DETERMINATION OF FACTORS INFLUENCING STUDENT ENGAGEMENT USING A LEARNING MANAGEMENT SYSTEM IN A TERTIARY SETTING

A Thesis submitted by

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ABSTRACT

Determining the key factors that affect student engagement will assist academics in improving students' motivation. The Quality Indicators for Learning and Teaching (QILT) reports have shown low engagement levels in higher education student cohorts (QILT 2016, 2017). While factors such as online education, lack of attendance, and poor course content design have been attributed to this cause, it is still not clear as to the determination of those factors influencing student engagement in a higher education setting. It is widely accepted that the selection of appropriate learning resources is an essential phase in the education process. In contrast, an incompatible range of course materials can demotivate a student from engaging in the course (Quaye & Harper 2014).

In the modern tertiary setting, Information and Communication Technology (ICT) plays an essential role in disseminating information with a Learning Management System (LMS) as the platform to communicate crucial course-related information. Academics can develop course materials on these LMSs to engage students beyond the classrooms, and students need to interact through the same platform to comprehend the transmitted knowledge. Since LMSs are operated on a computer platform, academics and students require strong ICT skills which are further utilised in the preparation of course materials. The knowledge required is dependent on the relevance and appropriateness of materials, the way various tasks are prepared, how communication is facilitated, the role and utilisation of discussion forums and other available social media structures, and the way in which assessments are conducted. This cumulatively leads to the development of a Just in Time (JIT) type of knowledge, which can be challenging to measure. The investigation into these major factors forms the basis of this study. Thus, understanding how various factors influence student engagement through the use of LMS platforms in a tertiary setting is the focus of this study.

This study used a hybrid method involving a qualitative component to understand the factors that influence the student engagement in an LMS driven learning setting and a quantitative component for confirmation of various factors identified through the literature review. The study developed five specific hypotheses for testing, and the following table shows the outcomes of hypotheses testing:

Table 1.1. Research hypotheses and outcomes

Hypotheses	Outcomes
H1: Students are influenced by teaching resources in order to realise engagement in classroom activities	ACCEPTED
H2: Academics influence engagement in classroom activities through their involvement in various teaching and management aspects	REJECTED
H3: An academic's activities influence the management of teaching activities, resulting in improved engagement by students in the class	ACCEPTED
H4: Learning Management Systems (LMS) are a key part in improving students' engagement	REJECTED
H5: Management of various study-related activities to reach focus in the study will positively influence students' engagement	ACCEPTED

The outcomes of the study indicate that students and associated classroom activities, teaching resources, management of teaching, the way LMSs are established, and students' requirements and needs play a key role in assuring engagement. This study also found that an academic's activities play a less significant role in fostering engagement as there appears to be a shift from teaching to teaching management, as evidenced in the qualitative discussion. Further, the participants expected academics to have superior technology communication skills as this is essential in an LMS driven setting. Interestingly, this study correlated with a number of standards dictated by the Tertiary Education Quality Standards of Australia (TEQSA), a regulatory body that enforces standards in Australian tertiary education. This correlation was observed despite the fact that students that participated in this study had limited awareness of these TEQSA standards.

The main contribution of this study is in highlighting the fact that academics and other support services in tertiary settings should focus on how the LMS is presented as participants expressed that clear navigation of the system is essential for engagement. This has profound implications in the way the recruitment of academics is conducted. In terms of practice, TEQSA standards are key in assuring quality in tertiary settings, and this study has provided strong

evidence as to the needs for support systems, the way learning objectives are mapped to deliver learning outcomes, appropriateness of the content, time imposition on students in managing their study-related activities, and integration of technology. These are now a standard part of the TEQSA assessment.

The study can be further improved in the future by collecting data from various cohorts: for example, fulltime vs part-time, domestic vs overseas, and mature vs school leavers, to better assess their views in terms of engagement as these cohorts come with varying needs. These can then be encapsulated in the learning materials and systems development. This would then lead to a better alignment of learning management and engagement to realise better outcomes.

CERTIFICATION OF THESIS

This thesis is entirely the work of **Prabal Datta Barua** except where otherwise acknowledged. The work is original and has not previously been submitted for any other award, except where acknowledged.

Principal Supervisor:	**Prof. Raj Gururajan**
Associate Supervisor:	**Dr Xujuan (Susan) Zhou**
Associate Supervisor:	**Associate Prof. Abdul Hafeez Baig**

Student and supervisors' signatures of endorsement are held at the University.

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DEDICATION

I dedicate this thesis to:

- My grandfather Subal Chandra Barua and grandmother Saira Barua
- My three supervisors Professor Raj Gururajan; Dr Xujuan Zhou and Associate Professor Abdul Hafeez Baig
- My two uncles Joysen Barua and Temio Barua
- My father Joydatta Barua and My mother, Karabi Kana Paul
- My wife, Soniaswapna Vunnamatla
- My son Raoul Datta Barua
- My sister Nabanita Barua
- My nephew Prongha Talukder
- My brother in laws Kakan Bikas Talukder and Sarath Chand Vunnamatla
- My cousins Deba Prashad Barua, Simul Barua, Elu Barua, Pongkaj Barua and Prabartak Barua
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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AES	Academic Engagement Scale
BES	Beyond-class Engagement Scale
HEP	Higher Education Provider
HESF	Higher Education Standards Framework
HTMT	Heterotrait-Monotrait Ratio of Correlations
ICC	Interclass Correlation Coefficient
ICT	Information and Communication Technology
IES	Intellectual Engagement Scale
IT	Information Technology
KMO	Kaiser-Meyer-Olkin Measure
LES	Learner Engagement Scale
LMS	Learning Management System
NSSE	National Survey of Student Engagement
OES	Online Engagement Scale
PCA	Principal Component Analysis
PES	Peer Engagement Scale
QILT	Quality Indicators for Learning and Teaching
SEM	Structural Equation Modelling
SSES	Student-Staff Engagement Scale
SES	Student Experience Survey
TAE	Training and Education
TEQSA	Tertiary Education Quality and Standards Agency
TES	Transition Engagement Scale
USQ	University of Southern Queensland
VET	Vocational Education and Training
WLT	Wireless Learning Technologies

CHAPTER 1: INTRODUCTION

1.1. Chapter overview

This chapter introduces the main concepts associated with this study. The chapter is composed of six sections. Section 1.1 is this overview. Section 1.2 presents an introduction to the research. Section 1.3 explains the motivation and the reasons to conduct this research, followed by the research setting and audience addressed in section 1.4. The statement of the research problem is presented in section 1.5. Finally, section 1.6 states the research objectives and research questions, with section 1.7 highlighting the thesis structure. Figure 1.1 provides a graphical representation of this chapter's structure.

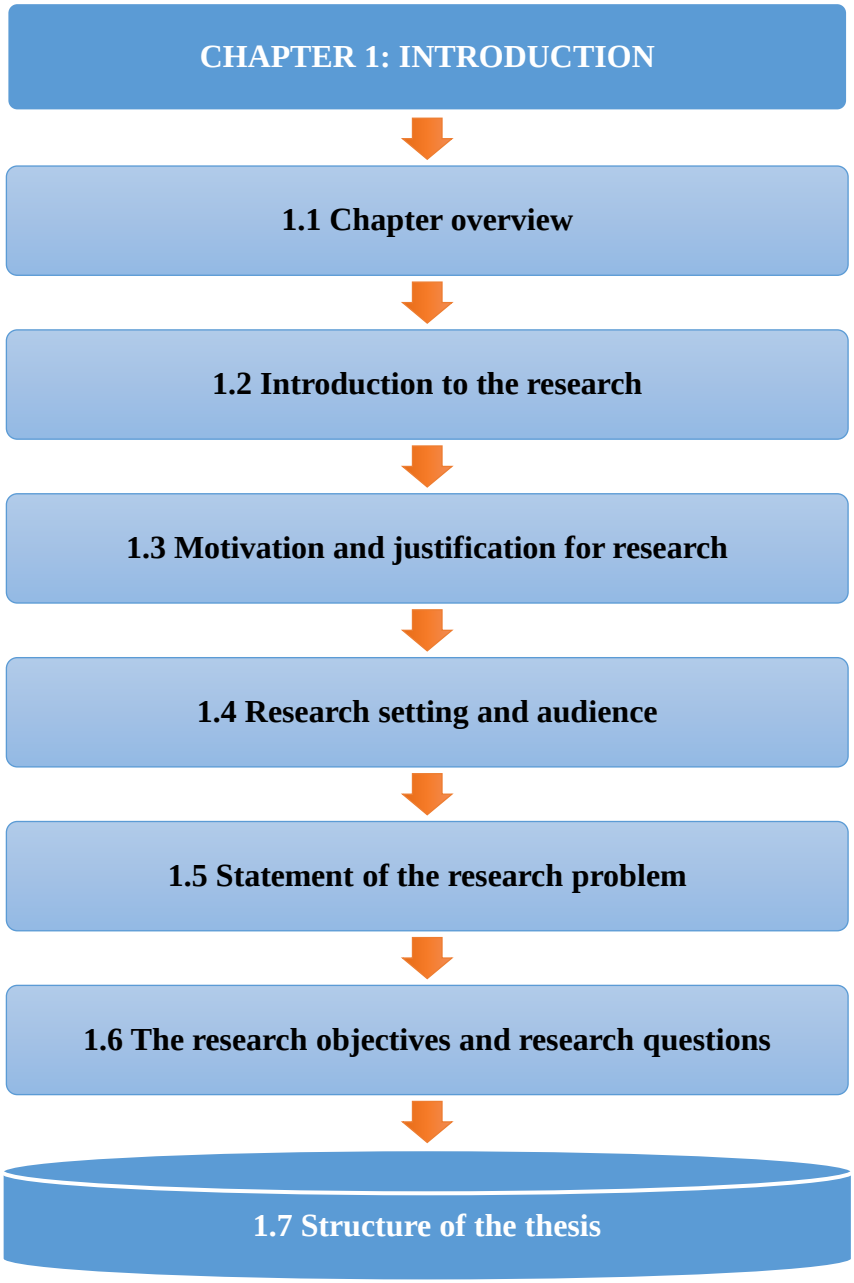

Figure 1.1. Graphical structure of chapter 1

1.2. Introduction to the research

The recent QILT (2018) survey has indicated that some universities did not obtain the expected results in the student engagement aspects. While there are many factors influencing the engagement in a tertiary environment, Vazquez, Vazquez and Guzman (2013) single out the lack of relevant materials in producing low student engagement levels. They provide an example of the lack of consideration exercised for a World

War Context used in an English Language course, without appropriate consideration for students of current age, fit of the topic, need, and relevance. Prior studies have also highlighted the importance of learning styles in order to identify needs and characteristics of learners (Robertson 2008), since they may not have the same needs, and therefore generic materials may not be suitable for all students. Practical experience also suggests that the lack of student attendance plays a crucial role in the level of student engagement.

While many factors may affect student engagement, it is worthwhile focusing on seven key factors identified through the literature review: (1) educational resources, (2) social network, (3) material relevance, (4) learning styles, (5) material selection, (6) material usefulness, and (7) preparation by educators (De Byl & Hooper 2013; Goss & Sonnemenn 2017; Reading 2008). These factors mainly refer to materials provided to students in a form that is comprehensible, accessed, discussed, and prepared to meet various individual needs, its relevance, appropriateness and finally its usefulness. When these factors are applied to an LMS context, then it is also possible to arrive at an informal grouping of these seven factors into a more concise number: (1) competency, (2) knowledge base, (3) capability, (4) active participation, and (5) the context. In the scope of this study, the LMS will provide the context. An underpinning assumption of this study is that while classroom-based engagement is the model many tertiary studies offer to students, in tertiary contexts, the learning and associated communication between the learner and the expert also occurs beyond the classroom. Some academics use LMSs to communicate with students and facilitate their learning. This communication is one of the surrogates of engagement. There is an expectation from students that academics should respond within a reasonable timeframe, and in an adequate and satisfactory manner. To provide such a response, academics use various tactics. Some academics use the discussion forums built into the LMS to trigger a discussion among students. Others provide a simple web link so that additional materials can be accessed. Some will use a virtual classroom to answer queries and clear doubts. Just in Time responses are also provided by using social media applications (or Slack-like applications) when specific small groups are involved. Real-time feeds are provided to students to keep them abreast of materials. The purpose of utilising these various strategies is to meet different learning needs,

and it is still unclear as to the determination of some or all of these in assuring student engagement. In essence, it appears that academics use their base knowledge in a subject to develop the fundamental materials required, then use a range of techniques to provide up-to-date materials to assure currency in the subject domain and use LMSs to constantly communicate and monitor students for their learning needs and performance. In this technological context, academics become 'managers' rather than 'teachers'. This is a fundamental shift and is reflected in students from learning, to assimilating, to articulating to the context given or expected. In this way, students also become 'managers' from 'learners' as they are required to understand the gamut of ICTs that facilitate materials and content communication for relevance, rigour and currency of materials. Thus, the context is changing in modern tertiary settings where the focus is slowly shifting from classroom-based engagement to LMS based engagement.

1.3. Motivation and justification for research

Student engagement is a serious topic in the Australian Higher Education sector. In fact, the Commonwealth Department of Education and Training has requested a revision on the Learner Engagement Scale (LES), with particular focus on the external students due to their lower engagement compared to the internal students (Matthews, Tan & Edwards 2017). The report presents an important variation in the results obtained previously versus the ones obtained by introducing new measuring elements. Basically, the initial results were 63.1% for internal and 24.2% for external students, while the new pilot scores were 68.4% for internal students and 51.5% for external students. Still, the student engagement scores are lower and present a slight decrease of 2% compared with the previous year (Figure 1). For some universities, it should be a concerning topic, since the 2017 Student Experience Survey (SES) results show their scores under the national average. According to recent data (QILT 2018), some universities have lower learner engagement scores such as 49.8% for undergraduate students and 57.7% for postgraduate coursework students. In the computing and information systems area, it was 44.1% while the national average was 60.7% for undergraduate students. It also contrasts with the results of other developed countries, such as the USA and UK. In terms of the quality of the entire educational experience

for final year undergraduate students, while the USA scores were 85%, the Australian scores were 75% (2008-2017). Similarly, UK scores were 84% versus 78% in Australia's overall satisfaction rating (2011-2017). Thus, the Australian Higher Education sector is performing below the expected worldwide standard, subsequently prompting the initiation of this study.

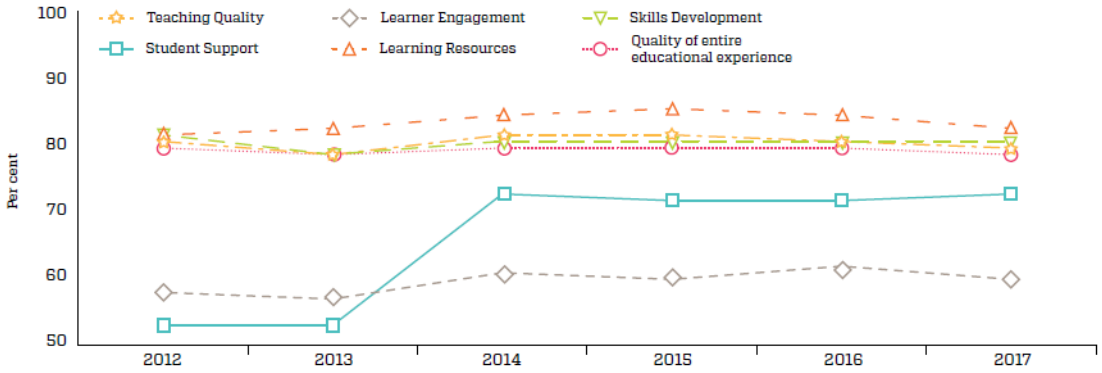

Figure 1.2. The undergraduate student experience 2012-2017

Source: QILT 2018

This research will provide tangible and intangible benefits for the higher education sector in Australia. We are of the opinion that the University of Southern Queensland (USQ), where this study is pitched, represents a normal population of the Australian tertiary sector, and the results arising from this study will be directly beneficial to USQ, as we have collected data from their students enrolled in the IT/IS programs. The outcomes, in our view, will have the following specific significance:

- Governmental institutions may have a set of constructs that could aid the policy development to benefit domestic and international students, Higher Education Providers (HEP), industry, and community in general, as the policy framework is in need for the assertion of such determinants.
- Current international students may find some reasons as to their own engagement levels and may take action towards the improvement of their weaknesses.
- Higher Education Providers (HEP) may also take action to address their weaknesses.

- Further, in the industry, the overall improvement in the performance of future students will increase the private operator's profits since students will be better prepared and probably more engaged in their profession.
- Intangible benefits can be derived in terms of a better quality of lives, as a strong engagement results in a strong workforce, hence productivity in employment.
- Finally, in the academic field, based on the outcome of this study, future studies could design strategies and frameworks to improve the student environment in classrooms and their engagement.

1.4. Research setting and audience

This thesis focuses the research on student engagement in the higher education sector in Australia. As mentioned before, not only will HEPs be benefitting from this research, but governmental institutions and researchers in the higher education industry will also be able to rely on the data and outcomes to guide future decision-making procedures.

1.5. Statement of the research problem

The change in LMS-based engagement also introduced new concepts such as Academic Engagement, Peer Engagement, Student-Staff Engagement, Intellectual Engagement, Online Engagement, and Beyond-class Engagement. While the focus of the study is on factors to determine these engagement concepts, it is imperative to realise that LMSs facilitate these types of engagement and some of these are off-shoots from the traditional classroom model. Similar to changes in types of engagement, students have also changed, and the current student generation can be considered a 'connected' generation. They have grown up with exposure to a rapid and previously unseen evolution of technology, including the development of online social networking as a legitimate means of communication. To match the "connected generation", (De Byl & Hooper 2013) provide a five-dimension model of the learning environment —playfulness, pedagogy, instrumentalism, status, and performance— as a result of gamification of learning, which could play an important role in the discovery of the factors that impact the student engagement. In the same thread,

Reading (2008) discusses some student engagement indicators, grouped by behavioural, emotional, and cognitive engagement in the ICT-rich learning environments. Furthermore, ICT integration improves student engagement by creating dynamic and realistic scenarios regarding the studied topics (Wilson & Boldeman 2012). These authors have indicated the use of Web 2.0 technologies, mobile applications, iPads, and YouTube are powerful tools in increasing the level of student engagement. Consequently, some factors influencing engagement can be derived as a result of using technologies in the learning space.

Thus, it can be perceived that ICT enables LMSs to play a crucial role in assuring engagement of students in the educational context, including developing analytic (Nizam Ismail, Hamid & Chiroma 2019) . While this aspect has been recognised, what is not clear is how prepared the academics and students are in making use of LMSs to transfer the knowledge from one course to another, and what factors influence this transference within the scope of an LMS. While knowledge transferred is beyond the scope of the study, the factors that influence engagement as a result of technology facilitating learning among students has been identified as the major gap that this study is focusing on.

Despite many studies on student engagement, few studies have been dedicated to delving into the factors that affect the engagement of higher education students, particularly in the Australian context. Retention and sense of belonging (explained in later chapters) are key indicators of student engagement, which can be improved by motivating students to participate in their extra-curriculum activities and with a proper guide to each activity (Department of Education NSW 2020; Hallam et al. 2010; Kift 2004). The goal of active participation is demonstrating one's learning rather than listening (Goss & Sonnemenn 2017). It appears that a lack of engagement among research students is unlikely as the majority of the coursework is led by independent study. Hence, this study will focus on the engagement of undergraduate and postgraduate by coursework students.

1.6. The research objectives and research questions

The main objective of this research is to determine those direct and indirect factors that influence student engagement in a tertiary setting. To achieve this objective, the following sub-objectives are carried out in this study:

- To understand how various ICT driven LMS factors influence engagement in tertiary settings
- To determine those factors that contribute to this engagement.

An initial literature review reveals direct factors such as learning resources, teaching competency, knowledge base and learning styles, and indirect factors such as social networks, teaching contexts and learning management technology influence engagement. As indicated in the research objectives, these two sets of factors influence both students and academics. Therefore, to accurately determine the factors that influence student engagement, it is imperative that these set of factors are examined comprehensively. This notion has culminated in the following set of initial research questions that will be considered to guide the direction of this study. To achieve the objectives of this study, this study will address the following four broad research questions:

1. Which direct factors determine students' engagement in a learning management system based tertiary context?
2. Which indirect factors determine students' engagement in a learning management system based tertiary context?
3. What is the granularity of the influence of these two sets of factors (direct and indirect) on academics and students?
4. What is the common set of factors that influence students' engagement?

1.7. Structure of the thesis

This thesis is composed of nine chapters. Its structure and format are based on the referencing style manual of Harvard AGPS6 version 2 (Australian Government Publishing Service, 2002) and on the "Guidelines for the Preparation of a Higher

Degree by Research Thesis" (University of Southern Queensland, 2015). Figure 1.2 shows the followed structure graphically.

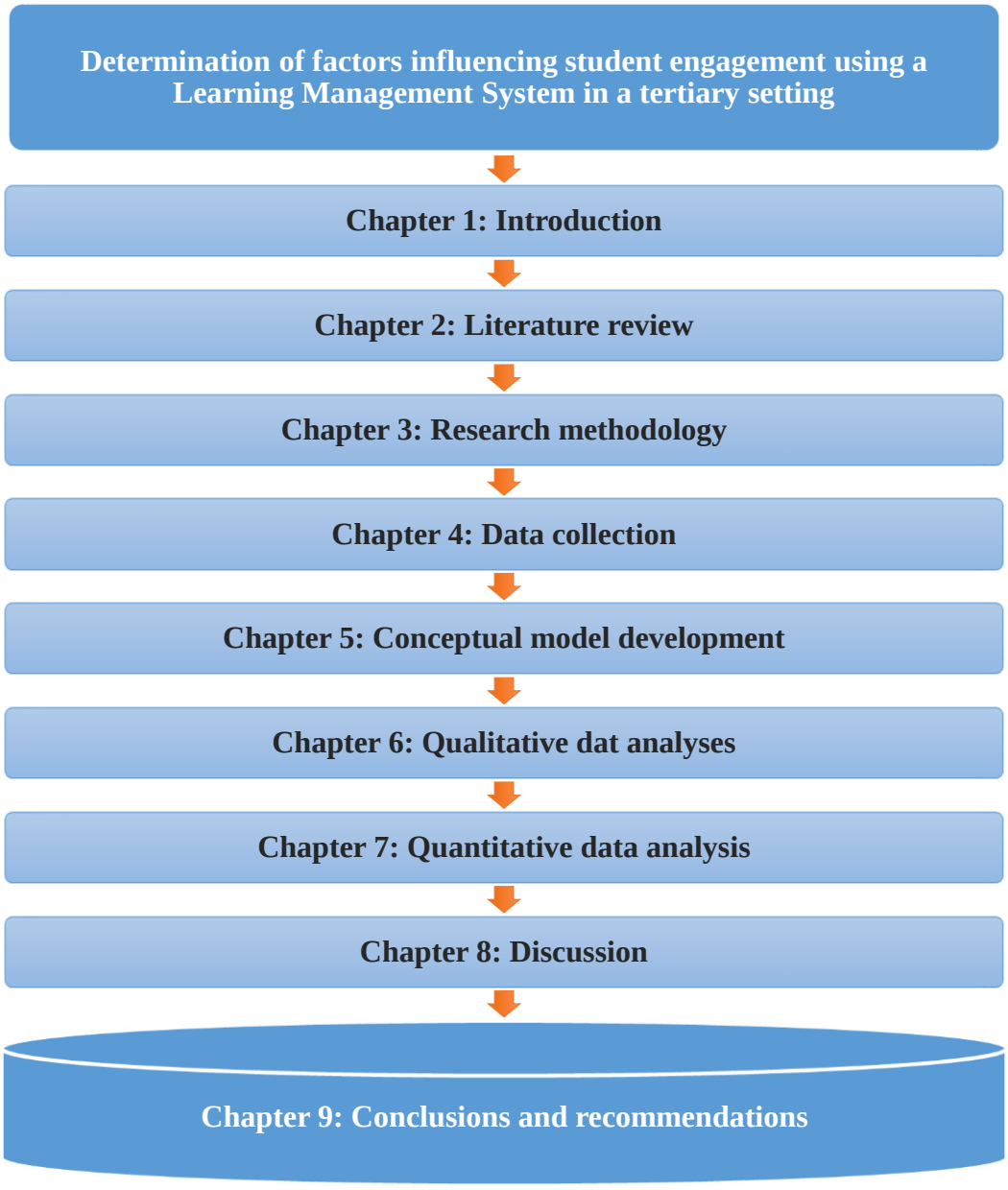

Figure 1.3. Structure of the thesis

CHAPTER 2: LITERATURE REVIEW

2.1. Chapter overview

In the previous chapter, an introduction to the purpose of this study was provided. It outlined the details regarding the justification in conducting this research and the posited initial research questions. In this chapter, a critical review of the key elements leading to student engagement is presented. Researchers present the theoretical fundamentals in which this study is supported. The literature was reviewed with those aspects that influence student engagement, with tertiary education in mind, as student engagement varies at different stages of learning. This study excluded student engagement at primary and high school level and considered only post-secondary study domains.

