbook of partial least squares* (pp. 47-82): Springer.

Warburton, B. (2009). Quick win or slow burn: modelling UK HE CAA uptake. *Assessment & Evaluation in Higher Education, 34*(3), 257-272. doi:10.1080/02602930802071080

Williams, M. D., Dwivedi, Y. K., Lal, B., & Schwarz, A. (2009). Contemporary trends and issues in IT adoption and diffusion research. *Journal of Information Technology, 24*(1), 1-10. doi:http://dx.doi.org/10.1057/jit.2008.30

Wold, H. (1980). Model construction and evaluation when theoretical knowledge is scarce *Evaluation of econometric models* (pp. 47-74): Academic Press.

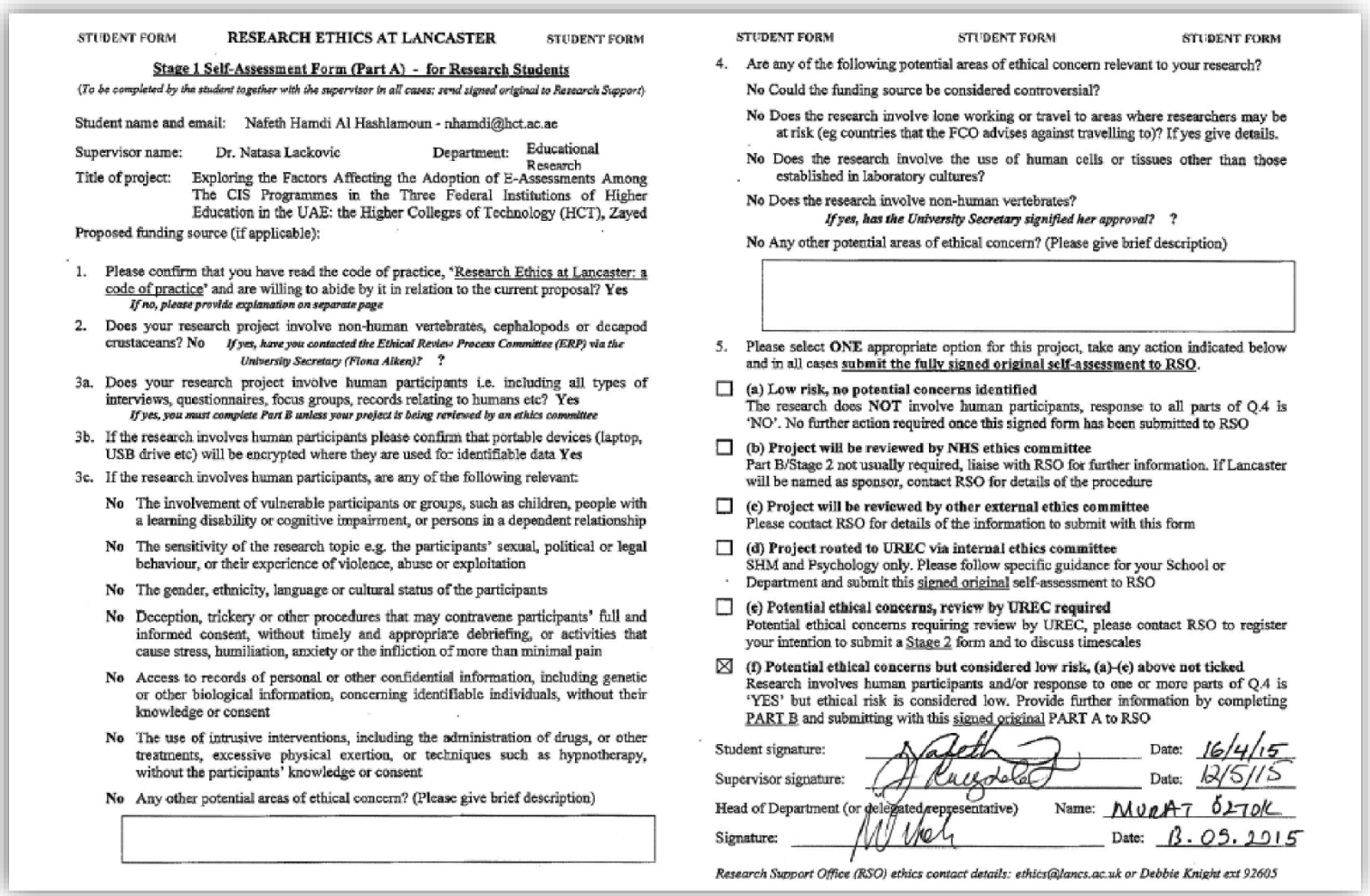
Wold, H. (1985). Partial least squares. *Encyclopedia of statistical sciences*.