Section 2.2 presents the student engagement definitions adopted in this study, followed by the student engagement perspectives. After that, behavioural, psychological, socio-cultural, and holistic perspectives are presented in the next sections. Section 2.8 shows a holistic focus on the ICT impact on student learning. Later sections address some of the most important aspects that will be reviewed in this study, including the academic´s competency, educational material preparation, course material selection and Learning Management Systems (LMS). In section 2.13, a student engagement framework is presented, followed by a critical review in section 2.14. Finally, a research gap is analysed, and conclusions are presented in section 2.16.

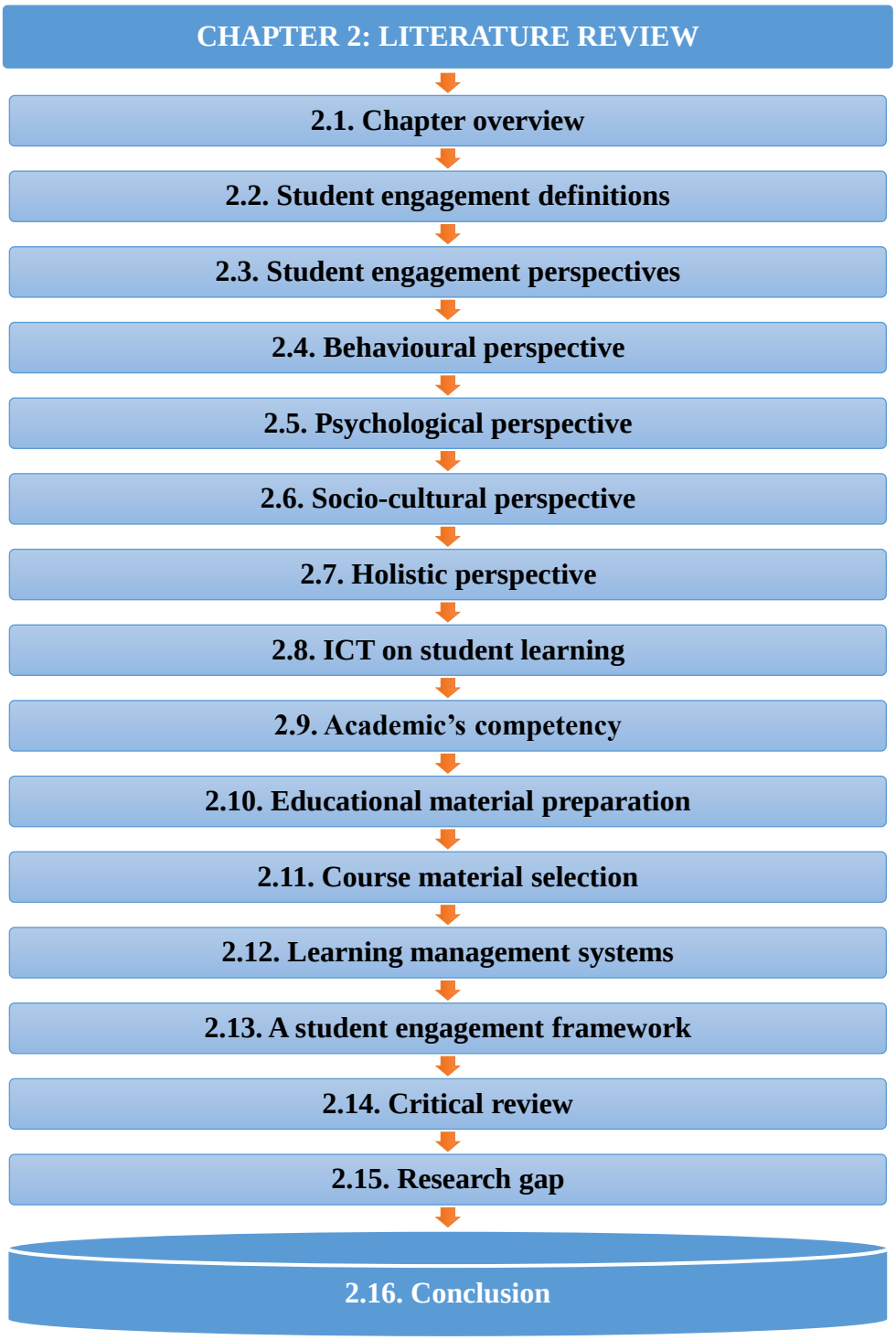

Figure 2.1. Graphical structure of chapter 2

2.2. Student engagement definitions

Despite its importance in the education sector, the term "Student Engagement" has no universally accepted definition. This term has been connected to educational achievement, student retention, student motivation, student success, and institutional

success, without a cohesive approach to the overarching definition of the expression. In the tertiary setting, it involves a series of terms, commonly used in the sector to define the set of behaviours that may characterise students (Krause 2005). Robinson (2012) refers to student engagement as the active involvement of students, as a collective, regarding matters related to students' experience. Similarly, Coates (2008) defines student engagement as the active involvement of students in activities and conditions to produce high-quality learning outcomes. Other studies use terms such as motivation, time-on-task, and student interest, and point out a link between the time employed in completing the task and its academic achievement (Bulger et al. 2008). Hence, for this study, student engagement is defined as the active student involvement and motivation in the achievement of the learning goal, assessed beyond the course pass marks.

Student engagement has been intended as a crucial element in the achievement of the learning objective. There is a rich history related to student engagement in the Australian higher education sector (Krause & Armitage 2014). However, it is important to note that old paradigms can be challenged (Krause 2005) because the way students learn has changed in recent years, with technology playing a crucial role in the overall learning journey. For example, students and teachers are generally 'connected', games are used to learn, information is easily available and accessible through digital journals, videos, blogs, social networks, and HEPs use several tools such as LMS' to provide students with easier ways to become engaged in the learning process. To improve the understanding and approach of this concept, (Krause & Coates 2008) present seven scales of student engagement for first-year undergraduate students in Australia: Transition Engagement Scale (TES), Academic Engagement Scale (AES), Peer Engagement Scale (PES), Student-Staff Engagement Scale (SSES), Intellectual Engagement Scale (IES), Online Engagement Scale (OES), and Beyond-class Engagement Scale (BES). These scales are intended for student engagement monitoring and promotion in the first-year undergraduate students.

2.3. Student engagement perspectives

There are four dominant research perspectives identified about student engagement in the literature: namely, the behavioural, the psychological, the socio-cultural, and the holistic perspective (Kahu 2013). Researchers have found some key issues related to

unclear definitions and relations between the state of engagement and its outcomes in the short and long term. These issues should be clear in order to determine metrics, measurements or factors involved in this matter. Hence, student engagement should also be analysed with regards to these four perspectives that help to discover the factors that may impact or influence student engagement. All of these perspectives have a significant value for this complex construct.

2.4. Behavioural perspective

Behavioural perspective is well recognised in tertiary setting literature. From this perspective, student behaviours and institutions influence student engagement. Chickering and Gamson (1987) emphasise that institutions influence student engagement in their seven principles of good practice in undergraduate education. In this category also falls the five scales defined by the NSSE (2010): academic challenge, active learning, interactions, enriching educational experiences and supportive learning environment. Similarly, (Coates 2010) includes a sixth scale: namely, integrated learning. Other studies also have different categories, levels or scales that can be included in this perspective (LaNasa, Cabrera & Trangsrud 2009; Pike 2006). So, even though this perspective has wide acceptance, there is still no consensus classification of student engagement factors, principles or levels.

2.5. Psychological perspective

In this perspective, student engagement is viewed as a psycho-social process that is developed gradually throughout time and student experiences with different levels of intensity. This approach presents a combination of the following engagement dimensions: behaviour, cognition, emotion and conation, where student antecedents play an important role (Kahu 2013). The behaviour dimension includes active learning, time-on-tasks and attendance. The cognition dimension is related to the self-regulation and in the process of learning leading to depth (Fredricks et al. 2005). The emotion dimension is significant since it is related to students' feelings, perceptions and involvement with the tasks to achieve their learning goal in a more interesting manner. Finally, the conation dimension influences the wish to succeed. It is a concept that can mix beliefs, commitment and conviction, among others (Riggs & Gholar 2009). This perspective is associated directly with the student as an individual able to

encourage themselves to achieve their goals by increasing their own engagement levels.

2.6. Socio-cultural perspective

The focus of this perspective is the interaction of students within the social context. Student engagement can be influenced in minor or major measures, depending on their cultural background. Prior studies suggest that students may experiment "a subjectively undesirable separation" or disengagement due to some contextual factors such as excess focus and value on performance, the domination of particular social groups, ethnic differences, and predominant cultural differences (Christie et al. 2008; Geyer 2001; Griffiths, Winstanley & Gabriel 2005; Mann 2001; Thomas 2002). These contextual factors, along with the new generation of students, can change the perception and engagement levels, particularly for the non-traditional students such as international students, first-year students or minority ethnic groups.

2.7. Holistic perspective

This perspective considers student engagement as a dynamic sum of factors that encompasses perceptions, expectations, experiences, locations, academics, staff, institutions, and resources in the construction of a student. Several studies emphasise the need to incorporate the concept of "becoming" and view the student beyond the qualifications and marks, as stated by Bryson and Hand (2008). Bryson, Cooper and Hardy (2010) and Kahu (2013) present an interesting point of view, where they point out that engagement is not only a process but also an outcome. They present the idea of what the universities should do – labelled as 'engaging students'- and what students do – labelled as 'student engaging'. This perspective involves the confluence of many of the factors identified in the previous sections, where student motivation and expectations should be recognised.

2.8. ICT on student learning

As indicated in an earlier statement, new student generations are considered 'connected' generations. This has enabled gamification of learning materials to facilitate student engagement for behavioural, emotional, and cognitive aspects of the ICT-rich learning environments. Wilson and Boldeman (2012) point out the importance of ICT integration to improve student engagement by creating dynamic

and realistic scenarios regarding the studied topics. They have indicated the use of Web 2.0 technologies, mobile applications, iPads, and YouTube as powerful tools to increase student engagement. Thus, from these discussions, it is possible to infer that ICT rich learning environments are emerging as a major game-changer in which students are engaging with curriculum and content-based discussions, and these environments play a defining role in student engagement.

Further, Wireless Learning Technologies (WLTs) are gradually replacing the traditional methods of information sharing, and this leads to future collaborative multiuser sharing. WLTs used in education include mobile technologies such as smartphones, tablets and laptops as well as systems designed to be used specifically in technology-rich collaborative learning spaces. Such spaces are networked both technologically as well as through student-to-student interactions, expected to realise better student engagement (Bhati et al. 2013).

Prior studies have also pointed out that factors beyond the ICT based learning environment becoming key factors in the domain of student engagement. For example, the impacts of teachers' competency and quality of study materials provided in the student engagement have been singled out by (Tschannen-Moran & Hoy 2001). These two factors are discussed in prior literature, mainly to determine:

1) if there exists a lack of uniform competency among relevant stakeholders involved in teaching; and

2) if the selected study material is being properly considered.

The implications of the results above are the capability of academics able to deliver content and their acumen in the choice of study materials. If these are extended further, an academic's capability might include their proficiency in the content area, their ability to communicate the content to meet a range of student needs, their capacity and availability to understand students' needs and to cater to these needs, preparing student content and making this available through an ICT medium and so on. It appears that these factors are essential to improve engagement in the classroom and beyond.

In the context of a learning journey, students enrol in a course to acquire specific content knowledge. By enrolling, students are provided with access to course

content either within a classroom, printed out – or both. In modern tertiary settings, despite the mode of access, ICT plays a key role in facilitating the course content access regardless of the students' location. The following sections elaborate on particular key aspects that can influence student engagement. The course content access leads to their engagement with the content and the person who provides the content, as well as with the peers that access the content. So, to ensure a satisfying learning engagement, competency and preparation are essential. Competency in this context includes the pre-requisite knowledge, the ability to quickly navigate through the materials, and comprehend the materials independently. This requires preparation, planning, scheduling, and interaction. The competency and preparation aspects are elaborated below.

2.9. Academic's competency

The 'academic efficacy' mainly deals with the capability of academics to promote engagement towards a student's learning process, even with unmotivated or difficult students (Tschannen-Moran & Hoy 2001). Encouraging students may require not only a great effort from academics but also methodologies and techniques that can be acquired through professional development.

Similarly, an academic's sense of preparation is related to their proficiency in the subject, their sense of efficacy, and is also directly related to the student's learning (Darling-Hammond, Chung & Frelow 2002). Selecting study materials per market evolution, current topics, and contextualisation may fulfil stakeholder (in this case, students and peers) expectations. For example, the standardisation of course material may produce undesirable results regarding student engagement (Pilotti et al. 2017). Adapted materials may increase the student's motivation by providing familiar and common situations that make the material more meaningful for them (Duarte & Escobar 2008). Students who are provided with generic or non-contextualised material could lose their motivation toward certain topics. Thus, the lack of competency in teaching and unsuitable course material may decrease student engagement.

The lack of uniform competency in academics is considered a problem that affects the level of engagement. Since the competency of academics is related to their preparation, it directly impacts students' engagement. In fact, this lack of competency

may influence the students' intellectual helplessness, although the real problem is in not recognising this 'incompetence' (Bukowski et al. 2016). In addition, Vincent Tinto, cited on (Quaye & Harper 2014), states that some students do not continue with their undergraduate studies in the same institution due to the lack of connection with 'peers, professors, and administrators at the institution' (p. 4). That means that academics that are not adequately prepared in their areas do not have proper tools to maintain the students' engagement with the course and to reinforce the teacher-student relationship. On the other hand, students' needs vary over time, and the educational methods of the last decade may not be currently useful. Academics that have updated their knowledge and teaching methods should feel they are more prepared, and their productivity may increase. Novice teachers may increment their preparation by having mentoring practices (Rots et al. 2010). Moreover, certified teachers may feel better prepared and qualified to deliver the materials than non-certified teachers (Darling-Hammond, Chung & Frelow 2002). That is why the enthusiasm of academics, their commitment, and their capacity to keep students motivated can be directly related to their preparation and their sense of efficacy and productivity. Therefore, the lack of competency can be considered as a problem that impacts student engagement.

Academics' competency is related to the set of abilities, knowledge, and skills that make a person suitable for the job of teaching. Robertson (2008) explains that teachers require a spectrum of knowledge involved in the teaching activity that provides a point of reference about the capabilities that a teacher should have. To be a trainer in the Vocational Education and Training (VET) system in Australia, trainers are required to complete a Certificate IV in Training and Assessment (TAE40116). This contrasts with the requirements of school and university sectors where more stringent qualifications are required. However, it is expected that academics count on at least five years of industrial experience to ensure students will benefit from their knowledge and experience. In fact, many VET practitioners had not undertaken pedagogical courses offered by many Australian universities (Simons & Smith 2008). According to Christenson et al. (2008), student engagement is affected by different contexts, including the school context, where teachers play a significant role to provide clear expectations and maintain a good teacher-student relationship. Christenson et al. (2008) provide details of the association of various elements that influences the student engagement, including family, peers, and academic institutions,

having a direct relationship with academics, the behavioural, cognitive, and psychological factors. So, it appears that student engagement is not only dependent on how well-prepared academics are, but also other elements relevant to the academic context.

Academics influence student engagement and learning by disseminating and sharing their knowledge and skills to students. By using a range of educational activities, academics use their own experience, understanding of the subject, concepts and philosophies to deliver their course content. According to Dori and Belcher (2015), in a traditional teacher-centred educational approach, knowledge and skills are expected to be disseminated by teachers. In contrast, some studies indicate that knowledge is an active process in which learners are not just passive knowledge recipients, but also actively participate in the sharing of knowledge (Bransford, Brown & Cocking 2000). Sawers et al. (2016) point out that the confluence of teaching philosophy, learning space, and instructor behaviours are related to perceptions of student engagement, and also state that student engagement is influenced by the types of activities conducted in a classroom, which is closely related and depending on the academic's delivery methods. McArthur (2015) suggests that "instructor behaviour" is a matter of importance in the student engagement along with learning space; and Zepke, Leach and Butler (2010) found that teachers can influence the student motivation more than external factors. The academic, through different activities in class, teaching styles, and resources, can deliver the course content in a passive or active format for the students. Consequently, the academic is responsible for motivating the learner to achieve a positive outcome in their learning process, showing that academic competency is a fundamental cornerstone in the determination of student engagement levels.

2.10. Educational material preparation

Student engagement is also affected by the way educational materials are prepared. In a traditional context, this pertains to answering student queries, while in alternative methods of teaching, this also includes the handling of various tools provided in the LMS. A primary challenge in the modern teaching context is that students' needs may include communication exchange which can be beyond the traditional hours, as well as adapting to individual learning characteristics and supporting these with

appropriate additional content, leading students to advanced levels with additional content. A study by Vogt and Rogalla (2009) demonstrated that using a high Adaptive Teaching Competency approach, which involves preparation, planning, and topic knowledge, may increase students' learning and engagement. Thus, new technological tools can assist in better preparation of educational materials. This will be broadly explored in the scope of this study.

Course materials can be difficult to understand for some students. Classes can be comprised of international or first-year students, who may not know the class flow or teaching style due to potential, cultural and ethnic differences in educational systems. Some of them even may have some disadvantages compared with their peers, such as poor communication skills due to the language barrier or variations in colloquial expressions between countries and cultures. Some of them probably have missed some classes. In these and other situations, the course material should be easily comprehensible without academic assistance. However, when a student faces the class activity, homework or assessment, some doubts, or issues, can appear. According to Stone (2012), this is where the importance of material preparation lies. Generally, course materials are tailored for a generic group of students, and little, if no, care is taken to match the material to the entire cohort. In this instance, the academic has a comprehensive knowledge of how the course is composed. However, it may be more appropriate to tailor the learning materials in a fashion that will be more easily understood by the entire cohort, and as such can lead to a better level of engagement in the course cohort.

2.11. Course material selection

The selection of appropriate learning resources is an important phase in the education process. An incompatible selection of materials can demotivate students. Researchers have discovered that some academics do not prepare or select the material per students' needs, and that material could be unattractive for some students. Sometimes materials include only a coursebook or websites that are not connected directly with the topic, and probably will not be completely useful. For that reason, students may lose their interest in the topic. In the VET context, attention to learning styles helps in identifying the needs and characteristics of learners (Robertson 2008). Students learn in different ways, and they may not have the same needs; therefore, generic materials

may not be suitable for all students. Consequently, many students may feel that their educational needs are not addressed appropriately and may become demotivated, especially when they cannot achieve the goals they had been working towards.

Not all modern learning resources are appropriate for all learning environments. The Internet age has made it possible to develop new learning resources in the education arena. Several studies have investigated the use of social networks for educational purposes, which in some cases have resulted in success (Aydin 2012; Gao, Luo & Zhang 2012; Greenhow & Askari 2015; Manca & Ranieri 2013; Rodríguez-Hoyos, Haya Salmón & Fernández-Díaz 2015; Yang et al. 2011). YouTube is an example of a learning resource that has assisted students in their educational process. While students use social media for communication and engagement in course content, not all social networks are considered suitable for this purpose. Brailas et al., and Polk, Johnston, and Evers (cited inSelwyn & Stirling 2016, p. 4) point out the worrying gradual acceptance that some social networks, such as YouTube and Wikipedia, may gain in education as valid reference sources. Social media can divert a student's attention, since a lot of the information is channelled together, with messages, advertising, and biased news becoming entangled with the information that is being sought. Manca and Ranieri (2016) state that Facebook is not suitable for some educational purposes since it is not a good environment to create productive arguments and discussion. In the VET sector, social networks could be used according to the course or class purpose depending on the style of course and the cohort's level of familiarity with the relevant social network; without these factors, the use of social networking in learning is limited and may not benefit the group as intended.. Thus, it can be inferred that not all modern resources are appropriate for engagement purposes.

A proper educational resource selection may lead the improvement in student engagement and can be the key to increasing their motivation. Hämäläinen and De Wever (2013) revealed that using a 3D game, academics were able to provide a better guide to young adult students (between 16 to 18 years old), achieving a good level of engagement from them, indicating the impact of compatible resources on students' engagement. In the same way, using modern technologies may improve students' perception by catching their attention, through the use of technological resources that support their learning.

Thus, from the discussion above, it can be inferred that ICT tools play an important role in students' engagement with learning, and a lack of competency from academics could affect student engagement. If academics do not use the available tools appropriately to meet the students' requirements and increase overall motivation, students may feel their educational needs are not being addressed, resulting in reduced interest in the subject and potentially even the whole course. Similarly, the selection of learning resources affects student engagement. This selection should consider student needs and their different learning styles. Some learning resources can be less appropriate, not suitable or even incompatible with the style of learning for the cohort. Those incompatible resources can, in turn, lead to further demotivation and disengagement from the topic. Appropriate resources should be selected to encourage students to learn in their own ways, leading to improved motivation to achieve their educational goals. These two key aspects – competency of academics and preparation of learning materials – form the basis of this study.

2.12. Learning management systems

The use of LMS' in the tertiary education setting could change the way in which students feel attracted towards their learning. The role of LMS' is crucial, especially outside the traditional classroom as LMS integrates students to resources, and also facilitates academic assistance to provide a collaborative environment with peers. Students can be more engaged through ´distance learning´ than in the classroom due to the availability of the resources they need. A downfall of this is that the traditional class attendance records could become obsolete, and it will be difficult to measure the level of interest (Douglas & Alemanne 2007). However, LMS' provide a vast amount of data that can assist us in measuring student participation. We can determine when the student logs into the system, how many times they log in, how long a task takes to be completed, and many other variables of this nature. With this information, other instruments to measure the overall level of student engagement can be considered. Thus, LMS´ not only provides a learning environment but also can be used to create an instrument to measure the engagement of the students.

2.13. A student engagement framework

The four perspectives on student engagement presented previously provide a framework to develop initial factors of student engagement. Kahu (2013) presents a comprehensive framework that includes many perspectives, as shown in figure 2.1.

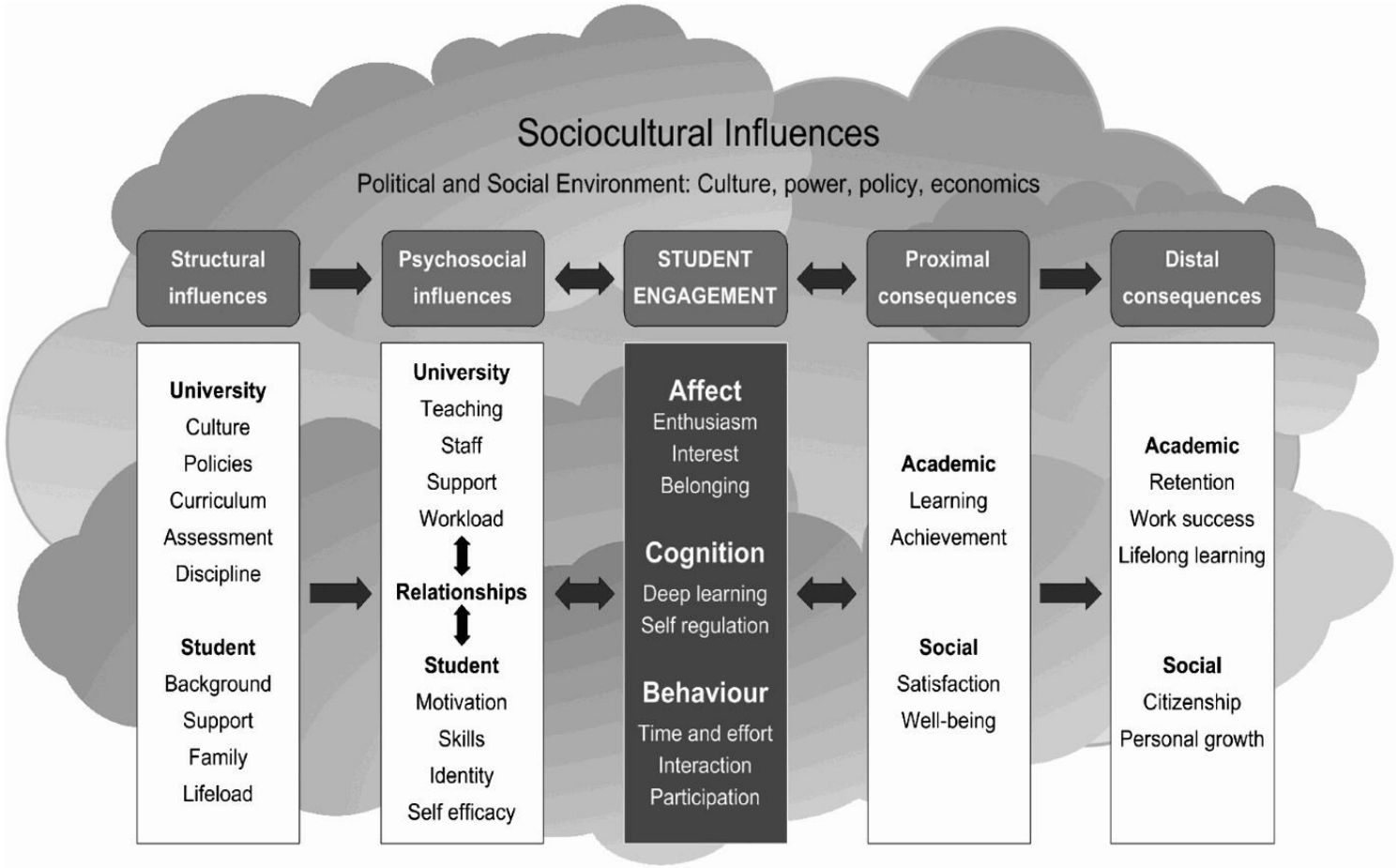

Figure 2.2. Conceptual framework of engagement, antecedents and consequences: Source (Kahu 2013)

The framework includes the possible factors that affect the student engagement group by their most important influences. It draws attention to the student engagement itself, mainly based on the emotional, cognitive, and behavioural components presented in the holistic perspective. The framework makes a special emphasis on the student as the centre of the key engagement constructs echoed by Fredricks, Blumenfeld and Paris (2004). Every element in the framework can be identified as a possible force to influence student engagement. Student engagement cannot be considered as the sole influence of internal or external factors, but factors can be classified as direct and indirect factors that increase or decrease student engagement depending on the intensity and relation of each of them.

With reference to the framework above, it presents a summary of many of the possible factors that influence the student engagement. Human learning processes cannot be isolated from internal or external perceptions. As well as this, student engagement is also influenced by the socio-cultural context and self-background, institutions policies and procedures, teaching methods and support, course materials, human and technological resources (such as institution staff and learning management systems), that join to the human facets – emotions, behaviours, motivation to succeed, enthusiasm, family, life load, peers, academics, and relationships. These factors can either– produce or reduce the "fuel" required to achieve their short- and long-term objectives.

2.14. Critical review

Based on the previous literature, the researcher can determine that there is not a unique theory or approach to define the concept of student engagement in the tertiary setting, as well as inferring that it is impossible accurately establish how various engagement related factors would influence students to achieve their educational goals.

Some studies, such as the Lamborn, Newmann and Wehlage (1992), indicate that students can complete their assessments and get their knowledge and skills without being engaged in the topic. However, Gibbs and Poskitt (2010) argue that cognitive engagement requires not only behavioural but emotional engagement. Other studies suggest that teachers and students should work collaboratively to achieve the learning objective, and that is unlikely that students or teachers can do it by

themselves. Thus, it is obvious that more research is required in the different topics involved in this matter.

In addition, the current instruments utilised to measure student engagement, such as surveys only, probably are not the most effective tools since it is not clear whether surveys accurately capture context-sensitive details of student engagement. Moreover, the surveys could be oriented or biased by the institution that conducts those surveys, rendering the data void. For example, Carini, Kuh and Klein (2006) show a lack of association between student academic achievements and NSSE benchmarks within 14 institutions involved in the study. Other studies have also shown modest contributions of NSSE benchmarks, for example, Gordon, Ludlum and Hoey (2008). Thus, if only surveys are used in measuring student engagement, then the evidence might become insufficient to demonstrate valid predictability in the used instruments.

A recent NSW Education reports indicate that student engagement could identify outcomes of programs offered to students, and their participation in various curriculum related activities (Department of Education NSW 2020) Thus, measures of engagement could iclude dimensions such as relationships with teachers and peers; cognitive measures such as academic performance or attainment and behavioural dimensions such as attendance and participation in school activities. Research also has shown that student engagement is not only an important outcome in itself, but is also directly related to academic performance and future outcomes (Nizam Ismail, Hamid & Chiroma 2019). Using LMS, these are now possible as LMS' provide various options and analytics functions to track such measures.

Student engagement has been classified in different scales and principles. The following table shows some of them.

Table 2.1. Student Engagement Classification

Study	Classification	Subclassification
Krause and Coates (2008)	Seven scales of student engagement for first-year undergraduate students in Australia: • Transition Engagement Scale • Academic Engagement Scale • Peer Engagement Scale • Student-Staff Engagement Scale • Intellectual Engagement Scale • Online Engagement Scale • Beyond-class Engagement Scale	
Kahu (2013)	Student Engagement Perspectives; • Behavioural Perspective • Psychological Perspective • Socio-cultural Perspective • Holistic Perspective	Dimensions of engagement in the psychological perspective: • Behaviour • Cognition • Emotion • Conation

The NSSE (2010)	Five engagement scales: Academic challenge Active learning Interactions, Enriching educational experiences Supportive learning environment	
Coates (2010)	Educational outcome measures: Higher order thinking General learning outcomes Career readiness Grade Departure intention Satisfaction	

2.15. Research gap

An investigation into what really constitutes student engagement, in this particular century, and what factors influence this engagement is required before determining metrics to measure student engagement. From the discussion above, it is possible to discern several factors that influence student engagement directly and indirectly. The direct factors are those that aid learning as a result of engagement. This could be course materials, academics' skills, or the approach to supporting learning styles of students. On the other hand, the indirect factors are those that facilitate engagement. These could be the technology platform, the LMS, and the delivery mode. These factors have been identified loosely as an initial point in this study based on the literature review and shown below so that further investigation can be conducted.

Table 2.2. Direct and Indirect Students' Engagement Factors

Direct Factors	Indirect Factors
Learning resources (preparation, selection, usefulness, and relevance)	Teaching context (Institution and delivery mode)
Teaching competency	Social network
Knowledgebase	Technology (LMS)
Learning style	

The literature is able to provide us with the distinction between the direct and indirect factors, what is unclear in the literature is the application of these to the seven key factors that influence student engagement in a course, namely, (1) educational resources, (2) social network, (3) material relevance, (4) learning styles, (5) material selection, (6) material usefulness, and (7) preparation by educators. While these seven factors appear to be 'direct' factors, it is unclear as to how these factors influence the indirect factors identified in the scope of this study. The teaching context, as explained before, plays a crucial role since it may involve ICT technologies such as LMS' plus the appropriate selection of the educational materials and the way these can be accessed, discussed and delivered to meet the various individual needs. These influences need to be investigated to ascertain the teaching context and its technology

so that the indirect factors and any influence that these factors demonstrate in terms of student engagement can be determined. Further, the literature is unclear as to how these factors can be grouped to determine the dimensions of (1) competency, (2) knowledge base, (3) capability, (4) active participation by students, and (5) context. Therefore, further thought is required to ensure the appropriate measurement of these factors and dimensions so as to arrive at the determination of engagement in an LMS environment.

In essence, the literature review has clearly identified that there is much needed to be done in terms of student engagement as the technology factor and subsequent engagement appears to occur beyond the classroom, and perhaps continuously. With this assumption, this study has identified the main gap as to **how the various ICT driven LMS factors influence engagement in tertiary settings and how do these factors contribute to such engagement**.

Within this gap, this study is able to identify four key questions that can be addressed to verify the factors that influence student engagement, and it is imperative that these set of factors are examined comprehensively.

1. Which direct factors determine students' engagement in a learning management system based tertiary context?
2. Which indirect factors determine students' engagement in a learning management system based tertiary context?
3. What is the granularity of the influence of these two sets of factors (direct and indirect) on academics and students?
4. What is the common set of factors that influence students' engagement?

These four questions have anchored the study, and in the next chapters methodologies, data collection, and data analyses procedures will be explained to answer these research questions.

2.16. Conclusion

In this chapter, available literature was reviewed with a view to discerning critical information on student engagement. In the next chapter, Research Methods that are suitable to address the main research questions are presented.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Chapter overview

The ‘search for knowledge’ is commonly referred to as research (Kothari 2004, p. 1). The definition of Business Research is normally considered to be the application of scientific method on a business problem so that facts can be established (Babin & Zikmund 2016; Zikmund, Babin & Griffin 2013). According to Babin and Zikmund (2016); Zikmund, Babin and Griffin (2013), scientific methods provide evidence-based on information collected so as to reach impartial findings, by primarily collecting facts and examining (in an unbiased manner) ideas to support decisions (Babin & Zikmund 2016; Zikmund, Babin & Griffin 2013). Thi chapter discusses how scientific methods are applied in this study.

This chapter contains ten sections. Section 3.1 is an overview of the chapter. Section 3.2 contains the research philosophy with a treatment on pragmatist research philosophy. Section 3.3 provides details on the mixed method research design employed in this study. Section 3.4 provides a sketch on both inductive and deductive approaches. Section 3.5 discusses qualitative methods, with Section 3.6 detailing the quantitative methodology. Section 3.7 provides details on primary and secondary sources of data collected in this study. Section 3.8 provides details on sampling techniques employed in this study. Section 3.9 gives an account of ethical considerations. The last section, 3.10, provides a summary of the chapter. These are shown in the following graphical layout:

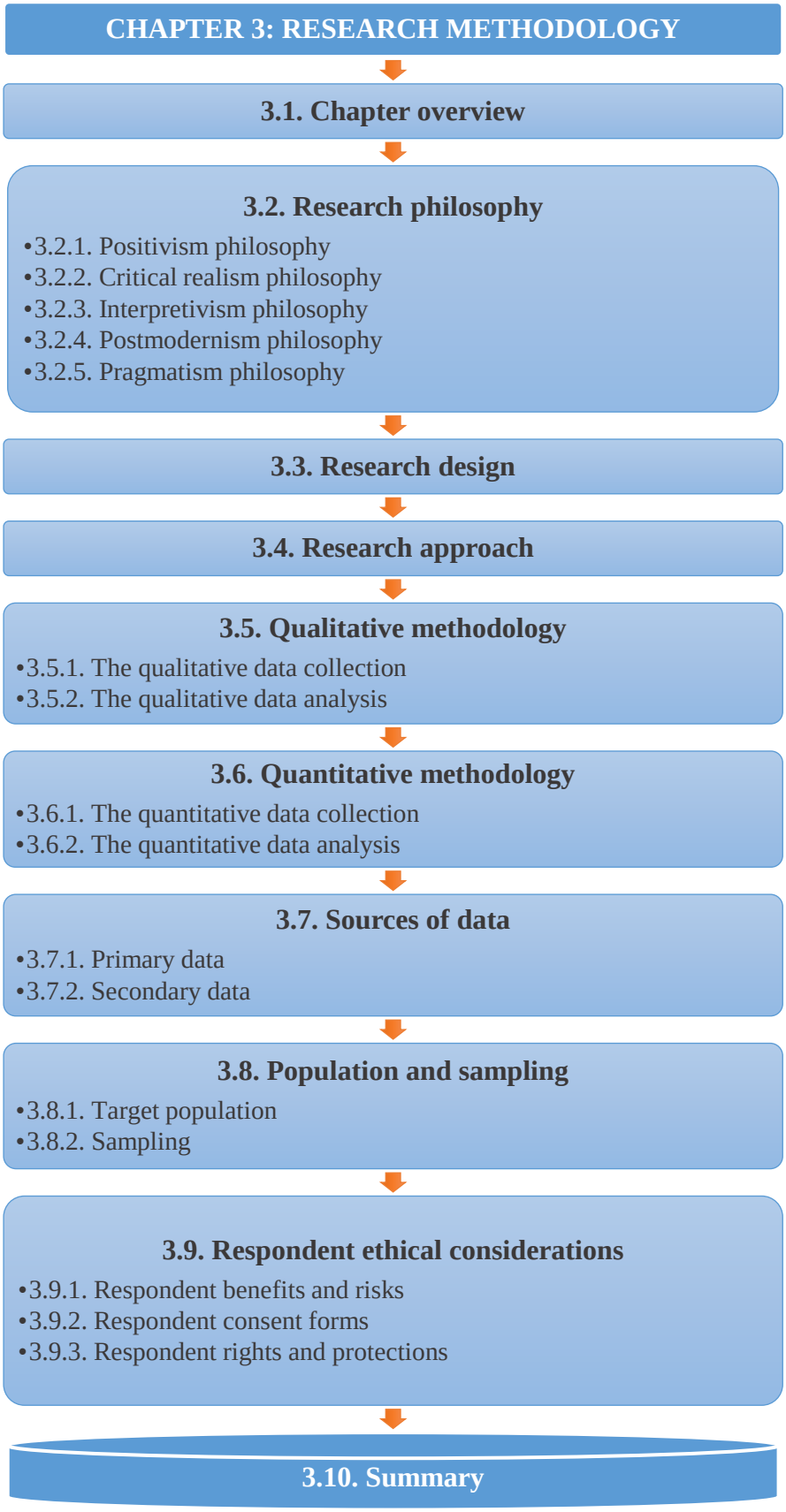

Figure 3.1. Graphical structure of chapter 2

3.2. Research philosophy

Research philosophy refers to a set of beliefs about adding to knowledge contribution on a chosen research topic (Collis & Hussey 2013; Saunders, Lewis & Thornhill 2015; White & Rayner 2014), and forms a significant part in laying out the research process. The philosophy provides a clear direction to explore various possibilities in answering the research objectives, and this, in turn, will culminate in improved research skills, leading to a better research design (Holden & and Lynch 2004). In terms of research philosophy, especially within the domain chosen, it is possible to find positivist philosophy, critical realism, interpretivist philosophy, postmodernism and pragmatist philosophy (Saunders, Lewis and Thornhill (2015, p. 135). However, due to the variety of philosophies available on hand, there can be confusion as to the appropriateness of the chosen philosophy, and there appear to be no particular recommendations found in the literature. If anything, the literature clearly indicates that the research philosophy should be closely aligned to the type of research questions asked. In order to justify the choice of the research philosophy, this study provides a brief discussion as follows.

3.2.1. Positivism philosophy

Positivism identifies quantitative approaches as a meaningful path to reaching a conclusion (Goldenberg 2006; Sarantakos 2013; Saunders, Lewis & Thornhill 2015). This positivism philosophy was developed by Comte in the late 1830s (Remenyi et al. 1998). This philosophy concentrates on objective and quantitative research and is heavily dependent upon quantitative (statistical) tools to provide evidence (Collis & Hussey 2013; Remenyi et al. 1998; Sarantakos 2013; Saunders, Lewis & Thornhill 2015). This philosophy is built on large quantitative samples (hence sampling error and techniques), and associated measurements (Saunders, Lewis & Thornhill 2015). In this study, it would be appropriate to use the Positivist philosophy for the quantitative component.

3.2.2. Critical realism philosophy

Critical realism philosophy deals with knowledge systematically derived from the real world (objective) (Mingers, Mutch & Willcocks 2013; Saunders, Lewis & Thornhill

2015), and hinges on the notion that the world is accessed through oblique and mental models (Sarantakos 2013). This philosophy is suitable for studies that explore either qualitative or quantitative subject matter, but not both (Saunders, Lewis & Thornhill 2015). Therefore, this philosophy may not be suitable for this study.

3.2.3. Interpretivism philosophy

The philosophical position of Interpretivism is that humans vary in their subjective meanings from time to time (Sarantakos 2013; Saunders, Lewis & Thornhill 2015), and hence, this philosophy is dependent upon the various interpretations and narratives to draw conclusions (Saunders, Lewis & Thornhill 2015). The basis of Interpretivism is understanding of social life events (Sarantakos 2013, p. 40) and is relevant when studies explore subjective meanings with the conversational-type investigation (Goulding 1998; Sarantakos 2013; Saunders, Lewis & Thornhill 2015). For the qualitative aspect of this study, this philosophy may be relevant.

3.2.4. Postmodernism philosophy

Postmodernism is concerned about socially constructed themes (Calás 2003; Saunders, Lewis & Thornhill 2015), predominantly focusing on various meanings such as absences and silences as well as interpretations (Saunders, Lewis & Thornhill 2015). Postmodernism is somewhat similar to Interpretivism as both philosophies employ qualitative investigations (Saunders, Lewis & Thornhill 2015). Therefore, it can be argued that Postmodernism can be applied to this study, specifically to the qualitative component.

3.2.5. Pragmatism philosophy

Pragmatism is employed when human action is measured (Saunders, Lewis & Thornhill 2015), and is widely applicable for various research methods (Creswell 2014; Saunders, Lewis & Thornhill 2015; Wahyuni 2012). Philosophical Pragmatism was developed by John Dewey as a means of measuring human action and experiential learning (Hickman 1990; Miettinen 2000; Sleeper 1986). Hence, it is possible to use this philosophy for the current study due to the philosophy's versatility. As Pragmatism can include both quantitative and qualitative spectrums, within the

context of this study it is possible to explore the research objectives mixing qualitative and quantitative data freely without stipulating the sequence so as to better understand social reality through the experiences (Gray 2013; Saunders, Lewis & Thornhill 2015; Wahyuni 2012). In addition, using this philosophy, it is possible to start the exploration of a research question with a view to arriving at a research framework as suggested by (Johnson & Christensen 2014; Wahyuni 2012) and then seek answers for the research problems (Johnson & Christensen 2014; Saunders, Lewis & Thornhill 2015). Using Pragmatist philosophy, it is also possible to arrive at precise values and facts indicating the spectrum of quantitative and qualitative and extract contextual details from established theories and concepts (Saunders, Lewis & Thornhill 2015). For these reasons, the pragmatist approach is found to be most suitable in guiding the framework of this study.

3.3. Research design

The research design outlines approaches, methods, techniques, and processes for data collection, validation and analysis (Creswell 2014; Zikmund, Babin & Griffin 2013), and addresses conditions of collecting and analysing data in a relevant way (Waithiegeni Kibui 2015). The purpose of a research design is to simplify complexities encountered in the research and make the steps involved easy to execute (Fiorini, Griffiths & Houdmont 2016; Johnson & Christensen 2014; Lowenthal & Leech 2009).

This study is conceived to understand the various factors that influence student engagement in the classroom. This objective was met by conducting focus group discussions and interview as part of a sequential qualitative multimode design. The second key objective is to investigate the relationship between the key engagement factors and their respective influence on engagement, and this was met by employing a quantitative survey questionnaire. The reason for employing a multimodal approach is to provide depth and breadth at the same time. Prior studies examined focused on only one approach, thus limiting their validity. By using mixed modes, it is possible to improve the validity of outcomes as the rich conversations will complement survey data (Creswell 2014; Köker 2014; Punch 2014; Venkatesh, Brown & Bala 2013).

In this study, a sequential exploratory approach is employed (qualitative informing and quantitative design) to address the objectives of the study in a suitable manner (Cameron 2009; Cooper & Schindler 2011; Creswell 2014; Johnson & Christensen 2014; Leavy 2017). In order to comprehensively understand the domain and the context chosen, this study employed a qualitative phase, and this subsequently informed the quantitative phase of data collection and analysis, as the survey instrument was drawn from the rich qualitative conversations (Cameron 2009; Creswell 2014; Mauceri 2014). This approach enabled the researcher to better understand the research settings and test the hypotheses later in the second phase (Bentahar & Cameron 2015; Creswell 2014; Johnson & Onwuegbuzie 2004). This delay in hypotheses testing also enabled the researcher to verify the research design in terms of the conceptual model, as the qualitative phase provides further validation to the model developed initially from the literature that was not specific to a given context. Figure 3.2 shows this in a graphical form below.

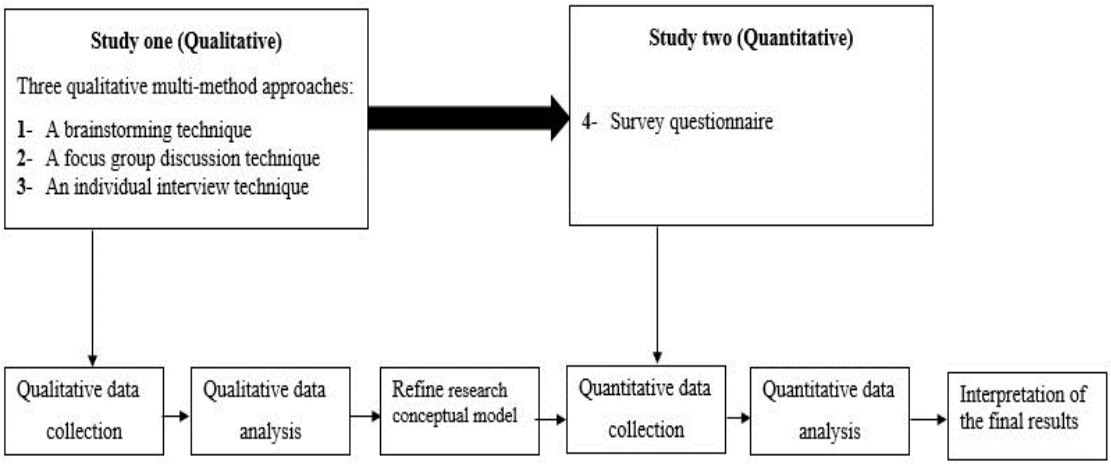

Figure 3.2. A sequential mixed methods design (Source: A specific approach designed by Gururajan & Baig and successfully implemented in many prior research studies)

As shown in Figure 3.2, study one employs the brainstorming, focus group discussions and individual interviews (Gururajan et al. 2015; Ritchie et al. 2013; Torres & Carte 2014). The brainstorming was employed for the following reasons:

Prior studies recommend that for generating ideas in terms of both quantity and quality, brainstorming is an optimal method (Boddy 2012; Goldenberg & Wiley 2011; Haddou, Camilleri & Zaraté 2014; Hägg & Musse 2016; Korde 2014; Kornish & Hutchison-Krupat 2017; Levine et al. 2016; Rietzschel, Nijstad & Stroebe 2006; Sekhar & Lidiya 2012). Brainstorming generates creative ideas that are original and specific (Brewer 2017; Dean et al. 2006; Helquist, Kruse & Diller 2017). Boddy (2012); Gřibek (2011); Potter and Losee (1996) state the other merits of brainstorming techniques:

1. it provides each participant with equal time to think and speak (Litcanu et al. 2015);
2. it encourages the generation of many ideas in a short time span (Litcanu et al. 2015; Sekhar & Lidiya 2012); and finally,
3. it provides input into other techniques such as the focus group discussions (Fitzgerald 2015; Gallo & Gonos 2014; Keeney 2012; Lee et al. 2015; O'campo et al. 2015).