Wong, K. K.-K. (2013). Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing Bulletin, 24*(1), 1-32.

Zoom Video Communications, I. (2016). *About Zoom Video Communications*. http://www.zoom.us/about

IX. Appendices

Appendix (A) Research Students Stage 1 Form



STUDENT FORM **RESEARCH ETHICS AT LANCASTER** STUDENT FORM

Stage 1 Self-Assessment Form (Part A) - for Research Students

(To be completed by the student together with the supervisor in all cases; send signed original to Research Support)

Student name and email: Nafeth Hamdi Al Hashlamoun - nhamdi@hct.ac.ae

Supervisor name: Dr. Natasa Lackovic Department: Educational Research

Title of project: Exploring the Factors Affecting the Adoption of E-Assessments Among The CIS Programmes in the Three Federal Institutions of Higher Education in the UAE: the Higher Colleges of Technology (HCT), Zayed

Proposed funding source (if applicable):

1. Please confirm that you have read the code of practice, 'Research Ethics at Lancaster: a code of practice' and are willing to abide by it in relation to the current proposal? **Yes**
   If no, please provide explanation on separate page
2. Does your research project involve non-human vertebrates, cephalopods or decapod crustaceans? **No** *If yes, have you contacted the Ethical Review Process Committee (ERP) via the University Secretary (Fiona Aiken)?* ?

3a. Does your research project involve human participants i.e. including all types of interviews, questionnaires, focus groups, records relating to humans etc? **Yes**
If yes, you must complete Part B unless your project is being reviewed by an ethics committee

3b. If the research involves human participants please confirm that portable devices (laptop, USB drive etc) will be encrypted where they are used for identifiable data **Yes**

3c. If the research involves human participants, are any of the following relevant:

- **No** The involvement of vulnerable participants or groups, such as children, people with a learning disability or cognitive impairment, or persons in a dependent relationship
- **No** The sensitivity of the research topic e.g. the participants' sexual, political or legal behaviour, or their experience of violence, abuse or exploitation
- **No** The gender, ethnicity, language or cultural status of the participants
- **No** Deception, trickery or other procedures that may contravene participants' full and informed consent, without timely and appropriate debriefing, or activities that cause stress, humiliation, anxiety or the infliction of more than minimal pain
- **No** Access to records of personal or other confidential information, including genetic or other biological information, concerning identifiable individuals, without their knowledge or consent
- **No** The use of intrusive interventions, including the administration of drugs, or other treatments, excessive physical exertion, or techniques such as hypnotherapy, without the participants' knowledge or consent
- **No** Any other potential areas of ethical concern? (Please give brief description)

STUDENT FORM STUDENT FORM STUDENT FORM

4. Are any of the following potential areas of ethical concern relevant to your research?
   - **No** Could the funding source be considered controversial?
   - **No** Does the research involve lone working or travel to areas where researchers may be at risk (eg countries that the FCO advises against travelling to)? If yes give details.
   - **No** Does the research involve the use of human cells or tissues other than those established in laboratory cultures?
   - **No** Does the research involve non-human vertebrates?
     If yes, has the University Secretary signified her approval? ?
   - **No** Any other potential areas of ethical concern? (Please give brief description)

5. Please select **ONE** appropriate option for this project, take any action indicated below and in all cases **submit the fully signed original self-assessment to RSO**.

☐ **(a) Low risk, no potential concerns identified**
The research does **NOT** involve human participants, response to all parts of Q.4 is 'NO'. No further action required once this signed form has been submitted to RSO

☐ **(b) Project will be reviewed by NHS ethics committee**
Part B/Stage 2 not usually required, liaise with RSO for further information. If Lancaster will be named as sponsor, contact RSO for details of the procedure

☐ **(c) Project will be reviewed by other external ethics committee**
Please contact RSO for details of the information to submit with this form

☐ **(d) Project routed to UREC via internal ethics committee**
SHM and Psychology only. Please follow specific guidance for your School or Department and submit this signed original self-assessment to RSO

☐ **(e) Potential ethical concerns, review by UREC required**
Potential ethical concerns requiring review by UREC, please contact RSO to register your intention to submit a Stage 2 form and to discuss timescales

☒ **(f) Potential ethical concerns but considered low risk, (a)-(e) above not ticked**
Research involves human participants and/or response to one or more parts of Q.4 is 'YES' but ethical risk is considered low. Provide further information by completing PART B and submitting with this signed original PART A to RSO