The focus group technique was selected for the following reasons:

(1) focus groups can explore participants' experiences and knowledge using open-ended format and facilitates information sharing (Dilshad & Latif 2013; Eizenberg, Orenstein & Zimroni 2017; Morgan et al. 2016; Thrul et al. 2017; van Venrooij & Barnhoorn 2017).

(2) focus group discussions provide a mechanism for idea evaluation through snow-balling effect conversations (Boddy 2012; Eizenberg, Orenstein & Zimroni 2017; Mandić, Crnković & Vranešević 2013; Thrul et al. 2017; van Venrooij & Barnhoorn 2017).

(3) focus groups provide rich conversations and act as a pre-cursor to in-depth interviews if conducted later (Brown 2015; Morgan et al. 2016; Pearson & Vossler 2016; Zikmund, Babin & Griffin 2013);

(4) focus groups enable a researcher to be involved in the conversation with participants, and thus provides a comprehensive understanding of the subject domain

(Eizenberg, Orenstein & Zimroni 2017; Jeong 2016; Mandić, Crnković & Vranešević 2013; Thrul et al. 2017; Tshehla 2014). Finally,

(5) focus groups are cost effective to conduct (Brown 2015; Eizenberg, Orenstein & Zimroni 2017; Jeong 2016; Masadeh et al. 2016; Morgan 1997; Pearson & Vossler 2016; Saberiyan 2015; Yelding & Cassim 2016; Zikmund, Babin & Griffin 2013).

The following reasons justify the individual interviews employed in this study:

(1) individual interviews cater to indepth conversations, eliciting experiences and enable understanding of meanings created (Brashear et al. 2012; Lucas 2014).

(2) individual interviews provide depth in exploring complex research objectives (Al Ariss, Cascio & Paauwe 2014; Morgan et al. 2016; Saberiyan 2015).

(3) individual interviews are useful in leading to the formation of pesudo generalisations as they provide an initial feel for what can be accomplished through a quantitative survey (Dworkin 2012);

(4) individual interviews enable deeper comprehension and exploration (Ahorbo 2014; Brashear et al. 2012; Brédart et al. 2014; Manly 2016).

(5) individual interviews help to finalise a survey instrument that is relevant and appropriate to a given context (Brédart et al. 2014; Creswell 2014; Howard et al. 2016; Veronese, Pepe & Afana 2016).

(6) individual interviews can be conducted with people with good communication skills as they involve rich interactions about a specific topic (Silverman 2014).

As a result of the above, in this study, it was decided to employ a multimode qualitative (inductive) phase to explore various experiences in the given context with a view to validating the initial set of factors identified through the literature and establish relevance to those factors in the given context. Subsequently, a survey instrument was prepared by mixing the literature and qualitative data to ensure the relevance and validity of the instrument. Finally, second order regression modelling was employed for hypothesis testing (Bryman & Bell 2007; Creswell 2014; Tharenou, Donohue & Cooper 2007).

In conclusion, based on a deep understanding of this sequential exploratory strategy, qualitative methodology was employed as a first stage process followed by the second stage of quantitative methodology.

3.4. Research approach

There are two core categories of research approaches available (inductive and deductive) that are applicable depending on the theory used and the associated research process employed (Cho & Lee 2014; Ledin, Norell & Thorell 2016; Tanwar et al. 2017). The deductive approach is employed when the study follows a quantitative spectrum, and hypotheses testing are conducted (Brannen 2017; Cho & Lee 2014; Hamad et al. 2016; O'Dwyer & Bernauer 2014; Sekaran & Bougie 2016; Tanwar et al. 2017; Walliman 2011), and this approach is predominantly when theory is expanded with data (Hawashe & Ruddock 2014; Leavy 2017). On the other hand, the inductive approach is employed when conversations are distilled to generate a theory (Brannen 2017; Cho & Lee 2014; Hamad et al. 2016; Leavy 2017; Sekaran & Bougie 2016; Tanwar et al. 2017; Walliman 2011), and when the theory developed from practical actuality (Collis & Hussey 2013).

In this study, a sequential mixed-methods design consisting of deductive and inductive approaches were used with both qualitative data and quantitative data (Sekaran & Bougie 2016). Brannen (2017); Saunders, Lewis and Thornhill (2015); Sekaran and Bougie (2016) indicate that inductive type approaches are most appropriate to explore rich information from participants qualitatively. The inductive approach employed in this study is to augment the five key themes identified.

On the other hand, a deductive approach relies on quantitative testing protocols. In this study, the deductive approach is employed through a custom prepared quantitative survey questionnaire. The hypotheses were tested using the survey to investigate the relationship between engagement processes and the engagement itself. Thus, the two complementary approaches served the aim of this research.

3.5. Qualitative methodology

Qualitative research is utilised by researchers to discover and realise the meaning of certain phenomenon (Creswell 2014). In this study, the researcher assessed the reliability and validity of brainstorming, focus group and interview instruments by employing a peer review through academic experts to ascertain that the instruments are relevant to the given context (Antaya & Parrish 2014; Eschler, Taylor & Palkar 2015; Gururajan et al. 2014; Gururajan et al. 2013; Yurtseven & Altun 2015). The qualitative data collection and the analysis provided a comprehensive knowledge of the given research. Figure 4.3 is a graphical summary of the qualitative part of this study.

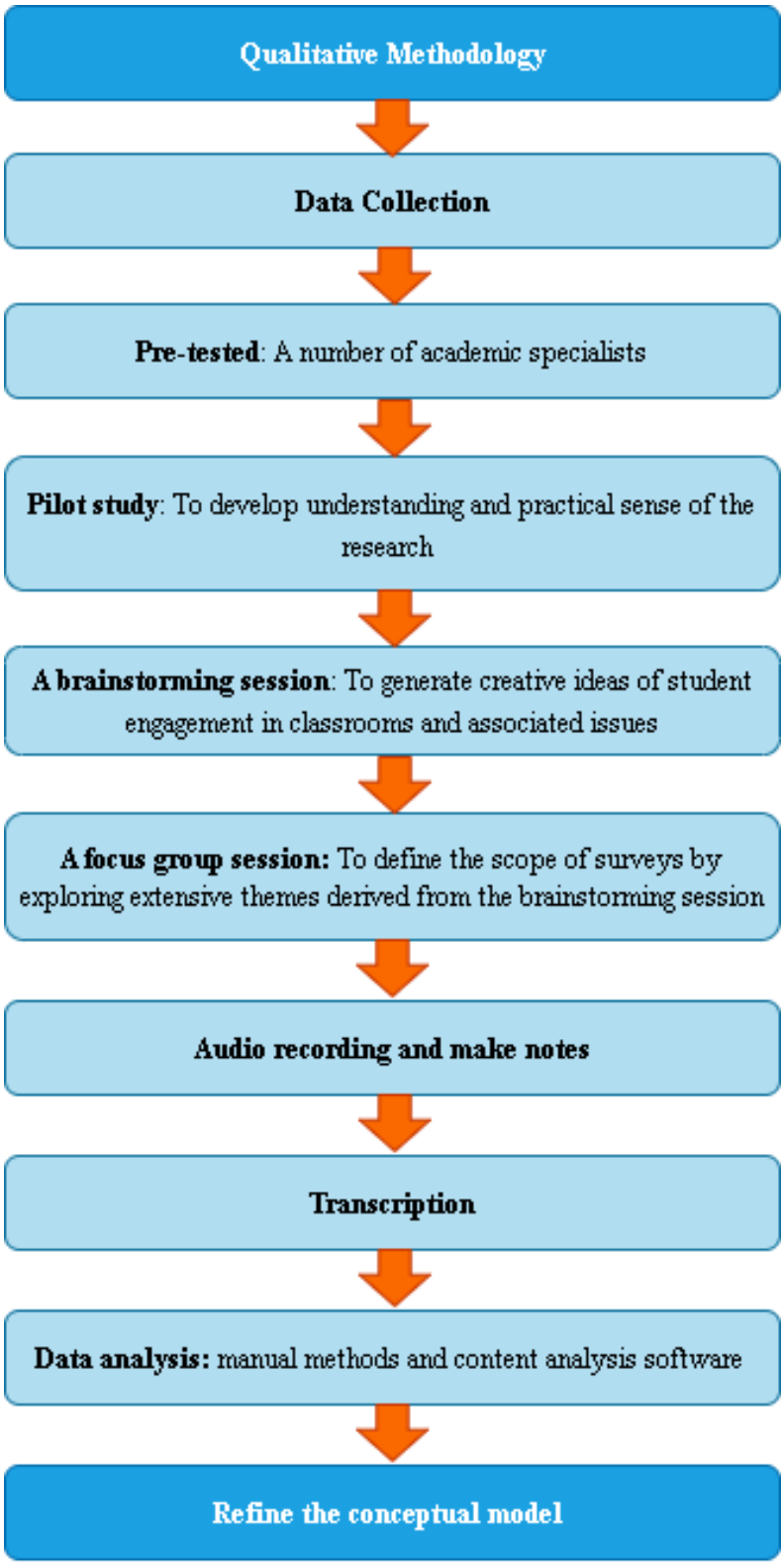

Figure 3.3. Qualitative methodology

3.5.2. The qualitative data collection

The qualitative data collection is concerned with the collection of textual and other non-numerical information (Zikmund, Babin & Griffin 2013). In this study, brainstorming, focus groups, and interviews were employed to define the scope and boundary of the study. Further, the qualitative component also enabled the researcher to obtain a comprehensive understanding of the context in order to develop the survey instrument (Aldhaban 2016; Dilshad & Latif 2013; Gururajan et al. 2014; Torres & Carte 2014).

3.5.3. The qualitative data analysis

The analysis of qualitative data involved making sense of the data into small themes (Zikmund, Babin & Griffin 2013). This involved developing a detailed, systematic way of cataloguing the data collected with a view to adding richness to the given context (Tharenou, Donohue & Cooper 2007). The data analysis normally involves extracting constructs, themes, nodes, and trees, and this process is dependent upon the software application used. It is customary practice to manually read the transcripts to make a sense of the conversation, and this leads to the formation of a rough mental model. The mental model will result in the arbitrary selection of various concepts called nodes or themes (Ngulube 2015; Paulus & Bennett 2017). Thus, the qualitative study in this research was useful for designing a questionnaire that was administered in the second phase of this research. The procedures of the qualitative data analysis methodology are fully discussed in Chapter Six of this study.

3.6. Quantitative methodology

Quantitative research examines the testing of relationships among variables (Creswell 2014; Sarantakos 2013). In this study, as mentioned earlier, the quantitative data collection and the analysis were conducted to test the relationship between the constructs contributing to the engagement and the engagement itself. Figure 4.4 shows the approach of quantitative methodology.

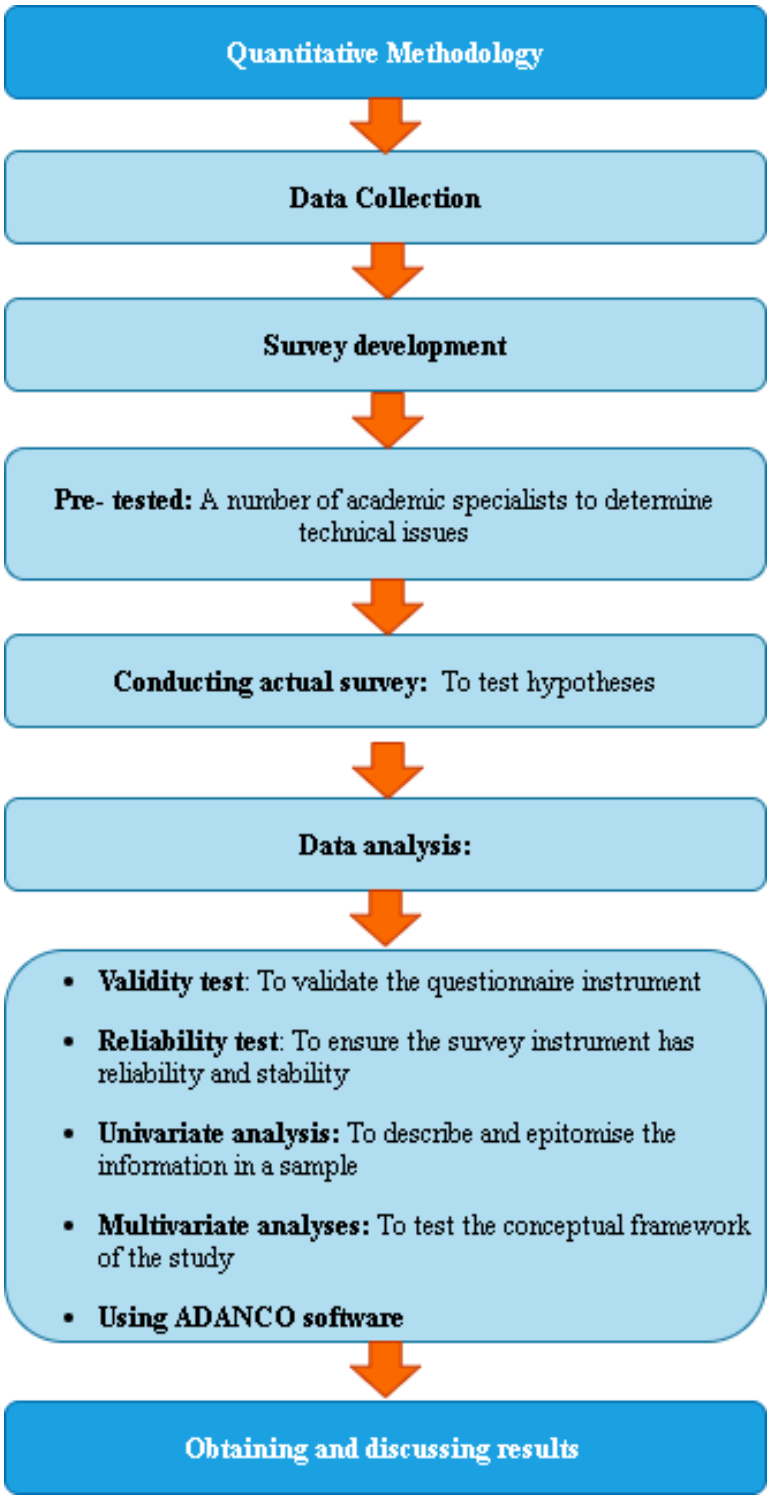

Figure 3.4. Quantitative methodology

3.6.2. The quantitative data collection

Data characterised by numbers is normally called the quantitative data collection (Zikmund, Babin & Griffin 2013). Normally in quantitative research, data are in the

form of measurements, and hence the scale is very important (Punch 2014). In this study, to explore the relationship between the study's variables, required data were gathered by a questionnaire consisting of a five-item Likert scale (Clason & Dormody 1994; Dimitrov 2012; Zikmund, Babin & Griffin 2013).

The researcher refined the questionnaire through an academic peer review process to validate the relevance (Raj 2013; Ritchie et al. 2013). Subsequent to this validation, a pilot test was conducted to evaluate the feasibility of the questionnaire.

3.6.3. The quantitative data analysis

The quantitative data analysis is conducted in this study to examine trends as well as modelling (Zikmund, Babin & Griffin 2013), and to examine hypotheses forecasts (Tharenou, Donohue & Cooper 2007). In this study, various tests to assure that the data were normal were conducted prior to the Structural Equation Modeling.

3.6.3.1. Validity testing

Validity is referred to as the accurate representation of measures employed in an instrument (Hair et al. 2010). Validity is essential in a quantitative survey as it underpins the attitudes (Fink 2003). In this study, content and construct validity were used to ensure the survey instrument was both relevant and appropriate (Cooper & Schindler 2011; Fink 2003; Nguyen Hong 2016). The content validity assured the suitability of questionnaire items, and this involved checking the clarity of each statement in terms of meaningful and grammatical content. On the other hand, the construct validity assured the right statements were included in the instrument, thus assuring relevance (Osborne & Costello 2009; Yong & Pearce 2013). In this study, using exploratory construct validity, questionnaire item validity was asserted (Aladwani 2014; Hajian et al. 2016; Olufadi 2015, 2017). Using a simple factor analysis, construct measurement was illustrated (Osborne & Costello 2009; Yong & Pearce 2013). Further, a number of other statistical tests were used to ensure the convergent validity of the constructs (Fornell & Larcker 1981; Hair et al. 2010).

3.6.3.2. Reliability testing

In this study, a pilot test was employed to assure survey instrument reliability and stability (Johnson & Christensen 2014). Using Cronbach's alpha, the study measured internal consistency (Field 2018; Hair et al. 2010; Johnson & Christensen 2014). Normally a value of 0.7 or over is an indicator of internal consistency of an instrument (Field 2018; Hair et al. 2010; Tabachnick & Fidell 2007). In this study, this reliability test was performed on each key construct. Further, this study also employed the composite reliability technique to assure the validity and reliability of the survey instrument (Bagozzi & Yi 1988; Nunnally & Bernstein 1994).

3.6.3.3. Correlation, regression, and structural equation modelling analyses

Any significant relationships between engagement constructs and engagement processes were measured through simple regression and SEM analyses. The research hypotheses were tested using structural equation modelling. The Statistical Package ADANCO was used for quantitative data analyses. Both simple regression analysis and structural equation modelling were used for investigating the relationship between engagement constructs and the engagement processes so that reliability of the quantitative findings could be improved and asserted (Graham 2003; Hair, Ringle & Sarstedt 2011; Jeon 2015). This approach has been recommended by prior studies such as Chin (1998a); Gefen, Straub and Boudreau (2000). In this study, regression analysis was first used to generate an initial analysis, followed by structural equation modelling as the second-generation analysis technique (Chin 1998a; Gefen, Straub & Boudreau 2000).

3.7. Sources of data

In this study, both primary and secondary data sources were used as suggested by (Cooper & Schindler 2011; Hox & Boeije 2005).

3.7.1. Primary data

In this study, both qualitative and quantitative primary data were collected by using mixed-mode techniques.

3.7.2. Secondary data

In this study, a variety of sources such as published literature and grey literature were used to gain secondary data (Cooper & Schindler 2011; Hox & Boeije 2005; Koranteng 2014; Zikmund, Babin & Griffin 2013). Some of the government reports were found to be useful as they are widely available, and this approach was recommended by Zikmund, Babin and Griffin (2013). This resulted in cost and time savings (Hox & Boeije 2005; Zikmund, Babin & Griffin 2013). This approach using secondary data also enabled the researcher to minimise any potential bias, while at the same time improving the reliability and validity of data sources used (Rozenblat et al. 2017; Zikmund, Babin & Griffin 2013).

3.8. Population and sampling

Population and sampling used in this study is further expanded to include the target population and sampling – these two categories contain sampling criteria and sampling size.

3.8.1. Target population

A population is an integral group of independent elements from which a sample is selected (Bryman & Bell 2007; Cooper & Schindler 2011; Zikmund, Babin & Griffin 2013). It is a customary practice for a researcher to initially determine a target population and within this, an appropriate sample (Al Haidari 2015; Zikmund, Babin & Griffin 2013).

3.8.2. Sampling

Once the target population is identified, a sampling stage will follow, as the sample is drawn from the population (Cooper & Schindler 2011; Hair Jr et al. 2016; Johnson & Christensen 2014; Leavy 2017; O'Dwyer & Bernauer 2014; Tharenou, Donohue & Cooper 2007; Zikmund, Babin & Griffin 2013). In this study, a specific sampling strategy was adopted (Collins, Onwuegbuzie & Jiao 2006, 2007; Migiro & Magangi 2011). The study used a purposive sampling technique for the qualitative phase and a stratified random sampling for the quantitative phase (Collins, Onwuegbuzie & Jiao 2006, 2007).

3.8.2.1. Sampling criteria

This study has chosen higher education as its scope. Within the scope of this study, individuals studying at USQ were recruited for the following reasons:

(1) these individuals were able to provide specific classroom engagement details, thus leading to a competitive resource (Chadee & Raman 2012; Ortlieb & Sieben 2012; Thomas 2015);

(2) leading to the improved validity of the data collected (Arnold 2016; Kong, Chadee & Raman 2013; Thomas 2015);

(3) these individuals were able to provide accurate information about the various processes involved in the classroom engagement as they are in the domain of the research study (Ortlieb & Sieben 2012; Thomas 2015); and

(4) these individuals were able to contribute to the engagement and thus play a significant role in a dynamic environment (Borisova et al. 2017; Kong, Chadee & Raman 2013; Rong & Grover 2009).

While sampling in mixed research is complicated, it is essential to follow appropriate sampling aspects to establish quality inferences (Lowenthal & Leech 2009).

3.8.2.2. Sampling size

In mixed-method studies, determining an appropriate sample size is dependent on the availability of resources and the research objectives (Kelley et al. 2003). Due to its nature, qualitative studies normally require a small sample (Kelley et al. 2003; Sabbah 2017). In this study, the sample for the brainstorming part consisted of six to eight participants, and this sufficed and guided the group in terms of the brainstorming's purpose and procedure (Hopf et al. 2014; Lefika & Mearns 2015; Peek & Fothergill 2009; Todd, Jones & Lobban 2012). The focus group size was expected to vary between four and ten individuals, depending on the site and availability of staff on the day of the focus group interview (Ahmed, Hay & El-Gohary 2015; Atanga 2007; Gates & Statham 2013; Gururajan et al. 2015; Ritchie et al. 2013; Todd, Jones &

Lobban 2012; Zikmund, Babin & Griffin 2013). In terms of individual interviews, this study estimated a sample size of five to eleven participants (Blackman & Kennedy 2008; Gateau & Simon 2016; Kong, Chadee & Raman 2013; Peet 2010; Whelan, Collings & Donnellan 2010).

In this study, to test the hypotheses, regression and structural equation modelling techniques were used (Chin 1998a; Gefen, Straub & Boudreau 2000). Normally such approaches will require sample sizes of 200 respondents or more (Byrne 2016; Ekermans et al. 2011; Fabrigar, Porter & Norris 2010; Hoe 2008; Hooper, Coughlan & Mullen 2008; Igundunasse 2016; Jöreskog & Sörbom 1996; Kuo & Yang ; Lei & Wu 2007; McCoach 2003; Nokelainen 2007; Siddiqui, Mirani & Fahim 2015). Therefore, the researcher initially sampled between 300 and 400 individuals and received 97 valid responses. This sample size has provided the researcher with an option to use a PLS based tool as these tools accommodate small sample sizes to provide meaningful outcomes. The summary of the population and research sample is shown in the table below:

Table 3.1. The population and research sample

Description	Qualitative study	Quantitative study
Population	Individual students from University of Southern Queensland	
Justification	Convenience and approachability	
Sampling method	Purposive	Random
Sample size	Brainstorming = 8 Focus group = 10	280

3.9. Respondent ethical considerations

It has become the norm in research to follow ethical behaviours so that no harm or adverse consequences are encountered by participants (Cooper & Schindler 2011;

Zikmund, Babin & Griffin 2013). Ethical considerations are important in Business Research and inform participants as to the conduct of the research study (Cooper & Schindler 2011; Creswell 2014; Ritchie et al. 2013; Saunders, Lewis & Thornhill 2015; Tharenou, Donohue & Cooper 2007; Zikmund, Babin & Griffin 2013). Ethical conduct of research includes informed consent, conflicts of interest, harm to participants, and invasion of privacy (Bryman & Bell 2007; Tharenou, Donohue & Cooper 2007; Zikmund, Babin & Griffin 2013). The researcher has applied all required procedures to obtain ethics approval from the University of Southern Queensland's Office of Research/Human Research Ethics Committee (HREC). This research complies with the National Statement on Ethical Conduct in Human Research (2007), and full approval was provided for a period of three years.

3.9.1. Respondent benefits and risks

As prior studies suggested, in this study, possible benefits of participation were explained to participants (Leavy 2017). This study enabled:

1- participants (the qualitative study) had an opportunity to discuss with other issues that were similar for each of them;

2- participants (both the qualitative and quantitative studies) benefitted because they had an opportunity to consider issues relevant to their study; and

3- participants (both the qualitative and quantitative studies) were able to understand various processes in terms of engagement in classrooms.

In terms of the qualitative study, there were minimal risks associated with participation in this project and these were covered in the consent form and during the briefing sessions. These included voluntary participation, withdrawal from the study at any time, reporting of ethical issues of the university and so on. In terms of the quantitative study, this study assessed the risks to be negligible.

3.9.2. Respondent consent forms

In this study, respondent consent forms were prepared for participants to inform them of what the researcher was investigating, and to enable them to provide informed

consent for participation (Creswell 2014; Zikmund, Babin & Griffin 2013). Informed consent, in this study, applied to the three qualitative techniques of this research. Appendix B provides a consent form of the brainstorming, focus group, and survey techniques of this study. In the online survey, a statement was included to highlight voluntary participation and clarified that all participants had the right to discontinue participation at any time.

3.9.3. Respondent rights and protections

During this research, the paper files were stored appropriately following the university guidelines. In addition, the data were stored at USQ (on the researcher's computer) managed by USQ ICT services. This computer was password protected. After completion of the study, all electronic files and data were stored in the USQ record repository. For the purpose of data retention, the electronic data were stored on the USQ sites. The data is not publicly available because the data may contain sensitive information on organisational processes.

3.10. Summary

This chapter has focused on the research methodology in ten sections. Section 3.1 started by presenting an introduction to this chapter. In section 3.2, general explanations were made about the research philosophy with a brief explanation of these concepts. The research design, a sequential exploratory strategy as mixed methods, was discussed in section 3.3. This involved both qualitative (i.e. brainstorming, focus group discussions, and individual interviews) and quantitative (survey questionnaire) methods. The research approach, inductive and deductive approaches were discussed in section 3.4. Qualitative methods were presented in section 3.5. A quantitative methodology was addressed in section 3.6, while sources of data were outlined in section 3.7. Population and participant sampling were explored in section 3.8. Section 3.9 reviewed ethical considerations. Finally, this summary in section 3.10 has concluded this chapter.

CHAPTER 4: DATA COLLECTION

4.1. Chapter overview

In social sciences studies, qualitative and quantitative approaches are commonly utilised to discover and realise the meanings of a given phenomenon (Creswell 2014). The research methodology was explained in the previous chapter, and this chapter reviews the data collection approaches employed in this study. The qualitative approach employed in this study is explained first, followed by the quantitative approach.

The three qualitative methods considered for this study – namely, brainstorming, focus groups, and survey were organised to address the first research objective of the study. The study aims to understand how engagement factors and processes are conducted in a classroom environment, and the higher education setting is chosen for this study.

The qualitative data collection is organised into nine sections. In Section 4.1, the chapter overview is provided, with brainstorming, focus group discussions, and survery outlined in Section 4.2. The third section, 4.3, provides justification for conducting the three qualitative methods, and this is followed by section 4.4. on methods to confirm the reliability and validity. Section 4.5 explains the qualitative pilot study. Section 4.6 provides details on the administration of the qualitative data collection techniques. Section 4.7 discusses how the qualitative techniques were implemented, including the challenges in using three qualitative techniques. This is then followed by strategies to overcome the challenges discussed in Section 4.8. The final section, 4.9, provides a summary of the chapter. This is shown below graphically.

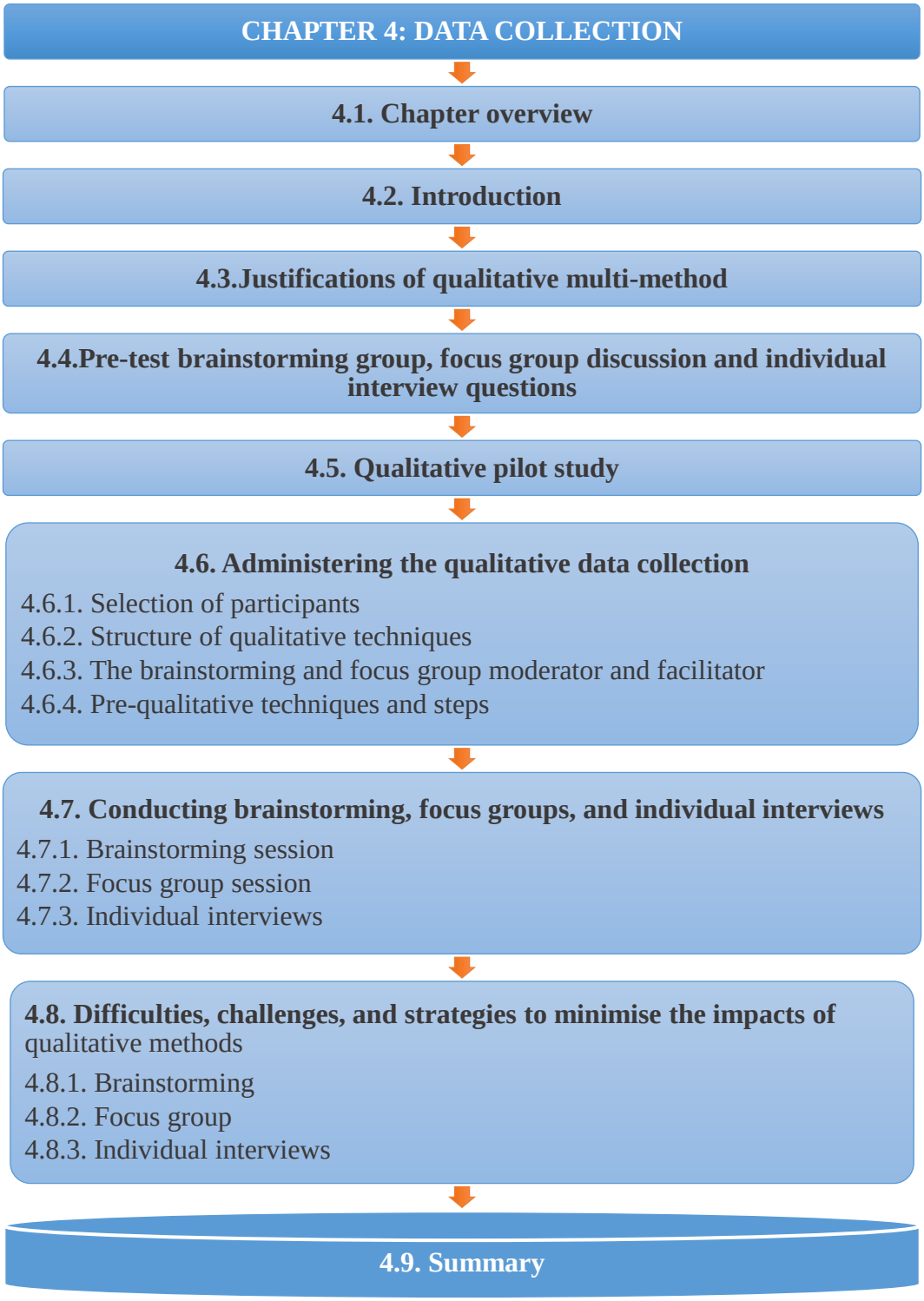

Figure 4.1. Graphical structure of chapter 4

4.2. Introduction

In Chapter 2, it was argued that the existing literature on the measurements of classroom engagement is limited, leading to the first objective of the study; to understand the best processes that are currently used in managing classroom engagement activities. This resulted in consideration of brainstorming, focus group discussions, and individual interviews as the methods of obtaining primary qualitative data (Aldhaban 2016; Dilshad & Latif 2013; Gururajan et al. 2014; Torres & Carte 2014).

In order to understand the context in which the study was conducted, a brainstorming session was conducted. The purpose of the brainstorming session was to derive the themes that reflect various engagement activities so that the scope of the research could be defined. As a means of expanding and understanding the scope, a focus group session was conducted. The purpose of the focus group was to further validate the themes identified through the brainstorming session and to provide a framework for the interviews. The interviews enabled the researcher to explore themes in-depth so that a conceptual model could be finalised for quantitative testing. The data collection occurred with students who were actually the beneficiaries of classroom engagement.

The participants of the data collection were comprised of a representative sample of students who were studying in a tertiary institution in Australia. For example, the participants of the qualitative phase included students studying in a bachelor's program of IT. These students were both domestic and overseas students and came with different levels of background knowledge, experience, educational experience and cultural backgrounds. Some participants had technical knowledge in computing, such as individuals employed in professional Information Technology (IT). All participants were required to complete a consent form to maximise their comprehension of the information shared and how it would be used (Speer & Stokoe 2014; Webster 2017). (See Appendix B). The same consent form was used for the brainstorming session, the focus group session, and the individual interviews.

Brainstorming generates ideas as a result of participants providing key themes in short phrases and possible solutions for issues identified through the discussion

(Hägg & Musse 2016; Helquist, Kruse & Diller 2017; Keeney 2012; Litcanu et al. 2015; McMahon et al. 2016; Rowley & Phibbs 2012). Subsequent to developing ideas, group members go through them to identify similarities with a view to regress the number of ideas generated (Boddy 2012; Gřibek 2011; Keeney 2012; Korde & Paulus 2017; Rietzschel, Nijstad & Stroebe 2006; Rowley & Phibbs 2012; Shih, Venolia & Olson 2011; Shirani, Shahin & Ghasemi 2012).

According to Aldhaban (2016); Gururajan et al. (2015), once the ideas were regressed, the data collection process should then progress towards a focus group session. However, in certain brainstorming sessions, there is an option to rank the ideas so that the scope of the research can further be restricted, and this depends upon the research objectives.

In the focus group, data are collected by snow-balling conversations (Albanesi 2014; Keeley et al. 2016; Krueger & Casey 2015; Walliman 2011), and this results in rich, in-depth information from participants. This sequence enables the confirmation of the findings from the brainstorming session, as well as to provide a framework for interviews (Dilshad & Latif 2013; Gururajan et al. 2014; Torres & Carte 2014). The focus group will normally involve a trained moderator to control the sequence of events of discussion and to ensure that no one person in the group dominates the conversation while exploring topics within the problem domain (Cooper & Schindler 2011; Gururajan et al. 2015; Krueger & Casey 2015; Litosseliti 2003; Sherriff et al. 2014; Silverman 2014; Zikmund, Babin & Griffin 2013).

In this study, individual interviews were the last stage of qualitative data collection (Aldhaban 2016; Gururajan et al. 2015), and the interviews were one-on-one, enabling in-depth exploration of themes identified in the previous two stages. Interviews were conducted using three styles - structured, semi-structured, and unstructured (Al Sawafi 2014; Bryman 2015; Bryman & Bell 2007; DeFour-Howard 2015; Doody & Noonan 2013; Leavy 2017; McTate & Leffler 2017). Table 4.1 shows the details of the three types of interviews.

Comparison of the three types of interviews

Structured interviews	Semi-structured interviews	Unstructured interviews
Pre-determined set of questions	Have an agenda of general themes	Allow participants to talk freely
Permit very little flexibility	Allow eliciting more details and explanations	Allow more flexibility to elaborate
Conducted face-to-face in a formal structured setting and can be done over the phone too	Interviewer has some control over the flow of the interview	Reduce the effect of the interviewer
Provide less details	Provide more details	Provide in-depth detail
Less time to analyse	More time to analyse	Very time consuming to analyse
Easier to be analysed and interpreted	Difficult to be analysed and may provide irrelevant data	Data may often be irrelevant and hard to analyse
Can be used with large samples	Less suitable for larger samples	Unsuitable for larger samples

Source: (Al Sawafi 2014, p. 64)

From Table 4.1, it can be inferred that each type comes with their own advantages and challenges and considering the nature of this study, it was decided to employ semi-structured interviews. In doing so, this study followed the recommendation provided by (Al Sawafi 2014; Brédart et al. 2014; DeFour-Howard 2015; DeStefano 2016; Gururajan et al. 2016; Gururajan et al. 2014; Gururajan et al. 2015; McTate & Leffler 2017; Mwakima 2014)

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4.3. Justifications of qualitative multi-method

Qualitative multi-method techniques were used in this study for the following reasons:

(i) They can lead to the alignment in participants' discussion points (Huff et al. 2015).
(ii) They can improve and improved the reliability and validity of results (Ayón et al. 2016; Huff et al. 2015).
(iii) They can capitalise on the researcher's communication skills to explore themes by probing participants by recognising participants expertise (Ayón et al. 2016).
(iv) There is limited evidence that such a technique is employed in prior studies that explored engagement processes, leading to a new way of exploring knowledge.

Prior studies recommended the use of qualitative components to improve the validity of results due to the ability to cross-reference and aggregate the findings from the different methods (Arino, LeBaron & Milliken 2016; Bogdan & Biklen 2007; Mauceri 2014; Miles, Huberman & Saldana 2014).

4.4. Pre-test brainstorming group and focus group discussion

In this study, all instruments used to collect qualitative data were subjected to rigorous peer and expert reviews so that face validity and content validity could be assured (Antaya & Parrish 2014; Gururajan et al. 2014; Gururajan et al. 2013). The review included academics who specialise in the fields of teaching management associated with information systems and academics who are specialists in linguistic aspects. The peer-review feedback was incorporated into the instruments, and the qualitative data collection used the peer-reviewed and pilot tested versions.

In this study, open-ended questions were used for qualitative data collection as prior literature supported this method for the inductive approach, and this approach is useful in obtaining rich information on a certain issue (Brannen 2017; Cho & Lee 2014; Hamad et al. 2016; Leavy 2017; Sekaran & Bougie 2016; Tanwar et al. 2017; Walliman 2011). To be consistent with the questions, this study adopted the following protocols:

1- The crafting of the questions was carefully constructed.
2- The questions enabled the extraction of personal as well as experience-based information.
3- The questions motivated individuals to engage in discussions.

4.5. Qualitative pilot study

A pilot study is conducted with a trial to ensure that the procedures employed in data collection are working so that they can be replicated in the main study (Pyrczak & Bruce 2016; Shader 2015; Zikmund, Babin & Griffin 2013). In this research, a pilot study was implemented to verify various procedures of the qualitative data collection and to develop a sense of the study domain (Kezar 2000; Van Teijlingen & Hundley 2002). The pilot involved six participants as per the recommendations of Morgan (1997).

The pilot study employed in the study asked two questions; the first one was related to the key themes that influence the engagement, and the second one was in assessing the relationships between these key themes. Details regarding the pilot study findings are outlined elsewhere in this thesis.

4.6. Administering the qualitative data collection

The brainstorming session included identifying and listing members with expertise and skills, and participants were provided with about 60 minutes to brainstorm based on suggestions made in prior studies (Börekçİ 2015; Helquist, Kruse & Diller 2017; Keeney 2012; McMahon et al. 2016; Sekhar & Lidiya 2012). The brainstorming session included three stages – displaying the issue for discussion, generating ideas and enabling engagement (Hender et al. 2001). In this study, the brain-dump and assessment of ideas were used as two key aspects during brainstorming (Boddy 2012; Rowley & Phibbs 2012). Within the context of this study, (1) participants were encouraged to generate numerous ideas; (2) avoided criticism on ideas by members; (3) were allowed the freedom to express out of the box ideas that do not conform to the topic; and (4) consolidate ideas that were similar in nature (Goldenberg & Wiley 2011; Gřibek 2011; Haddou, Camilleri & Zaraté 2014; Levine et al. 2016; Shih, Venolia & Olson 2011; Shirani, Shahin & Ghasemi 2012).

In terms of project management, the researcher provided some suggestions to participants prior to starting the brainstorming session. This included participants should feel free to express their ideas, no domination by an individual and key themes and phrases would be explored further.

On the other hand, in the focus groups, a variety of opinions on the topic were examined through discussions with a focus on a key point. This approach enabled engagement from participants so that they could contribute to the discussion. This approach was recommended by (Krueger & Casey 2015), (Hennink 2014; Sanders 2016; Stewart & Shamdasani 2015).

The reason for applying semi-structured interviews in this study was to obtain a thorough understanding of the topic and the research domain (Brédart et al. 2014; DeStefano 2016; Gururajan et al. 2016; Gururajan et al. 2014; Gururajan et al. 2015; Mwakima 2014). This enabled the identification of problems, so as to structure the quantitative questionnaires (Brédart et al. 2014), and for exploring individual experiences (Cheong et al. 2014).

4.6.1. Selection of participants

In this study, participants were carefully considered for the qualitative phase as they needed to have expertise in the area of the research domain, be able to communicate their ideas and engage in the conversation. Thus, the sample was carefully considered (Gururajan et al. 2016; Lowenthal & Leech 2009) by following a purposive sampling technique.

4.6.2. Structure of qualitative techniques

The structure of the administration of qualitative data collection involved significant planning & organisation, determination of the adequate number of sessions and associated logistics, and sample selection.

In this study, as indicated earlier, a brainstorming session was conducted first to gather key ideas, and these were regressed into a manageable set. This enabled further exploration at the focus group discussions where the ideas generated in the brainstorming sessions were explored further for clarity, depth, and understanding.

Finally, individual interviews provided comprehension through structured discussions.

4.6.3. The brainstorming and focus group moderator and facilitator

Another key aspect of administering qualitative data collection is the use of a moderator and facilitator (Markotic et al. 2017). In this study, a moderator was involved in eliminating any bias, and in removing domination from certain members of the group. In this study, the moderator was a passive person, mainly enabling the proper conduct of the session (Cooper & Schindler 2011; Goldenberg & Wiley 2011; Gururajan et al. 2015; Krueger & Casey 2015; Litosseliti 2003; Sherriff et al. 2014; Silverman 2014; Zikmund, Babin & Griffin 2013).

In this study, the researcher assumed multiple roles of 'moderator', 'listener', and 'observer' as guided by (Krueger & Casey 2015; Markotic et al. 2017). Further, the supervisors also assumed the roles of moderators due to their experience in conducting similar studies and guiding other PhD students to completion where similar methodologies have been used.

4.7. Conducting brainstorming and focus groups

As mentioned earlier, in this study, brainstorming was the first qualitative data collection stage. This is explained below:

4.7.1. Brainstorming session

In this study, it was decided that invitation to participate would be sent by email (Sutton & Hargadon 1996) and also through class lectures, with the purpose of the session then explained to participants, including the protocol. This enabled participants to attend the sessions, prepared to contribute to the discussions (Boddy 2012). The brainstorming procedure was also designed to involve team members in a discussion about future issues (Saunders 2013). Therefore, the brainstorming session was organised in such a way that themes emerged organically (Balasubramanian et al. 2008; Lu & Yuan 2011; Torres Kompen 2016).

In this study, a high-level brainstorming session was conducted in the first instance to derive themes around engagement and associated activities of engagement.

The brainstorming session occurred in meeting rooms at the University of Southern Queensland's Sydney, Springfield and Toowoomba Campuses. The investigator prepared the session logistics, such as writing materials and recording devices, and ensured the location had the right ambience. The researcher provided participants with an information sheet of the project, including the research objectives (Appendix D) so that participants were fully informed about the nature of the research before being involved in the brainstorming session (in person and via email). The participants read the consent form and signed it. The participants were advised that they could withdraw at any time without consequence.

The brainstorming session began with a short introduction where the moderator and the facilitator welcomed participants, and then introduced themselves and the research topic. The session's purpose was explained to the six participants (four males and two females). One key question was used to extract discussion themes, and this was displayed to participants via a video screen (Figure 4.2).

The question assessed key elements in participants' views and how they were impacted by these in a classroom context. Each round ideally required five minutes for each participant to answer (BörekçİI 2015). The participants discussed and agreed or otherwise on ideas generated, and this process consumed about 40 to 50 minutes. Finally, the moderator and facilitator acknowledged and thanked participants for their time and effort. This took five minutes. The researcher evaluated the details and formulated a synopsis of events to complete the procedures of audio recording and transcribing. The brainstorming session was audio-recorded in MP3 format, then transcribed without eliminating the spontaneity. The following diagram shows the main processes with estimated times of each process.

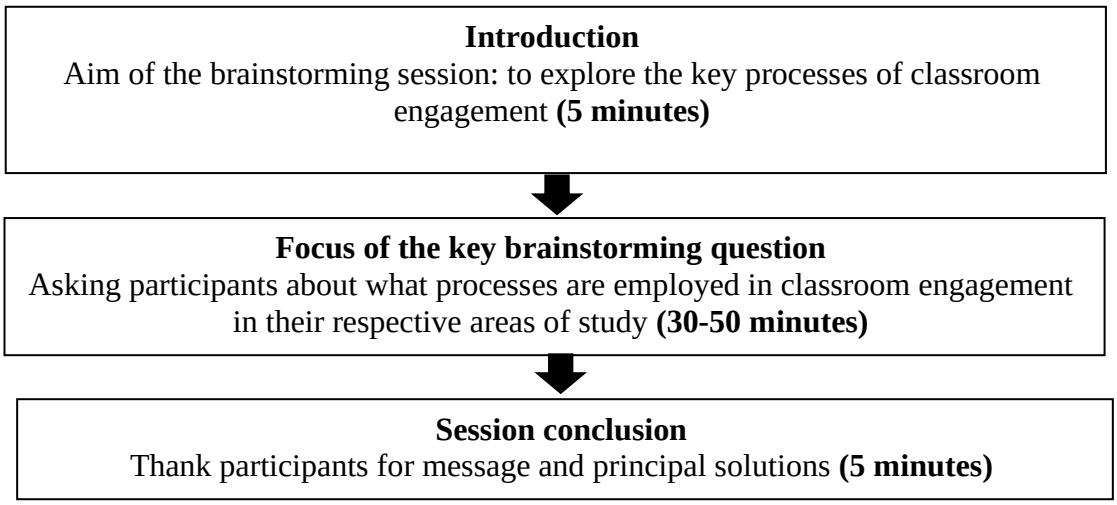

Figure 4.2. The schedule of the brainstorming session

4.7.2. Focus group session

The aim of conducting a focus group session is to gather further in-depth evidence on the themes identified in the brainstorming session (Krueger & Casey 2015). The focus group in this study was planned for 60-90 minute discussions (Cooper & Schindler 2011; Krueger & Casey 2015). In this study, the focus group session was conducted to confirm the findings of a brainstorming session and to define the scope of surveys. The focus group session occurred meeting rooms at the University of Southern Queensland's Sydney, Springfield and Toowoomba campuses. Each of the focus group sessions lasted 70 minutes. Similar to the brainstorming sessions, the logistics were verified by the researcher prior to the arrival of participants and followed similar preparation (Appendix D).

The focus group session began with a short introduction and a quick summary explanation of the purpose of the session supplied to the participants. Two specific questions were designed to collect about 40-60 minutes' worth of information on the scheduled day (Figure 4.3) so that the answers conformed to the themes developed in the previous brainstorming session. This process assisted in determining the themes related to classroom engagement.

The participants shared their thoughts and information, for about forty to sixty minutes, around engagement activities and processes in their study domain. Finally, the moderator and facilitator acknowledged and thanked participants for their time

and effort. It seemed that participants felt involved and motivated about the research topic due to the particularly meaningful discussions that occurred and the relevance of the discussion to their study topic. The following diagram shows the main process with the estimated time of each part of the focus group session.