Student signature: Date: 16/4/15

Supervisor signature: Date: 12/5/15

Head of Department (or delegated representative) Name: MURAT BALOL

Signature: Date: 13.05.2015

Research Support Office (RSO) ethics contact details: ethics@lancs.ac.uk or Debbie Knight ext 92605

Appendix (B) Participant Information Sheet

Educational Research | Lancaster University

Participant Information Sheet

Title of Project: *EXPLORING THE FACTORS AFFECTING THE ADOPTION OF E-ASSESSMENTS AMONG THE CIS PROGRAMMES IN A HIGHER EDUCATION INSTITUTION IN THE MIDDLE EAST (HEIME).*

Research Student: **Nafeth Hamdi Al Hashlamoun**

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Email: n.alhashlamoun@lancaster.ac.uk

Supervisor: **Dr. Natasa Lackovic**

County South, Lancaster University, LA1 4YD, UK

Tel: +44 (0)1524 593434

Email: n.lackovic@lancaster.ac.uk

Date: 16 April 2015

Dear <<Participant_Name>>,

I would like to invite you to take part in my PhD thesis research with the Centre for Technology Enhanced Learning in the Department of Educational Research at Lancaster University.

Before you decide if you wish to take part, you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Talk to others about the study if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

This document includes:

- Information about the purpose of the study (what I hope to find out).
- Information about what participation means and how to withdraw when and if you no longer wish to participate.
- Details of what notes, recordings and other sources of information may be used as 'data' in the study - for the group and with you as an individual.
- Information about how this data will be secured and stored.
- Information about how any quotes will be used and how you will be involved in checking, agreeing and consenting to their use.
- How the information will be used in the thesis and for other purposes such as conference presentations or publication.

The purpose of the study

This research is for my thesis on the PhD in Technology Enhanced Learning programme with the Centre for Technology Enhanced Learning in the Department of Educational Research at Lancaster University.

This research will be the first one to investigate and reflect on the teaching experiences of CIS teachers in relation to CBAs and CAAs, building on some of the most influential theoretical models of technology adoption

My research aims to investigate and reflect on the factors that promote and constrain e-assessments. This will be conducted through an empirical investigation of the factors affecting the adoption of Computer-Based Assessments (CBAs) and Computer-Assisted Assessments (CAAs) amongst the CIS programmes in a Higher Education Institution in the Middle East (HEIME). CAA refers to the use of any computing device within the assessment process. CBA refers to assessments that are developed in a way that enables teachers to author, schedule, control, deliver, and create reports on these assessments.

The study also aims to develop a conceptual framework for exploring teacher's e-assessment adoption. This will be carried out through analysing the experiences and perceptions of a number of teachers who have used e-assessments while teaching CIS classes. This study also focuses on how these teachers experience the transition from using traditional paper-based assessments to e-assessment.

The primary research question is: "**What are the factors that influence the CIS teachers' choice to adopt e-assessments on the HEIME campuses?**" The data collection and analysis I am planning to conduct in the first phase of this study are based on phenomenology in which I will rely on video-recorded interviews using Zoom, a videoconferencing cloud service. Participants (CIS teachers) will be given the chance to describe and explain their experiences 'in depth' and discuss their points of view. Interviews will be semi-structured and the questions will be open-ended. This will allow the participants to voice their experiences in using e-assessments in teaching the CIS classes. Each interview will take around 60 minutes.

What participation involves and how to withdraw if you no longer wish to participate

Why have I been invited?

You have been invited because of the following:

1. This study is set in the context of the higher education in the United Arab Emirates (UAE), with the emphasis on a particular Higher Education Institution in the Middle East (HEIME), and you work in this institution.
2. The research aims to examine which factors and to what extent each of these factors influence the e-assessment adoption decision making by CIS teachers, and you are a CIS teacher.
3. You have used e-assessments to assess your students' work while teaching CIS classes.

Why is the research important, and to whom?

The main objective of this research is to study the e-assessment adoption process. More specifically, the research aims to examine which factors and to what extent each of these factors influence e-assessment adoption decision making by CIS teachers. Consequently, this work proposes a conceptual framework for higher education institutions' adoption of e-assessments. In view of the institutional developments, this research will provide a space and time for reflection on the factors influencing and hindering the adoption of e-assessments. The findings of this study will have a significant value to the research community, lecturers,

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educational institutions, and e-assessment solution providers, in terms of formulating better strategies for e-assessments adoption. The proposed theoretical framework will improve their understanding of why some teachers choose to adopt e-assessments, while others do not.

Do I have to take part?