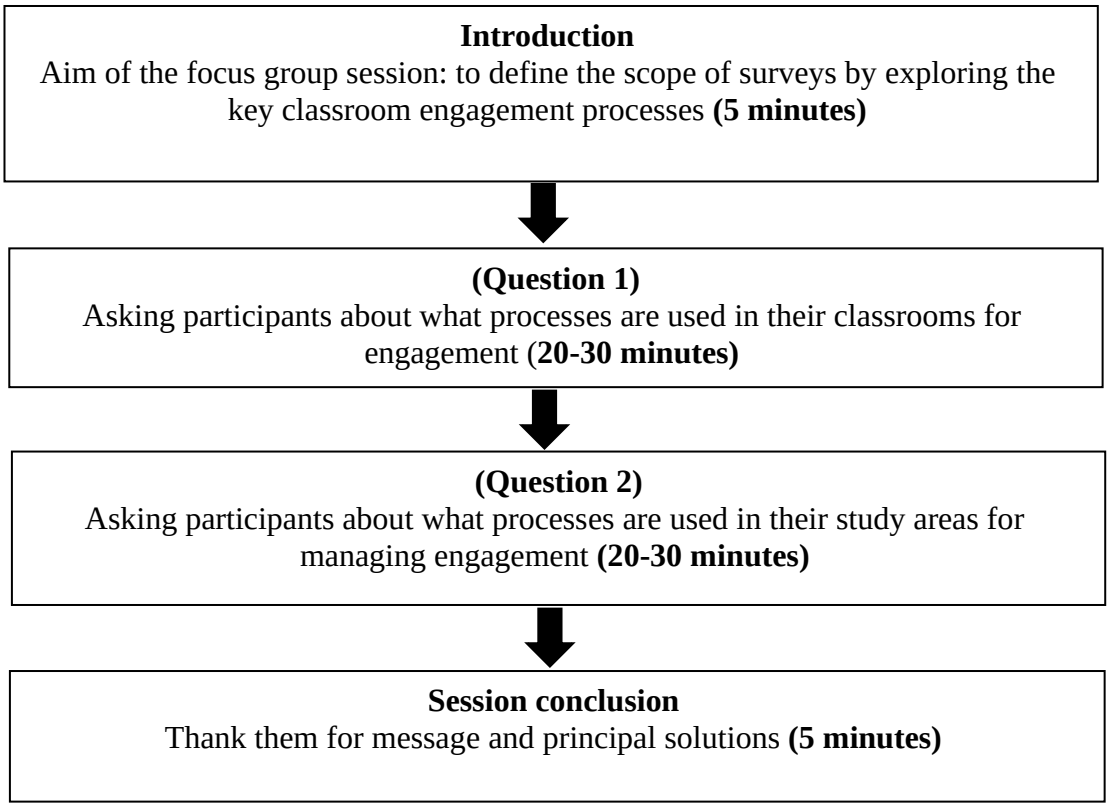

Figure 4.3. The schedule of the focus group session

4.8. Difficulties, challenges, and strategies to minimise the impacts of qualitative methods

Qualitative data collection comes with its own issues and challenges (Ritchie et al. (2013) and these include enormous amounts of data generated (Cowton & Downs 2015), lack of suitability of physical location, losing control during discussions, individuals derailing the sessions and time restriction and its influence on the quality and quantity of data collected (Bamu, De Schauwer & Van Hove 2016). In addition, brainstorming requires specific skills for its conduct as attested by (McMahon et al. 2016; Potter & Losee 1996; Sutton & Hargadon 1996; Wilson 2013) While the brainstorming methodology is popular, it may generate only fewer ideas defeating the very purpose of the session due to its procedural mechanisms (Goldenberg & Wiley

2011; Kavadias & Sommer 2009). The brainstorming technique requires careful consideration of logistics, and this requires good project management skills (Goldenberg & Wiley 2011; Hender et al. 2001).

These challenges and issues can be overcome despite the complexity. In this study, in order to ensure the relevance of data gathered, the researcher joined an academic research group to understand various research management processes. Further, by participating and then organising research meetings, the researcher learned skills and strategies in managing group dynamics, interaction and discussion.

In this study, the researcher was also a teaching academic. This experience helped the researcher to maximise the production of ideas by making the sessions less complex and as straightforward as possible (Helquist, Kruse & Diller 2017). The researcher ensured group members were provided with adequate time to freely discuss ideas, and at the same assessed the alignment of the ideas to the chosen topic (Fillion 2015; Goldenberg & Wiley 2011). The involvement of the supervisors in the moderation process helped the researcher to receive a realtime confirmation on ideas generated and enabled him to concentrate on managing the sessions (Goldenberg & Wiley 2011). The planning and scheduling of sessions also minimised unnecessary complications and duplications (Dilshad & Latif 2013; Gururajan et al. 2014; Shih, Venolia & Olson 2011; Torres & Carte 2014). Overall, by using the strategies discussed above, the brainstorming sessions were made purposeful and informed the focus group sessions (Fitzgerald 2015; Gallo & Gonos 2014; Keeney 2012; Lee et al. 2015; O'campo et al. 2015).

In terms of the focus group, data can be more complicated to analyse than individual interviews (Doody, Slevin & Taggart 2013; Masadeh et al. 2016; Then, Rankin & Ali 2014) as focus groups normally result in dynamic responses and hence may be difficult to analyse (Masadeh et al. 2016; Sæther & Mehus 2016). Further, the environmental and social context may indirectly influence the discussion of the group (Besen-Cassino 2017; Goyder & Shickle 2016; Then, Rankin & Ali 2014). Similar to the brainstorming sessions, the organisation can be a challenge. Individuals can dominate the discussions in focus group sessions, and this can result in a skew on group dynamics (Dilshad & Latif 2013; Pearson & Vossler 2016; Sæther & Mehus 2016; Then, Rankin & Ali 2014; Zikmund, Babin & Griffin 2013). If members

conform to a common view, then there will be issues in generalising findings (Cochran et al. 2016; Giles & Adams 2015; Mandić, Crnković & Vranešević 2013; Masadeh et al. 2016; Then, Rankin & Ali 2014).

In order to avoid such issues and challenges, this study was limited to two, targeted focus group sessions, and this was considered enough to confirm the findings of a brainstorming session and define the scope of surveys (Dilshad & Latif 2013; Gururajan et al. 2014; Torres & Carte 2014). The researcher was also careful to invite participants from a diverse range of study and social environments so as to avoid any undue social influences. The researcher was careful in providing equal time to all so as to increase the attention capacity and sharing rate of discussion (Goldenberg & Wiley 2011; Hägg & Musse 2016; Kavadias & Sommer 2009; Kornish & Hutchison-Krupat 2017; Litcanu et al. 2015). Moreover, an expert moderator was used to manage the focus group session (Cooper & Schindler 2011; Goldenberg & Wiley 2011; Gururajan et al. 2015; Krueger & Casey 2015; Litosseliti 2003; Sherriff et al. 2014; Silverman 2014; Zikmund, Babin & Griffin 2013). Overall, in utilising the strategies discussed above, the focus group session was managed satisfactorily (Campbell 2005; Gururajan et al. 2015).

4.9. Summary

This chapter has focused on qualitative data collection in nine sections. Section 4.1 presented an overview of this chapter. Section 4.2 introduced brainstorming and focus group discussions. The third section provided an understanding of the rationale behind the selection of brainstorming and focus group in collecting qualitative data. Pre-testing of the brainstorming group, focus group and discussion were evaluated in section 4.4. The next section provided an explanation of the qualitative pilot study. Section 4.6 addressed the practices and procedures related to the selection of participants for the brainstorming and focus group techniques. Section 4.7 outlined the conducting of the brainstorming session and focus group session. The difficulties and challenges in using each qualitative technique were addressed in section 4.8. In the same section, the strategies to overcome and control these issues were discussed. The ninth and final section has summarised the practices, justifications, and proceedings for the qualitative techniques utilised in this research.

CHAPTER 5: CONCEPTUAL MODEL DEVELOPMENT

5.1. Chapter overview

This chapter reviews the conceptual model development for this study based on the research objectives and the research questions of this study. The second research objective of this study is to investigate the relationship between engagement processes and how they influence classroom activities. To achieve this aim, the initial research model of this research was developed. This model was constructed based on the literature related to class engagement, materials read and comprehended, and their associated theoretical underpinnings. The review of the literature resulted in the development of a measure involving five constructs of engagement: Academics, Students, Learning Management Systems, Teaching Resources and Management. An explanatory (independent) variable was represented as Engagement processes. It was hypothesised that the five constructs influence engagement in the classroom; however, no appropriate hypotheses were formulated at the initial stage.

The qualitative component of this research was used to guide the final conceptual model of the study. While the initial research model was refined according to the outcomes of the qualitative study, the final research model included these five constructs in a refined form and resulted in a quantitative questionnaire. Thus, to fully achieve this (second) objective, the study formulated five hypotheses from the refined research model to answer the research questions of the study. The rationale for this approach is to assist the researcher in testing the relationship that may exist between the variables of this study.

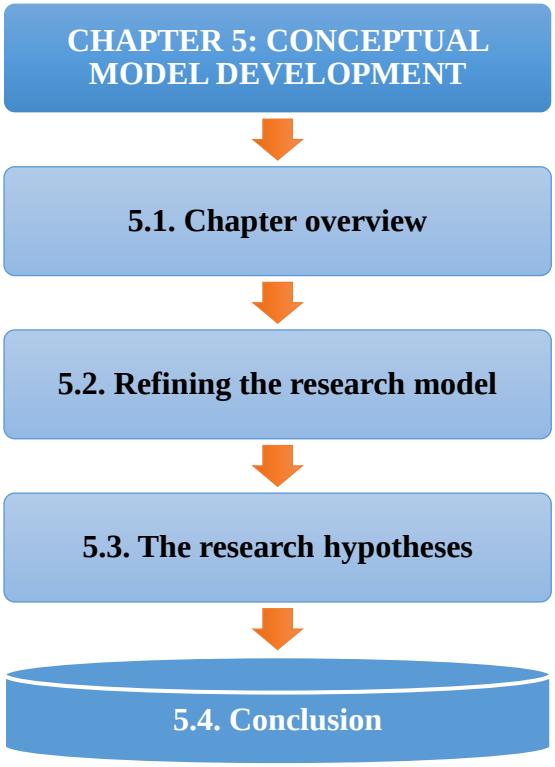

Figure 5.1. Graphical structure of chapter 5

5.2. Refining the research model

Figure 6.4 shows the initial conceptual model with supported theories and models (developed from literature) before the qualitative study was carried out. However, after carrying out the qualitative study, the initial conceptual model (Figure 6.4) has been revised, as shown in Figure 6.5. The following five key themes and their associated attributes were captured in the refined conceptual model. In addition, in the revised model, the direction of hypotheses was shown because the qualitative results of this study already provided an indication of the direction this study should take, thus adding to strong validity.

The refined model includes five specific constructs (independent variables) influencing engagement processes (dependent variable) in the classroom. A total of 44 latent variables were extracted as a result of the qualitative component of this study, and they are distributed as follows:

1. ACADEMICS (Teacher/Lecturer)

1 A quality interaction with students will improve your engagement (motivation) on your course

2 A clear explanation of the course concepts for your easy understanding would increase your desire for participating in the course

3 Experience in the use of LMS technology will improve engagement

4 Use of videos to provide a summary of lectures will improve engagement

5 Use of AR/VR in the class-leading to cutting edge environments will improve engagement

6 Superior communication abilities (to disseminate concepts) will improve engagement

7 Attitude of academics towards students queries will improve engagement.

2. STUDENTS

8 Motivation of students in the study will improve engagement

9 Optimal student-staffff ratio will improve engagement

10 Attitude (want to just pass or want to score high grades) of students will improve engagement

11 Students' own interest in the subject will improve engagement

12 Prior knowledge of the student in the subject domain will improve engagement

13 Students' own digital devices to support LMS based materials will improve engagement

14 Students' knowledge in using the LMS will improve engagement

15 Interaction with administrative people (Program Management, IT etc.) will improve engagement

3. LMS (Learning Management System)

16 Quality access to LMS will improve engagement

17 Availability of quality content on the LMS will improve engagement

18 Structure of content of subject materials on the LMS will improve engagement

19 Mix of text, audio and video in the subject presentation will improve engagement

20 Clear and easy to use content (including appearance and navigation tools) will improve engagement

21 Portal Management & Navigation aids will improve engagement

22 Authentication protocols will improve engagement

23 Understanding students' needs while creating content for the LMS will improve engagement

4. TEACHING RESOURCES

24 Currency of information will improve engagement

25 Modern Teaching methodologies will improve engagement

26 Appropriateness of teaching materials and how they fit in the Program will improve engagement

27 Adequacy of content provided to students will improve engagement

28 Relevance of materials and the way it is communicated to students will improve engagement

29 The link between teaching resources and assessments (including examinations) will improve engagement

30 Reduced time on searching for teaching resources will improve engagement

5. MANAGEMENT

31 Improved task Management for the course will improve engagement

32 Improved time management for the course will improve engagement

33 Understanding various rules and regulations of the university will improve engagement

34 Addressing perceived isolation due to relative newness in the country will improve engagement

35 Addressing part-time students struggle in managing their work-study balance will improve engagement

36 Improved access to learning resources and how they are managed by the library will improve engagement

37 Quality time available to spend in course activities will improve engagement

6. ENGAGEMENT

38 Quality university environment will improve engagement

39 Cutting edge facilities provided in the classroom will improve engagement

40 Quality interaction between academic and students will improve engagement

41 Addressing students communication skills will improve engagement

42 Addressing classroom attendance issues will improve engagement

43 A clear plan of various activities and their due dates will improve engagement

44 Quality forum discussions will improve engagement

5.3. The research hypotheses

Prior to giving the meaning of null and alternative hypotheses as specific hypotheses in this research, it is important to introduce clarify the term "hypothesis". The hypothesis can be defined as an empirically reasonably intuitive relationship among two or more elements, indicated in a shape of directional and testable information and data (Cooper & Schindler 2011; Tharenou, Donohue & Cooper 2007; Waithiegeni Kibui 2015; Zikmund, Babin & Griffin 2013). The null hypothesis is a statistical 'statement about a population parameter' (Johnson & Christensen 2014, p. 560; O'Dwyer & Bernauer 2014, p. 234). Likewise, the alternative hypothesis is a statistical 'statement that the population parameter is some value other than the value stated by the null hypothesis' (Johnson & Christensen 2014, p. 560; O'Dwyer & Bernauer 2014, p. 234).[1] In this study, these hypotheses are used to investigate the relationship between engagement processes and the drivers of engagement.

According to the refined model of this study, there are five hypotheses that require testing the second research objective: to investigate the relationship between engagement constructs and the engagement processes. In this model, each one of the five engagement constructs, namely; academics, students, LMS, teaching resources and management (of teaching) will test an effect on the engagement processes. In essence, these constructs clarify their interaction with the process of engagements, and this is asserted based on data gathered from students engaged in this engagement processes in a classroom.

In terms of the construct Academics, the qualitative study indicated that communication is a key aspect and this was attributed to various factors such as quality interaction, clear explanation, use of video to explain concepts, attitude in comprehending and then answering students' queries and knowledge in the use LMS. Overall, an academic's communication skills – oral, written, presentation, as well as navigating through an LMS in the classroom appear to influence engagement in the classroom, and these communication processes are essential in communicating

[1] Following standard notation H_0 (null hypothesis) and H_1 (alternative hypothesis)

subject knowledge to students in order for them to engage in the classroom. Therefore, this leads to the following hypotheses:

Hypothesis 1:

H10: There is no significant positive influence on teaching resources in order to realise engagement in classroom activities.

H11: There is a significant positive influence on teaching resources in order to realise engagement in classroom activities.

In terms of the construct Students, the study identified attributes such as motivation of students, student-staff ratios, the attitude of the student, student's interest in the subject, prior knowledge in the subject domain, student's own digital device to access the LMS, students' knowledge in using the LMS and interaction with non-academic staff appear to influence their engagement in the classroom. Unlike the construct Academics, the construct Students involve both communication and attitude in determining engagement in the classroom. The attributes leading to this have identified communication (mainly interaction with people), knowledge and motivation as the three domains leading to engagement in a classroom. This has resulted in the following hypotheses.

Hypothesis 2:

This hypothesis proposes to answer the second research question of the study: To what extent does engagement influence classroom activities? Thus, hypothesis 2 attempts to investigate the extent to which various activities associated with engagement through LMS influence activities conducted in classrooms, during and beyond scheduled classroom activities the strength of the relationship between variosu factors of engagement to observe whether to accept or reject the stated null hypothesis.

$H2_0$: There is no significant positive impact of academic influence in classroom engagement activities through their involvement in various teaching and management aspects.

$H2_1$: There is a significant positive impact of academic influence in classroom engagement activities through their involvement in various teaching and management aspects.

Hypothesis 3:

During the qualitative interview, it emerged that quality access to LMSs, quality content available to via the LMS, organisation of subject matters for easy navigation, multichannel study materials consisting of text, video and interactive tutorials, clear and easy content, aids to navigate the portal and clear understanding of students' needs while creating content were highlighted. These aspects have been highlighted in the literature already forming the basis of the initial model developed for this study; however, the qualitative study provided the much-required granularity in the context of this study. This culminated in the following hypotheses.

$H3_0$: There is no significant positive influence of academic activities resulting in improved engagement by students in the class.

$H3_1$: There is significant positive influence of academic activities resulting in improved engagement by students in the class.

Hypothesis 4:

The literature clearly indicated teaching resources are crucial in improving engagement. However, the literature is limited in the context of LMSs, especially in identifying various attributes required to assert the role of teaching resources as well as the relationship of these resources in improving classroom engagement in the given context – in this instance, in an LMS driven system. This study is unique in the sense that the scope of the study is in an educational domain where LMSs play a key role in facilitating engagement in the classroom. Further, the classroom is beyond the physical resources (brick and mortar) style as in many tertiary education settings the classroom extends beyond traditional hours. Therefore, teaching resources were explored in this context.

It was possible to identify key attributes such as currency of materials, modern teaching methodologies, appropriateness of teaching materials, adequacy of content,

the relevance of teaching materials, teaching resources and assessment nexus, time imposition in identifying appropriate materials beyond what has been supplied as the main attributes through discussion with students. These are covered further in the discussion chapter. Based on these attributes, the following hypothesis was formed.

$H4_0$: There is no significant positive influence of Learning Management Systems (LMS) in improving students' engagement.

$H4_1$: There is a significant positive influence of Learning Management Systems (LMS) in improving students' engagement.

The qualitative discussions clearly indicated the management of teaching and learning is a crucial construct to improve engagement in classrooms. This knowledge is significant in the context given as the study environment consists of both full-time and part-time student, students with varying learning experiences and levels, thus leading to a true heterogeneous classroom. As a result of this, attributes such as task management of various activities, both in class and on the LMS, time management, university rules and regulations, work-study-life balance, access to learning resources and time adequacy were found to be significant in defining this construct. This led to the following hypothesis.

Hypothesis 5:

$H5_0$: There is no significant impact on the management of various study-related activities to reach focus in the study to positively influence students' engagement.

$H5_1$: There is a significant impact of the management of various study-related activities to reach focus in the study to positively influence students' engagement.

The above five hypotheses were formulated to test the interaction of the constructs in classroom engagement processes. The engagement was identified through the quality of the attributes of the university environment, advanced facilities and infrastructure, quality of interaction between the academics and students, students' communication skills, classroom participation, clear set of expectations of study and quality of discussion via the LMS.

These hypotheses have been shown with their direction in the following refined conceptual model.

5.4. Conclusion

This chapter has focused on the conceptual model development of this research study. In doing so, definitions of factors used in the initial framework were highlighted, and how these were refined by taking into account, the qualitative component was explained. Five hypotheses were formed in determining the relationships between the five constructs (academics, students, LMS, teaching resources and management) and the engagement processes so that these can be quantitatively tested. The next chapter discusses the quantitative data collection approaches employed in this study.

CHAPTER 6: QUALITATIVE DATA ANALYSES

6.1. Chapter overview

In this study, qualitative data was collected for two specific reasons. The first was to validate the factors that influence engagement; the second was to refine the initial framework developed through the literature.

The reason for the validation is to justify the inclusion of context-sensitive factors as the study was specifically conducted in a tertiary environment, and the samples were drawn from a specific cohort. This warranted the validation of factors influencing engagement in the given context as the literature was covered was broad and did not cover any specific aspects. Further, the context in which the study employed was rich in ICT usage, and the LMS was used via the ICT platform. For these reasons, the factors required validation in the context chosen.

The second reason for conducting the qualitative study was to assure relevance. The literature was broad and did not address specific tertiary related contexts. Further, in Australia, there are strict regulatory standards governing curriculum alignment, called the Higher Education Standards Framework (HESF), and all tertiary institutions must comply with this standard. As this is unique, the framework validation is considered essential to testing hypotheses.

For the above reasons, the qualitative component was employed. As explained in the methodology chapter, the qualitative component of the study consisted of brainstorming sessions, and focus group sessions so that themes identified in each phase were probed further for comprehensive understanding. In this chapter, the data analyses procedures using qualitative data are explained.

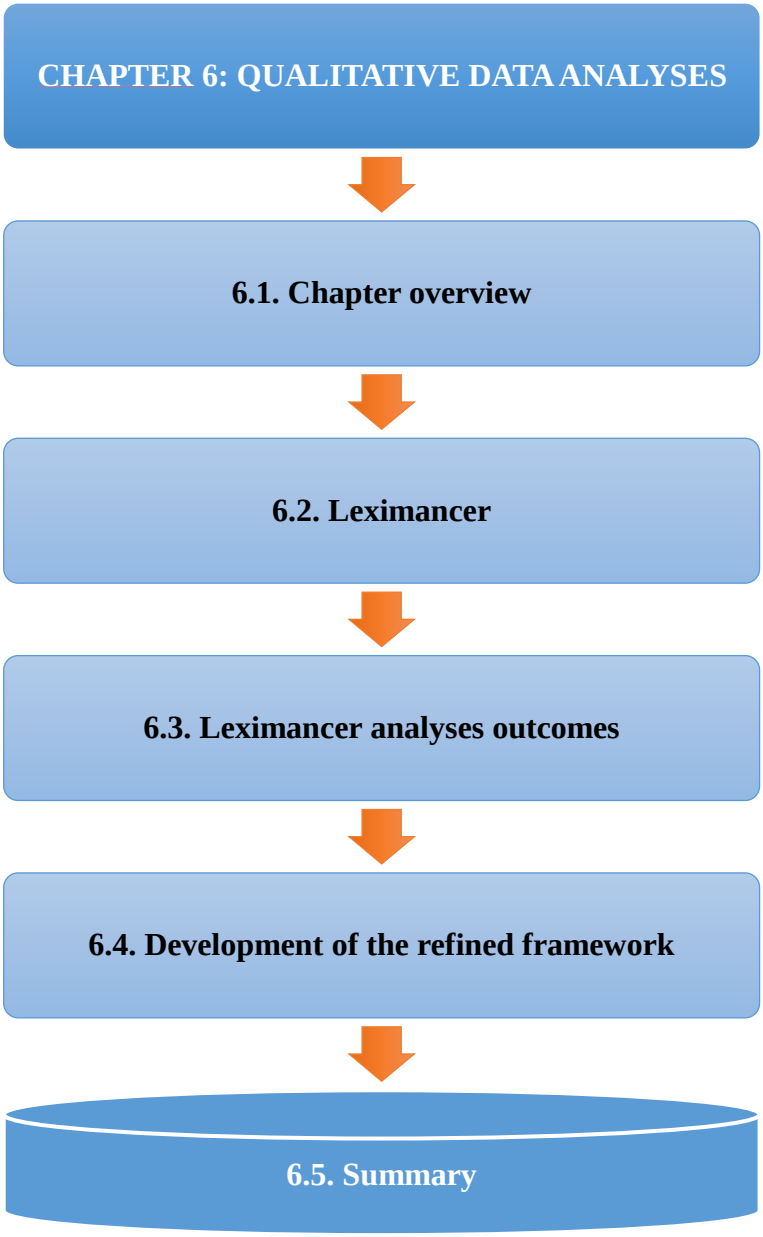

Figure 6.1. Graphical structure of chapter 6

6.2. Leximancer

In this study, Leximancer was used to conduct the qualitative analyses required for the study. Leximancer is a text analysis application software that automatically analyses text documents to identify the high-level concepts, delivering the key ideas and actionable insights with powerful interactive visualisations and data exports. Leximancer uses machine learning techniques to learn the main concepts within a text file and also provides views on how these main concepts are related to each other. The

power of Leximancer is drawn from its ability to conduct a thematic analysis and a relational (or semantic) analysis of the interview data, with the ability to provide word frequency counts and co-occurrence counts of concepts presented in the transcripts of the narrative interviews.

Leximancer uses in-built machine learning algorithms to transform lexical co-occurrences within information into semantic patterns in an unsupervised manner, by employing a two-stage process, comprised of semantic extraction and relational extraction through a variety of statistical algorithms employing nonlinear dynamics and machine learning (Smith & Humphreys 2006). The concept that has been identified using machine learning processes is based on a thesaurus of words that are associated with that concept giving the 'concept its semantic or definitional content' (Rooney 2005).