No, your participation is entirely voluntary. If you do not wish to take part, then please let me know. If you do not wish to be video/audio-recorded, please indicate this in the consent form attached. Every effort will then be taken to ensure that your data/voice is removed from recordings by editing out where possible or excluding such data from any transcription.

Can I withdraw at any time?

You can withdraw from the research immediately and up to 2 weeks from the date of interview and there is absolutely no obligation on you to continue nor penalty for withdrawing. If you withdraw within 2 weeks, your related data (recordings, notes) can be destroyed and not used; but after this point, the data will remain in the study.

What would taking part involve for me?

You will be invited to participate in an interview that will take from 45 minutes to one hour of your time. This interview will not in any way disrupt your normal work schedule. During the interview, you will be asked questions about your perception and attitude towards using e-assessments in teaching CIS courses. My primary objective is to hear your views and perceptions about using e-assessments in teaching the CIS courses. You will be informed about the nature of the questions in advance.

Results of the study will be shared with the teachers who may possibly make good use of the findings. It may help them to enhance the use of e-assessments. Your institution will benefit from reviewing the findings of this research study by applying the best practices in other courses. The information gained from this study may also help the larger education community better understand e-assessments best practices that support the development and maturation of technology enhanced learning within the UAE context.

What will I have to do?

The researcher will contact you by email or telephone, and confirm a date and time for him to use the Zoom videoconferencing tool or to come to your campus to conduct an interview with you.

Are there any risks anticipated with participating in this study?

No physical or mental risks will befall the research participants

Video/Audio Recording

You have the choice whether you want your interview to be video/audio-recorded. Accepting to video/audio record the interviews will allow the researcher to accurately reflect on what is discussed. It will also help him follow up ideas, probe responses and investigate motives and feelings.

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Protecting your data and identity

What will happen to the data?

'Data' here means the researcher's notes, interview transcripts, survey results, digital video/audio recordings and any email exchanges we may have had. The data may be kept for ten years after the successful completion of the PhD *Viva* as per Lancaster University requirements, and after any personal data will be destroyed. Video/Audio recordings will be transferred and stored on my personal laptop and deleted from portable media

Identifiable data (including video/audio recordings of you and the other participants) on my personal laptop will be encrypted. With devices such as portable recorders where this is not possible identifiable data will be deleted as quickly as possible. In the mean time I will ensure the portable device will be kept safely until the data is deleted.

You can request to view the field notes or listen to/watch the video/audio at the end of the interview and any parts you are unhappy with will be deleted, or disregarded from the data. Data may be used in the reporting of the research (in the thesis and then potentially in any papers or conference presentations). Please note that if your data is used, it will not identify you in any way or means, unless you otherwise indicate your express permission to do so.

You have the right to request this data is destroyed at any time during the study as well as having full protection via the UK Data Protection Act. The completion of this study is estimated to be by December 2016 although data collection will be complete by December 2015.

Data will only be accessed by members of the research team. This only includes my supervisor, Dr. Natasa Lackovic.

The research may be used for journal articles and conference presentations.

How will my identity be protected?

A pseudonym will be given to protect your identity in the research report and any identifying information about you will be removed from the report. All pseudonyms will be securely stored and kept by myself.

Who to contact for further information or with ***any*** concerns

If you would like further information on this project, the programme within which the research is being conducted or have any concerns about the project, participation or my conduct as a researcher please contact:

Professor Paul Ashwin – Head of Department
Tel: +44 (0)1524 594443
Email: P.Ashwin@Lancaster.ac.uk
Room: County South, D32, Lancaster University, Lancaster, LA1 4YD, UK.

Thank you for reading this information sheet.

Nafeth Hamdi Al Hashlamoun

Appendix (C) Consent Form for Participants

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CONSENT FORM

Title of Project: *Exploring the Factors Affecting the Adoption of E-Assessments Among the CIS Programmes in a Higher Education Institution in the Middle East (HEIME).*

Name of Researcher: Nafeth Hamdi Al Hashlamoun

		Please Tick
1.	I confirm that I have read and understand the information sheet dated _____for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2.	I understand that my participation in this research study is voluntary. If for any reason I wish to withdraw during the period of this study, I am free to do so without providing any reason.	☐
3.	I understand that my participation in the interviews will be part of the data collected for this study and my anonymity will be ensured. I give consent for all my contributions to the interviews to be included and/or quoted in this study.	☐
4.	I consent to the interview being audio recorded.	☐
5.	I consent to the interview being video recorded.	☐
6.	I understand that the information I provide will be used for a PhD research project and the combined results of the project may be published. I understand that I have the right to review and comment on the information I have provided.	☐
7.	I agree to take part in the above study.	☐

participant Name: _____ **Researcher Name:** _____

Signature: _____ **Signature:** _____

Date: _____ **Date:** _____

Appendix (D) The Email Invitation to Participate in the Survey

Subject: A request to participate in my survey about the use of E-Assessments

Dear colleagues,

I hope you've had a great weekend!