The interview scripts were manually read to ensure that appropriate discussion took place to converge on the initial concepts identified from the literature. A unique feature of this study in the qualitative study was preserving the key themes identified in the literature, and augmenting various attributes contributing to these key themes as a result of employing the study in a given specific context. The initial review of transcripts resulted in the identification of larger context of all the narrative interviews and the prominence of certain concepts. This step was necessary to remove the bias so that the researcher did not become fixated on some concepts to the detriment of others. The power of Leximancer was used in this regard to realise themes as Leximancer uses a combination of techniques such as Bayesian statistics that record the occurrence of a word and connect it to the occurrence of a series of other words. This approach ensured that each keyword identified was quantified by coding the segments of text, from one sentence to groups of sentences, thus providing some statistical inferences as to the choice of themes and their inter-relationships. Once this stage was completed, the machine learning algorithms in Leximancer created a 'concept space', leading to a thesaurus around a group of seed concepts. This information was visualised using network analysis.

6.3. Leximancer analyses outcomes

The Leximancer analyses in this study involved three specific operational steps. The first step involved consolidating all interview transcripts as one master file for analysis. The second step involved developing the 'seed': the keywords. The third step involved the development of a 'thesaurus', which enabled the researcher to develop the network of themes, as shown below:

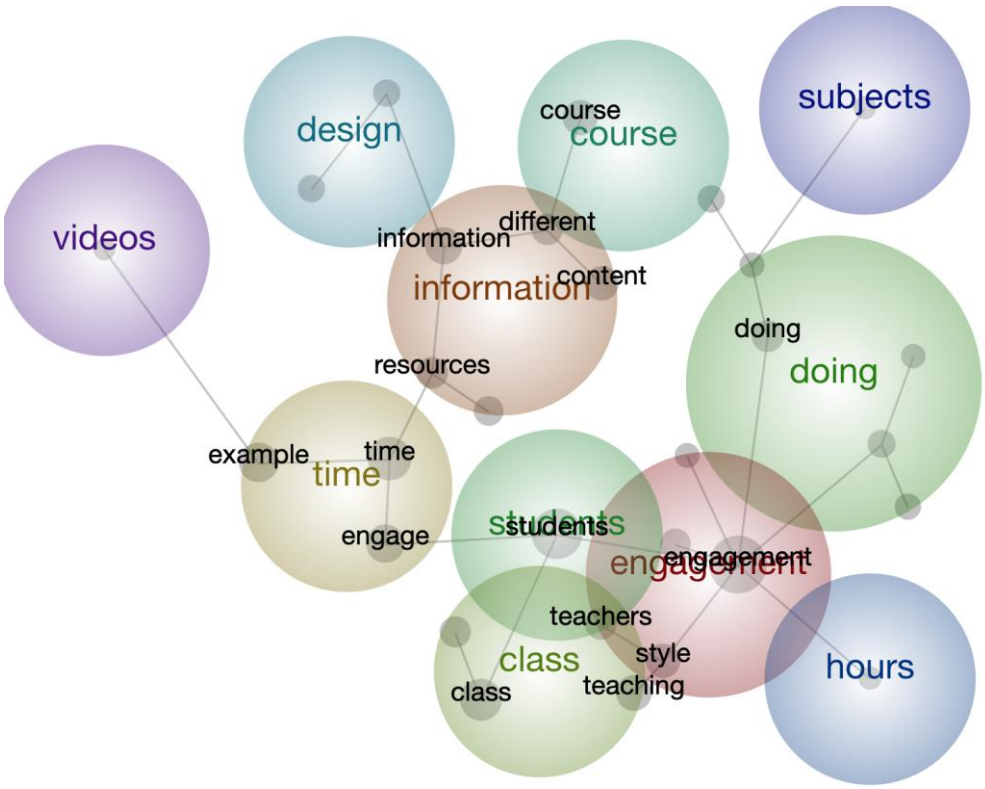

Figure 6.2. Network diagram of key inferences

From the network diagram above, some key inferences were made. These were:

The central theme of this study 'engagement' was well connected with many themes discussed in the interview, thus providing a level of assurance to the discussions and their relevance;

The other key themes – 'students', 'information', and 'class' – were well represented in the discussion with many sub-themes defining these themes. These included terms such as 'teaching style', 'content', 'time' and 'teachers'. While these

terms were not exactly the terms we were looking for, these represented the key themes of the research.

The linkages shown through a line between the main theme engagement and the other themes were appropriately representing the initial model prescribed in the earlier section of this thesis, as a result of the literature review.

This provided another level of assurance that the interviews extracted what they were supposed to extract. However, this was not enough as the strength of the themes and keywords were not visible in the network diagram shown. To identify the strength of the keywords, a word frequency was run, and this is shown below:

Table 6.1. Analysis of concepts

Concept	Count	Relevance percentage
engagement	77	100
students	59	77
talking	57	74
factor	50	65
time	48	62
example	43	56
class	42	55
information	36	47
engage	34	44
content	28	36
teaching	25	32
style	22	29
understand	22	29
resources	22	29
doing	22	29
different	21	27

teachers	19	25
important	19	25
knowledge	17	22
discussion	16	21
design	16	21
assignment	16	21
personal	14	18
group	11	14
courses	8	10
interest	8	10
videos	8	10
hours	7	9
lack	6	8
subjects	6	8

The table above was extracted from Leximancer and the keywords and their frequencies indicate that participants discussed exactly what was meant to be discussed. This not only provided assurance to the quality of the interviews but also provided convergence to the themes.

In addition to the word frequency test, this study also employed another test to explore where the discussion took place to ascertain the relevance and significance of the terms identified. The identification involved the recognition of key themes and the interconnection between various keywords, and this is produced in the form of an array in Leximancer. This array provided additional confirmation that the key themes identified in the literature did occur during the interviews, and hence the qualitative design of the study was appropriate. The Leximancer array is shown below.

Table 6.2. Sample of emerging themes

theme	hits	hit_num	hit_text	connectivity	concepts	theme_query
student	116	1	does â€“ I think it adds more engaging than Satak : reading the slide I tl	9063	student, student, I	WORD:student WORD:student NAME:Prabal
stuff	101	1	amount â€“ I donâ€™t know why but - thatâ€™s how they set it up - itâ€	8760	stuff, stuff, course	WORD:stuff WORD:stuff WORD:course WORD:course
stuff	101	2	â€“ based on that they design a course â€“ they talk to invested people-	8760	stuff, stuff, course	WORD:stuff WORD:stuff WORD:course WORD:course
stuff	101	3	everyone is from different country have different accent - yeh â€“ stude	8760	stuff, stuff, course	WORD:stuff WORD:stuff WORD:course WORD:course
talking	96	1	by others â€“ certain information in case we have way less time for the	11763	talking, talking, tir	WORD:talking WORD:talking WORD:time WORD:time
talking	96	2	go to everything â€“ itâ€™s quite confusing resources Prabal : are you s	11763	talking, talking, tir	WORD:talking WORD:talking WORD:time WORD:time
talking	96	3	I thought it was better to ask somebody else â€“ itâ€™s the user interfa	11763	talking, talking, tir	WORD:talking WORD:talking WORD:time WORD:time
engagement	96	1	the factor influencing the student engagement using the learning mana	11184	engagement, enga	WORD:engagement WORD:engagement WORD:stude
engagement	96	2	be influencing the other students if itâ€™s influencing me â€“ if it is no	11184	engagement, enga	WORD:engagement WORD:engagement WORD:stude
engagement	96	3	the feedback and also it could be a communication and engagement ov	11184	engagement, enga	WORD:engagement WORD:engagement WORD:stude
engagement	96	4	had listened other conversation from other fellow student do you want	11184	engagement, enga	WORD:engagement WORD:engagement WORD:stude
engagement	96	5	giving a lecture on that - thatâ€™s make you more attractive and engage	11184	engagement, enga	WORD:engagement WORD:engagement WORD:stude
factor	85	1	projector for the class that will effect I think â€“ I think that will the mos	5755	factor, factor, class	WORD:factor WORD:factor WORD:class WORD:class W
factor	85	2	had listened other conversation from other fellow student do you want	5755	factor, factor, class	WORD:factor WORD:factor WORD:class WORD:class W
factor	85	3	of getting not understanding what is being taught and then another fact	5755	factor, factor, class	WORD:factor WORD:factor WORD:class WORD:class W
factor	85	4	if the student doesnâ€™t understand then there obviously is there will	5755	factor, factor, class	WORD:factor WORD:factor WORD:class WORD:class W
teaching	25	1	the factor influencing the student engagement using the learning mana	2432	teaching, teaching	WORD:teaching WORD:teaching WORD:style WORD:st
teaching	25	2	projector for the class that will effect I think â€“ I think that will the mos	2432	teaching, teaching	WORD:teaching WORD:teaching WORD:style WORD:st
teaching	25	3	are feeling about the study pattern or something like that and they dona	2432	teaching, teaching	WORD:teaching WORD:teaching WORD:style WORD:st
teaching	25	5	had listened other conversation from other fellow student do you want	2432	teaching, teaching	WORD:teaching WORD:teaching WORD:style WORD:st
design	16	1	amount â€“ I donâ€™t know why but - thatâ€™s how they set it up - itâ€	1052	design	WORD:design
design	16	2	and stick with right content in right place like â€“ you cannot place the i	1052	design	WORD:design
group	11	1	inside the college so that also another factor influencing us for the stud	802	group	WORD:group
group	11	2	â€“ thank you so much for your participation â€“ so do you have any que	802	group	WORD:group
subjects	6	1	can be benefitted and you can learn better way and if you do not open u	268	subjects	WORD:subjects
subjects	6	2	â€“ before you join you know courses - and you have the course inform	268	subjects	WORD:subjects

As a result of these tables, emergent themes were visible to the user, and are expandable using the map visualisation that links directly to the areas of the data in which the concept occurs. This is used in qualitative components so that users can identify the conversation and if required, manually validate the 'messages' in the conversation. Further, the themes map enables a quick reading of the narrative interviews and provides visual clues of dominant themes, rather than subjectively imposing one's own interpretations on the data. In this study, Leximancer was used to eliminate any individual subjective bias.

Further, the proximity of two concepts in the visual map indicates how often or not they appear in similar conceptual contexts. While the array table provided this information already, the visual maps provided this information in a consolidated diagram. When two concepts are placed at a distance from each other, it indicates that they are not used in the same context. The themes are the coloured circles around clusters of concepts. The lines or pathways navigate the most likely path in conceptual space between concepts in order to aid reading the map. The connectivity score reflects the degree (equivalent to degree score in network analysis) to which the theme is connected to the other concepts in the map. As a result of adjusting various keywords and developing a thesaurus, we arrived at the final visual map as shown below:

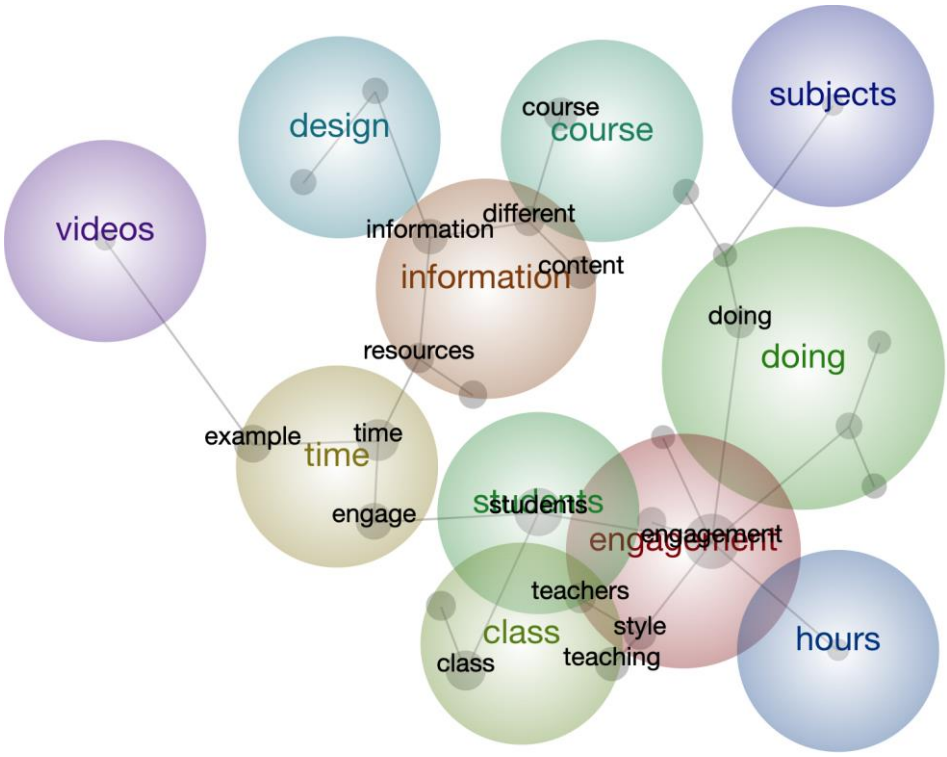

Figure 6.3. Network diagram of themes

6.4. Development of the refined framework

The visual map from Leximancer clearly indicates that engagement is influenced by teaching, classroom activities, the information provided to students, design of curriculum and associated content, and activities that are provided to students. In addition, other isolated concepts such as time involved in doing the assessment, the examples provided – and especially, the need for video type materials – emerged as concepts influencing engagement in an LMS based environment.

Thus, from the qualitative component of the study, it was possible to hypothesise that LMS based engagement is influenced by (1) various classroom-based activities provided; (2) teaching resources provided to students; (3) the various 'doing' components where academics demonstrate examples; (4) the competency required to do various activities; and (5) various types of information provided to both students and academics. This is shown in the following conceptual model:

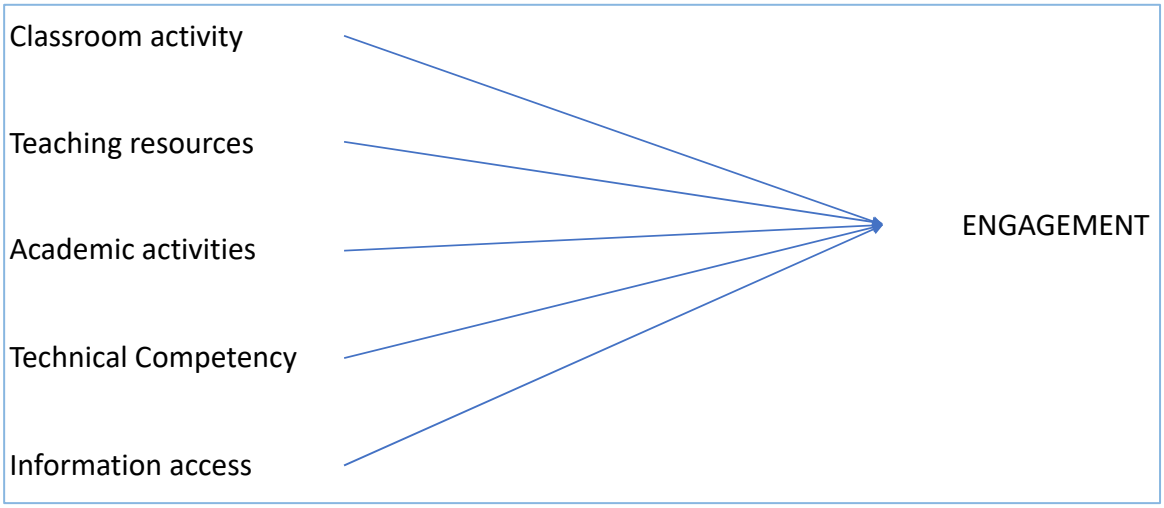

Figure 6.4. Engagement conceptual model

With this scope, when we manually read the transcripts, we were able to find additional information to enhance the clarity of the constructs shown in the left side of the above pictures. This review enabled us to redefine the constructs in a meaningful way and then to develop the hypotheses.

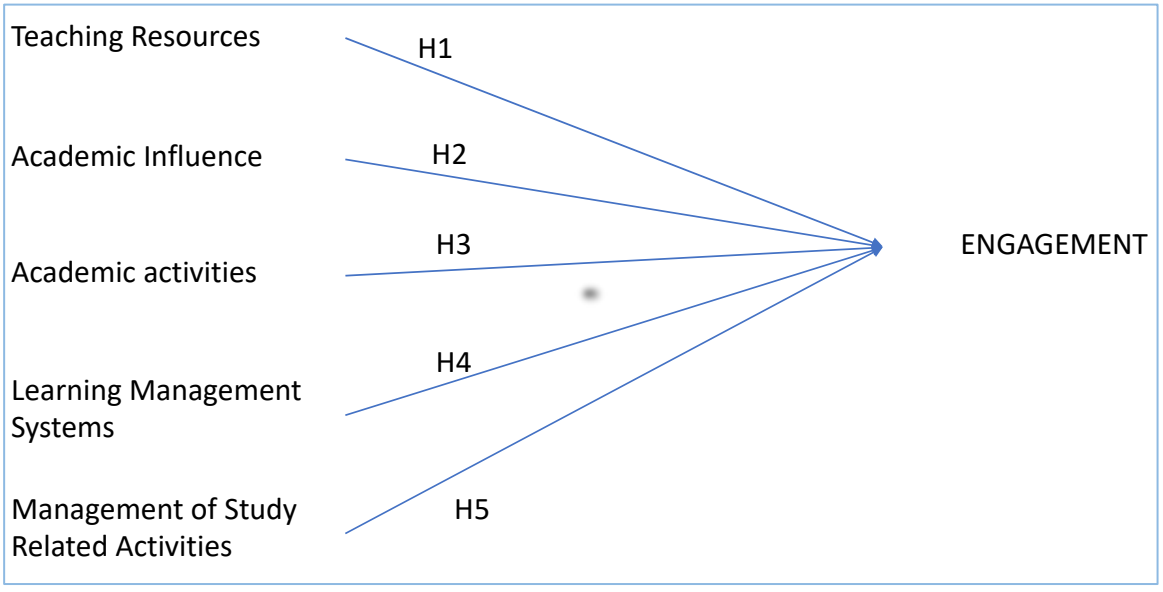

Figure 6.5. Redefined engagement conceptual model

Hypothesis 1:

$H1_0$: There is no significant positive influence on teaching resources in order to realise engagement in classroom activities.

$H1_1$: There is a significant positive influence on teaching resources in order to realise engagement in classroom activities.

In terms of the construct Students, the study identified attributes such as motivation of students, student-staff ratios, the attitude of the student, the student's interest in the subject, prior knowledge in the subject domain, students' own digital device to access the LMS, students' knowledge in using the LMS, and interaction with non-academic staff, all appeared to influence their engagement in the classroom. Unlike the construct Academics, the construct Students involved both communication and attitude in determining engagement in the classroom. The attributes leading to this have identified communication (mainly interaction with people), knowledge and motivation as the three domains leading to engagement in a classroom. This has resulted in the following hypothesis.

Hypothesis 2:

This hypothesis explores the nexus between the academic influence on students, especially in defining various classroom-based activities in order to reinforce engagement. The implied notion is that the academic influence spans beyond the classroom as in the context of the study, students undertake activities beyond the classroom using the LMS, and hence by default, the academic influence also extends beyond the traditional classroom.

$H2_0$: There is no significant positive impact of academic influence in classroom engagement activities through their involvement in various teaching and management aspects.

$H2_1$: There is a significant positive impact of academic influence in classroom engagement activities through their involvement in various teaching and management aspects.

Hypothesis 3:

During the qualitative interview, it emerged that quality access to LMSs, quality content available via the LMS, organisation of subject matters for easy navigation, multichannel study materials consisting of text, video and interactive tutorials, clear

and easy content, aids to navigate the portal, and clear understanding of students' needs while creating content was highlighted as factors that influence engagement. These aspects have been highlighted in the literature already forming the basis of the initial model developed for this study - however, the qualitative study provided the greatly required granularity in the context of this study. This culminated in the following hypotheses.

$H3_0$: There is no significant positive influence of academic activities resulting in improved engagement by students in the class.

$H3_1$: There is a significant positive influence of academic activities resulting in improved engagement by students in the class.

Hypothesis 4:

The literature clearly indicated teaching resources are crucial in improving engagement. However, the literature is limited in the context of LMS', especially in identifying various attributes required to assert the role of teaching resources as well as the relationship of these resources in improving classroom engagement in the given context (an LMS driven system). This study is unique in the sense that the scope of the study is in an educational domain where the LMS plays a key role and facilitates engagement in the classroom. Further, the classroom is beyond the physical resources (brick and mortar) style as in many tertiary education settings; the classroom extends beyond traditional hours. Therefore, teaching resources were explored in this context.

It was possible to identify key attributes such as currency of materials, modern teaching methodologies, appropriateness of teaching materials, adequacy of content, the relevance of teaching materials, teaching resources and assessment nexus, and time imposition in identifying appropriate materials beyond the supplied content as the main attributes through discussion with students. These are covered further in the discussion chapter. Based on these attributes, the following hypothesis was formed.

$H4_0$: There is no significant positive influence of Learning Management Systems (LMS) in improving students' engagement.

$H4_1$: There is a significant positive influence of Learning Management Systems (LMS) in improving students' engagement.

The qualitative discussions clearly indicated the management of teaching and learning is a crucial construct to improve engagement in classrooms. This knowledge is significant in the context given as the study environment consists of both full-time and part-time students, and students with varying learning experiences and levels, thus leading to true heterogeneity within the classroom. As a result of this, attributes such as task management of various activities both in class and on LMS, time management, university rules and regulations, work-study-life balance, access to learning resources and time adequacy were found to be significant in defining this construct. This lead to the following hypothesis.

Hypothesis 5:

$H5_0$: There is no significant impact on the management of various study-related activities to reach focus in the study to positively influence students' engagement.

$H5_1$: There is a significant impact of the management of various study-related activities to reach focus in the study to positively influence students' engagement.

The five hypotheses above were formulated to test the interaction of the constructs in classroom engagement processes. The engagement was identified through the attributes of the university environment, advanced facilities and infrastructure, quality of interaction between the academics and students, students' communication skills, classroom participation, clear set of expectations of study and quality of discussion via the LMS.

These hypotheses have been shown with their direction in the refined conceptual model above.

6.5. Summary

In this chapter, qualitative data analyses and its summary was provided in order to define the conceptual model for hypotheses testing. The next chapter will provide details of quantitative data analyses.

CHAPTER 7: QUANTITATIVE DATA ANALYSIS

7.1. Chapter overview

In the previous chapter, the quantitative data collection was presented. This chapter discusses quantitative data analysis using ADANCO, a Partial Least Square based software, which includes constructing validity, reliability, factor analysis, correlation analysis, and regression analysis. This chapter discusses all procedures and processes related to how the analysis has been conducted.

The analysis of the quantitative data is organised into nine sections. Section 7.1 is an overview of the chapter. Section 7.2 provides the introduction of the chapter, which is then followed by a discussion of validity and reliability in Section 7.3. The descriptive statistical analysis is addressed in Section 7.4. Validity is covered in Section 7.5. Exploratory factor analysis is emphasised in Section 7.6, while the subsequent section, 7.7, highlights regression analysis to test the research hypotheses with Section 7.8 providing outcomes of hypotheses. Finally, the summary of this chapter is outlined in Section 7.9. This chapter includes seven sections which are presented in the following graphical layout.