I am writing to you to request your kind participation in an online survey that I am using in my PhD. to investigate the Computer Information Science (CIS) teachers' perspective on the use of e-assessments. The main objective of this research is to study the e-assessment adoption process. More specifically, the research aims to examine which factors and to what extent each of these factors influence e-assessment adoption decision making by CIS teachers.

This survey will inquire about your experiences in using e-assessments while teaching CIS courses, and the feelings you may have about the implementation of e-assessments. This may include the factors that affected you, both positively and negatively. I very much appreciate your feedback, and especially your honesty, in responding.

Survey link: https://eu.qualtrics.com/SE/?SID=SV_dd0Lm1VAXLhmr

Following are some details about this research study:

- *The survey should take you around 10 minutes to complete.*
- *Your participation in the survey is completely voluntary and all of your responses will be kept confidential.*
- *No personally identifiable information will be associated with your responses to any reports of these data.*
- *The Institutional Research Review Board has approved this study (**See the PDF file attached**).*
- *This survey will be best displayed on a **laptop** or **desktop** computer. Some features may be less compatible for use on a **mobile device.***

Should you have any comments or questions, please feel free to contact me at nafeth.hamdi@hct.ac.ae or 052-8523000.

Regards,
Nafeth Hamdi,
Khalifa City Women's College.

Appendix (E) Reminder Email

Subject: A Gentle Reminder To Participate in My Survey

Dear colleagues,

Two weeks ago, I sent you a survey, asking for your opinions on the use of e-assessments in our college. If you have already completed and submitted the survey, **thank you so much** for your valuable input. If not, please complete your survey [https://eu.qualtrics.com/SE/?SID=SV_dd0LmIVAXLhmr], and submit your responses as soon as you can. Your responses are much appreciated as this will help me in my PhD. study.

If you have any questions, please contact me at [nafeth.hamdi@hct.ac.ae] or [052 852 3000].

Happy holidays!

Sincerely,
Nafeth Hamdi

Appendix (F)

Appendix (G) Permission Request for Research

Educational Research | Lancaster University

28 Sep 2015

To: Dr. Yahya Al Ansari

PERMISSION REQUEST FOR RESEARCH

Dear Dr. Al Ansari,

I am writing in relation to my practice in the Higher Colleges of Technology (HCT) and my doctoral studies supervised by Dr. Natasa Lackovic within the Department of Educational Research at Lancaster University. I would like permission to recruit instructors to investigate their perspective on *the use of e-assessments while teaching Computer Information Science (CIS) courses*.

The main objective of this research is to study the e-assessment adoption process. More specifically, the research aims to examine which factors and to what extent each of these factors influence e-assessment adoption decision making by CIS teachers. Consequently, this work proposes a conceptual framework for higher education institutions' adoption of e-assessments. In view of the institutional developments, this research will provide a space and time for reflection on the factors influencing and hindering the adoption of e-assessments. The findings of this study will have a significant value to the research community, lecturers, educational institutions, and e-assessment solution providers, in terms of formulating better strategies for e-assessments adoption. The proposed theoretical framework will improve their understanding of why some teachers choose to adopt e-assessments, while others do not.

Participation in the study involves the use of data collected by video/audio-recorded interviews (upon the interviewee's consent). These interviews will be held with a selection of participants at a time convenient for them. Lancaster University's Research Ethics Committee has reviewed and approved the study.

If you would like further information about this project, please contact me by email. You can also contact my supervisor, Dr. Lackovic, or the Head of Educational Research Department, Professor Paul Ashwin.

Please sign below and return to give permission for this research. A copy is attached for your own records. You can email the completed form to n.alhashlamoun@lancaster.ac.uk. Should you have any questions regarding this research, call me on this number: +971 52 852 3000.

Dean: _____ Date: _____

Researcher: *Nafeth Hamdi Al Hashlamoun, n.alhashlamoun@lancaster.ac.uk*
Supervisor: *Dr. Natasa Lackovic, n.lackovic@lancaster.ac.uk*
Head of Department: *Professor Paul Ashwin, paul.ashwin@lancaster.ac.uk*

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http://www.lancaster.ac.uk/fass/edres/

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