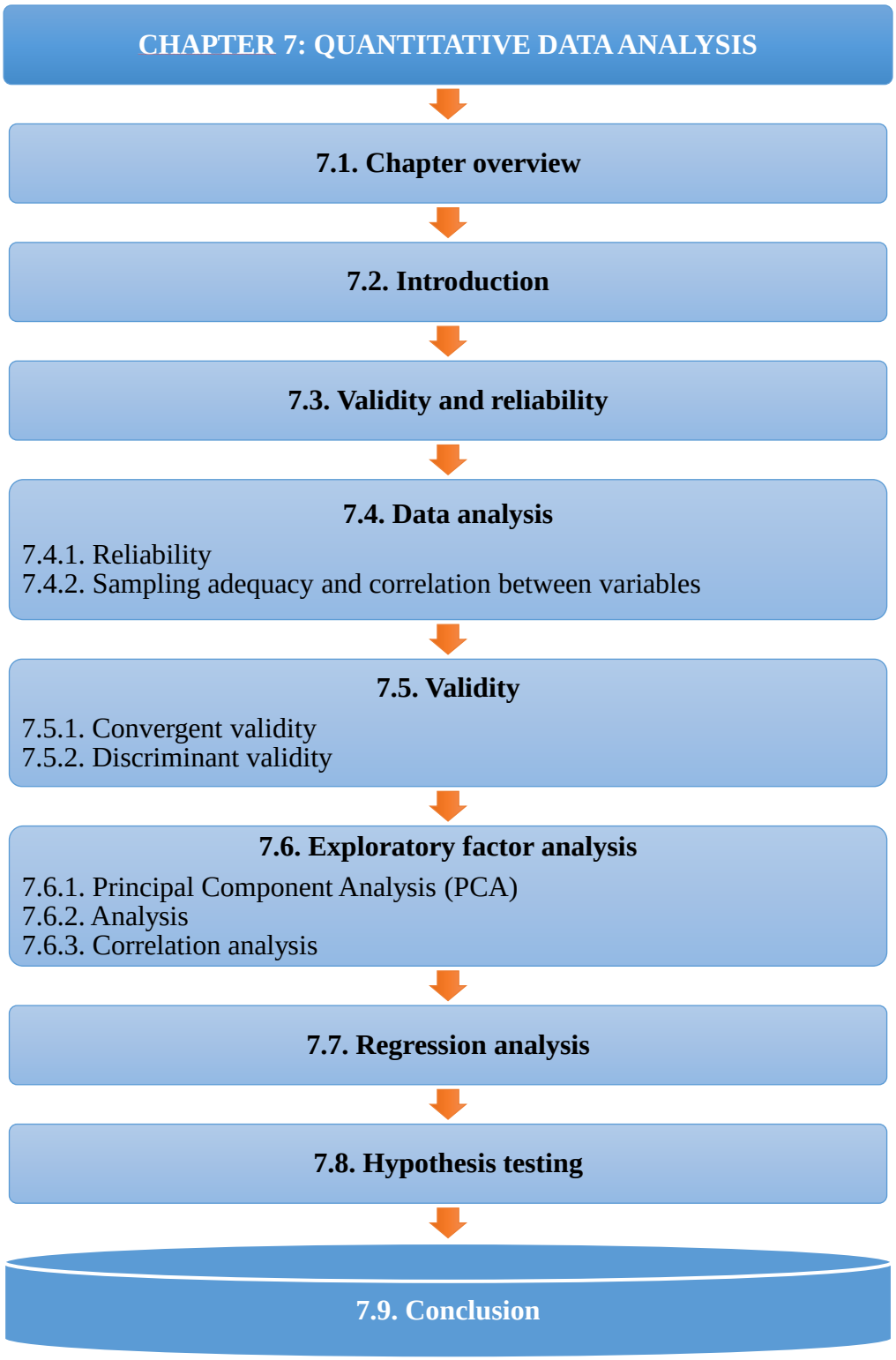

Figure 7.1. Graphical structure of chapter 7

7.2. Introduction

The second key objective of this study is to investigate the relationship between the constructs influencing classroom engagement and the engagement processes, specifically set in a tertiary environment in Australia. This objective has been addressed through hypotheses testing, which is a subdivision 'of inferential statistics that is concerned with how well the sample data support a null hypothesis and when the null hypothesis can be rejected' (Johnson & Christensen 2014, p. 559). Prior to analysing the quantitative data, the missing data should first be excluded. In this study, 98 completed questionnaires were used for data analysis, after excluding all missing datasets. The numerical data collected via an online survey was made suitable for data analyses by writing a microcode, and the data were transferred into an Excel spreadsheet.

Following this treatment, utilising the ADANCO SEM software application, a range of tests were conducted to address the hypotheses formulated for this study. Validity and reliability tests were conducted to examine construct-items correlation and to validate the research framework. The validity test included two criteria: content validity, which measures the suitability of questionnaire items, and Exploratory Construct Validity (ECV), a method utilised to measure the validity of the questionnaire instrument. Then, correlation, simple regression, and SEM analyses were used to identify any significant relationships between talent management processes and knowledge management processes. Correlation and regression analyses were used in the first instance as the first-generation analysis technique to comprehend the nature of the relationship between the dependent and the independent constructs. Then, SEM was used as the second-generation analysis technique to provide an enhanced understanding and a progressive level of statistical analysis. SEM was also used to confirm the outcomes that were obtained by correlation and regression analyses by providing further investigation into the relationship between the constructs. SEM identifies the associated errors among measured items by using the measurement model and investigating the hypothesised structural relationships among variables, as well as between each variable and its items (Baig 2010; Chin 1998a).

7.3. Validity and reliability

Content validity is a method to confirm the strength and suitability of questionnaire items (Cooper & Schindler 2011; Creswell 2014; Fink 2003; Nguyen Hong 2016; Ritchie et al. 2013; Zikmund, Babin & Griffin 2013). In this regard, the researcher prepared a special form to examine the opinions of academic experts who were specialists in the fields of LMSs and education. The clarity of each statement in terms of meaningful and grammatical content was the basis to correct what should be corrected, with the addition or deletion of the arbitrator's words in each of the instrument's questions. All experts subsequently agreed that the new questionnaire instrument was appropriate. Thus, the researcher modified and drafted some of the terms that the arbitrators thought should be re-drafted for clarity. Following a pre-test of the questionnaire, a quantitative pilot study was used to improve the internal validity of the survey questionnaire. The findings of the quantitative pilot study revealed similar themes as the findings of the actual study.

As indicated earlier, the reliability of the quantitative data gathered for this study was examined using Cronbach's alpha test to examine construct-items' correlations (Cronbach 1951; Nunnally & Bernstein 1994). The acceptable rate of the correlation coefficient should be at least 0.70 (Gefen, Straub & Boudreau 2000; Hair et al. 2010; Peters 2014). Tables 7.1 shows the reliability coefficients for the constructs, indicating high reliability.

Table 7.1. Summary of the reliability test for all Likert scale items (N=98)

Construct	Dijkstra-Henseler's rho (ρA)	Jöreskog's rho (ρc)	Cronbach's alpha(α)
Academics	0.7461	0.8383	0.7421
Students			
LMS	0.8725	0.8935	0.8647
Teaching Resources	0.7935	0.8727	0.7822

Management	0.7934	0.8555	0.7792
Engagement	0.8462	0.8826	0.8447

As can be seen in Table 7.1, the value of Cronbach Alpha for each of the constructs is over 0.7, indicating that the instrument of the study has a high internal consistency and hence is reliable.

7.4. Data Analyses

In this study, the data analyses were conducted using the ADANCO SEM application. In order to verify the hypotheses formulated for this study, the following tests were conducted.

7.4.1. Reliability

Cronbach's alpha was used to determine the reliability of the model. A satisfactory level of reliability is considered if the value for Cronbach's alpha is greater than 0.6 and less than 1 (Cronbach, 1951; Sijtsma, 2009). Jöreskog's Rho was used to evaluate composite reliability, a measure to understand the integrity and homogeneity of the model (Werts, Rock, Linn, & Joreskog, 1978). In our model, all constructs exhibited a higher level of reliability, indicating the instrument was appropriate, and the data can be subjected to further analyses.

Table 7.2. Overall reliability of constructs - Construct Reliability

Construct Reliability

Construct	Dijkstra-Henseler's rho (ρ_A)	Jöreskog's rho (ρ_c)	Cronbach's alpha(α)
Academics	0.7462	0.8383	0.7421
Students	0.8008	0.8701	0.8008
LMS	0.8724	0.8935	0.8647
Teaching Resources	0.7935	0.8727	0.7822
Management	0.7933	0.8555	0.7792
Engagement	0.8463	0.8826	0.8447

7.4.2. Sampling adequacy and the correlation between variables

For verification of sampling adequacy, Kaiser (1974) recommends the use of the Kaiser-Meyer-Olkin Measure (KMO) of computing sampling adequacy, which ranges between 0-1 (Dimitrov 2012; Field 2018; Gaskin & Happell 2014). The value 0 denotes a totality of partial correlations greater than the sum of the total correlations. This also means that the correlation model is widespread, which made the use of EFA not appropriate. If the value is close to 1.0, this indicates that the correlation model is reliable (more total correlations), and the EFA analysis will be credible (Field 2018). Kaiser (1974) has also emphasised that the accepted values should be greater than (0.50); if values are less than (0.50), a researcher should either collect more data (increase the sample size) or rethink the included variables in their measurement (Field 2018; Somashekhar, Raju & Patil 2016; Van Delft-Schreurs et al. 2016). To verify the correlation between variables, the Bartlett test was implicitly used. Using ADANCO, an empirical correlation matrix was developed, and the model provided with values to justify not going ahead with an EFA. If the correlation matrix was an identity matrix, this indicates that all correlation coefficients would be zero. The significance test will inform a researcher that a correlation matrix is not the identity matrix (Field 2018). The results are provided in Appendix F.

7.5. Validity

In order to establish the validity of the instrument, this study conducted convergent validity and discriminant validity, in addition to the previously discussed face validity and content validity methods.

7.5.1. Convergent Validity

Convergent validity is a parameter used to assess to what degree two measures of constructs that should be related hypothetically are indeed related. For each independent variable, convergent validity was used to examine the construct validity by using conformity scores; the acceptable value for the AVE should be equal to or above 0.5 (Campbell & Fiske, 1959; Carlson & Herdman, 2012). In our model, most of the constructs were approaching a score of 0.5, indicating a reasonable chance that

the constructs were achieving construct validity, with engagement showing the strongest convergence.

Table 7.3. Overall AVE for each construct - Convergent Validity

Convergent Validity

Construct	Average variance extracted (AVE)
Academics	0.5657
Students	0.6264
LMS	0.5126
Teaching Resources	0.6960
Management	0.5973
Engagement	0.5183

7.5.2. Discriminant Validity

Discriminant validity is a parameter used to assess whether constructs that are supposed to be unrelated are indeed unrelated. The degree of differentiation between the variables was examined by assessing whether the AVE of other constructs was lower than the square root of the average variance extracted from a specific construct (Campbell & Fiske, 1959; Carless, 2004). In our model, we were not able to fully establish the discriminant validity as there were overlaps in various concepts between constructs.

Table 7.4. Overall discriminant validity for each construct - Discriminant Validity

Discriminant Validity: HTMT Inference

Construct	Academics	Students	LMS	Teaching Resources	Management	Engagement
Academics						
Students	0.9563					
LMS	0.9889	0.8633				
Teaching Resources	0.8258	0.7960	0.8829			
Management	0.8213	0.8388	0.9301	0.9053		
Engagement	0.9274	1.0016	0.9104	0.9353	0.9409	

Discriminant Validity: Heterotrait-Monotrait Ratio of Correlations (HTMT)

Construct	Academics	Students	LMS	Teaching Resources	Management	Engagement
Academics						
Students	0.8286					
LMS	0.8827	0.7409				
Teaching Resources	0.6427	0.6227	0.7411			
Management	0.6766	0.7110	0.8024	0.7918		
Engagement	0.8105	0.9100	0.8134	0.8325	0.8374	

7.6. Exploratory factor analysis

Prior to measuring the construct validity using factor analysis of the questionnaire instrument and multivariate data analysis, the data file was first screened to ensure the quality of the data analysis process. This involved eliminating datasets that were incomplete and then to identify multivariate outliers (De Maesschalck, Jouan-Rimbaud & Massart 2000; Mertler & Reinhart 2017). Through this procedure, 6 survey questionnaires were identified and eliminated from further data analysis. The final sample size comprised of 86 datasets for further analysis, and this size was deemed suitable for ADANCO application as this application used Partial Least Square methods. To achieve the purpose of this particular study, ECV as a method was utilised to measure the construct validity of the questionnaire instrument (Aladwani 2014; Hajian et al. 2016; Olufadi 2015, 2017). This instrument was evaluated by conducting Exploratory Factor Analysis (EFA), which is commonly used in statistical applications in the social sciences (Osborne & Costello 2009; Tharenou, Donohue & Cooper 2007; Yong & Pearce 2013). Chin (1998a) recommends utilising the EFA technique prior to conducting SEM, especially when using PLS applications. The key aim of this technique is to summarise and reduce composite variables into a smaller number of generated factors that are greatly associated with them (Osborne & Costello 2009; Schumacker & Lomax 2010; Tharenou, Donohue & Cooper 2007; Yong & Pearce 2013; Zikmund, Babin & Griffin 2013). To determine the initial number of retained factors, the following two criteria should be considered when using EFA (Field 2018; Hair et al. 2010): sampling adequacy and correlation between variables should exist; and correlation coefficient of items should normally be greater than, or equal to, 40% ($\geq$ 0.40) to be statistically significant and this should be

included in a factor; and a cumulative percentage of variance explained should be greater than 60% or equal.

Thus, each element in the conceptual framework model of this research was calculated to obtain load factors. The data set used consisted of 43 items that measured six composite variables (five independent and one dependent). The six items are, to some extent, interdependent, as engagement in a classroom situation was dependent on many attributes. An explicit exploration of the dimensions of engagement processes scale, which consisted of seven items, had to be conducted. This required using EFA in order to identify the valid items to be included in this scale. Items not meeting the considerations of the above criteria were eliminated. In this study, ADANCO returned a value of 0.7279 as an adjusted R^2 value, confirming the verification of the first EFA criterion for the research measurement because the value was greater than 0.50. This indicates that the correlation model was reliable in terms of total correlations, and the EFA analysis would be credible.

7.6.1. Principal Component Analysis (PCA)

Factor analysis was conducted by Principal Component Analysis (PCA) to decrease the data set (Field 2018; Gaskin & Happell 2014; Yong & Pearce 2013). PCA is considered to be one of the most accurate methods and common uses of EFA methods (Gefen, Straub & Boudreau 2000; Quiyono 2014). Chin (1998a) recommends using PCA prior to conducting SEM. The aim of using this analysis is to condense contained information of original variables into fewer factors without missing information (Bańbura & Modugno 2014; Hair et al. 2010). In the current study, EFA was repeated many times to reach ultimate solutions around related items and achieve the two criteria above. The refined PCA is shown below.

Table 7.5. Refined PCA

Indicator	Academics	Students	LMS	Teaching Resources	Management	Engagement
A quality interaction with students	0.8094					

A clear explanation of the course concepts	0.7739					
Knowledge in the use of LMS technology	0.7548					
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments	0.6627					
Student's prior knowledge of the subject domain		0.7878				
Students' own digital devices to access LMS based materials		0.7358				
Students' knowledge in using the LMS		0.7477				
Interaction with professional support staff people (Program Management, IT etc)		0.8333				
Quality access to LMS			0.713			
Availability of quality content on the LMS			0.761			
Organisation of subject materials in the LMS			0.696			
A mix of text, audio, and video in subject presentation			0.665			

Clear and easy to use content			0.797			
Portal Management & Navigation aids			0.694			
Authentication protocols			0.686			
Understanding students' needs while creating content for the LMS			0.706			
Appropriateness of teaching materials				0.8294		
Adequacy of content provided to students				0.7923		
Relevance of materials				0.879		
Improved time management for the course					0.7421	
Addressing part-time students struggle in managing their work-study balance					0.7451	
Improved access to learning resources					0.775	
Adequate time available to spend in course activities					0.8262	
Quality university environment						0.7834
Cutting edge facilities provided in the classroom						0.6719
Quality interaction between academic and students						0.6822

Addressing students' communication skills						0.7222
Addressing classroom attendance issues						0.7175
A clear plan of various activities and their due dates						0.7097
Quality forum discussions						0.747

It is apparent from the table above that certain items were loading less, and it was possible to remove these items to refine the PCA. This exercise was conducted in this study so as to identify a minimal set that loads well to determine the factors. In doing so, the factor loading was kept at 0.70 or closer to this value so that a better PCA could be developed. This resulted in the PCA shown above.

Further, the model was checked for reliability. The reliability was tested on individual items, as well as at a composite level of constructs. In this study, as mentioned, six constructs were used, and the following table provides reliability scores for the constructs used.

Table 7.6. Reliability scores

Construct	Dijkstra-Henseler's rho (ρA)	Jöreskog's rho (ρc)	Cronbach's alpha(α)
Academics	0.7461	0.8383	0.7421
Students			
LMS	0.8725	0.8935	0.8647
Teaching Resources	0.7935	0.8727	0.7822
Management	0.7934	0.8555	0.7792
Engagement	0.8462	0.8826	0.8447

As can be seen from the table above, the value of the Cronbach Alpha for all the composite construct items was 0.7792 and above, indicating the instrument of the study had a high internal constancy consistency., because the value of Cronbach Alpha was greater than 0.70. As shown in the table above, the values of the Cronbach alpha of the composite variables ranged between (0.7792-0.8647). These indicate that the values were statistically acceptable because they were greater than the acceptable rate (0.70). Hence, this result ensured the reliability of the whole measurement of engagement processes. However, the reliability test using Cronbach Alpha did not calculate the reliability between items. Therefore, the reliability test using the Interclass Correlation Coefficient (ICC) was used to ensure the items measuring the same composite variable belonged (Field 2018). This test was required before testing the research hypothesis using regression analysis to confirm the items that measured the same composite variable. This process returned reliable inter-related items, and these are shown in the Appendix. This provided confidence to conduct path analysis prior to hypotheses testing.

7.6.2. Analysis

A special case of structural equation modelling (SEM) is path analysis or causal modelling. In path analysis, single indicators are used in the causal model for each variable and the strength of each path is calculated as a product of the path coefficient along that path. In our research, the value of $R^2 = 0.541$, which is acceptable and supports the model (Hooper, Coughlan, & Mullen, 2008).

Figure 7.2. Structural equation model with path coefficients

7.6.3. Correlation analysis

Correlation analysis was used to assess the significant relationships that may exist between talent management processes and knowledge management processes, with the dependent and the independent variables or constructs that were explored further by factor analysis. Correlation analysis is one of the more common methods to evaluate construct validity in business research (Sekaran & Bougie 2016). The correlation coefficient is a measure to assess the level of association between two variables (Collis & Hussey 2013; Field 2018; Remenyi et al. 1998). This coefficient ranges between -1 and +1 (Cooper & Schindler 2011; Hair et al. 2010; Remenyi et al. 1998). If the value of the correlation coefficient is 0, it means that there is no correlation between two variables (Cooper & Schindler 2011; Saunders, Lewis & Thornhill 2015). A value of +1 means a perfect positive correlation; however, if the value of the correlation coefficient is -1, it means a perfect negative correlation between two variables (Field 2018; Saunders, Lewis & Thornhill 2015). The following table provides a summary of the Pearson Correlation (r) analysis to measure

the relationship among the composite variables that were explored by factor analysis. Here, the r-analysis is fitting due to all the variables of the study being can be expressed in terms of the ratio scale.

Table 7.7. Pearson correlation (r) analysis

Construct	Academics	Students	LMS	Teaching Resources	Manage-ment	Engage-ment
Academics	1					
Students	0.6418	1				
LMS	0.7197	0.6368	1			
Teaching Resources	0.5029	0.501	0.6301	1		
Management	0.5476	0.6094	0.693	0.6409	1	
Engagement	0.6529	0.7684	0.7263	0.684	0.711	1

Additional tests were conducted using ADANCO to verify the values load between constructs appropriately,, and this was verified by checking the t-values loaded between the dependent variable and the independent variable. The values were positively loaded, and the dependent variable was engaged with many of the independent variables, giving confidence that the hypotheses testing can be conducted. The full results are shown in Appendix F.

7.7. Regression Analyses

We used ADANCO 2.0.1 software to conduct hypothesis testing in our research. This tool uses variance to model structural equations. For an unknown population data, a bootstrapping method should be used for modelling (Efron, 1987). Significance levels are measured using the t-values and the p-values, as depicted in the table below.

Table 7.8. Significance levels

	Significance	t-value
Level of significance	$p<0.1$	1.65
	$p<0.05$	1.96
	$p<0.01$	2.59

In our research, five hypotheses were postulated. To evaluate the reliability of each hypothesis, they were tested against recorded t-values of the independent variables and the dependent variable.

Table 7.9. Total effects inference

Total Effects Inference

Effect	Original coefficient	Standard bootstrap results					Percentile bootstrap quantiles			
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.5%	2.5%	97.5%	99.5%
Academics -> Engagement	0.0802	0.0906	0.0996	0.8048	0.4211	0.2106	-0.1583	-0.1002	0.2826	0.3656
Students -> Engagement	0.3866	0.3869	0.0896	4.3155	0.0000	0.0000	0.1400	0.2024	0.5655	0.6035
LMS -> Engagement	0.1380	0.1431	0.1092	1.2644	0.2064	0.1032	-0.1312	-0.0765	0.3540	0.4292
Teaching Resources -> Engagement	0.2489	0.2343	0.0983	2.5327	0.0115	0.0057	-0.0186	0.0437	0.4289	0.4776
Management -> Engagement	0.1833	0.1891	0.0919	1.9950	0.0463	0.0232	-0.0918	-0.0020	0.3673	0.3986

7.8. Hypotheses testing outcome

Of the five hypotheses that were identified in our research, the path co-efficient for three hypotheses emerge as significantly strong, and these hypotheses were accepted. The following is the list of (alternative) hypotheses set in this study:

H1: Students are influenced by teaching resources in order to realise engagement in classroom activities.

H2: Academic influence engagement in classroom activities through their involvement in various teaching and management aspects.

H3: Academic activities influence the management of teaching activities, resulting in improved engagement by students in the class.

H4: Learning Management Systems (LMS) is a key part of improving students' engagement.

H5: Management of various study-related activities to reach focus in the study will positively influence students' engagement.

The first hypothesis, H1, highlights the influence of teaching resources on the importance of engagement by students in the classroom activities. The model returned a value of t = 9.001 with CI > 99.99. **Thus the hypotheses that Students are**

influenced by teaching resources in order to realise engagement in classroom activities (t = 9.0010, p, 0.005) is accepted. This indicates that teaching resources are indeed significant in determining a student's engagement in classroom engagement and associated activities.

Further, when determining the influence, the path coefficients were also examined. The analyses indicated that individual constructs loading adequately (in the path coefficient calculation) to determine this construct, and this is shown below.

Table 7.10. Path coefficients

Indicator	Coeficient
Q24	9.8507
Q25	6.9671
Q26	24.1469
Q27	12.134
Q28	11.9751
Q29	7.0756
Q30	8.6132

According to Wright (1934), if the path coefficients return a value of 0.7 and above, the impact is considered strong. As can be seen from the above table, many path coefficients were well above the 0.7 thresholds. Therefore, it can be determined that this construct is very strongly influencing the independent variable "Engagement".

Table 7.11. Full list path coefficients

Indicator	Students	Teaching Resources	Management	Engagement	Academics	LMS
Q1					11.3586	
Q2					10.1816	
Q3					16.8743	
Q4					7.4843	

Q5					9.4922	
Q6					7.0904	
Q7					7.2035	
Q8	8.6816					
Q9	10.0602					
Q10	8.9046					
Q11	6.7111					
Q12	16.563					
Q13	12.7922					
Q14	14.3604					
Q15	10.464					
Q16						7.9175
Q17						10.6854
Q18						6.9229
Q19						7.9142
Q20						16.8423
Q21						9.4814
Q22						11.6521
Q23						9.6027
Q24		9.8507				
Q25		6.9671				
Q26		24.1469				
Q27		12.134				
Q28		11.9751				
Q29		7.0756				
Q30		8.6132				
Q31			14.2435			
Q32			29.0652			
Q33			12.9883			
Q34			4.3084			
Q35			6.0514			

Q36			6.5645			
Q37				23.5182		
Q38				13.9528		
Q39				9.1925		
Q40				12.6772		
Q41				10.9182		
Q42				9.8461		
Q43				11.9644		

The second key objective of this research was to investigate the relationship between engagement processes within a classroom context and the attributes that define it, within the context of a tertiary setting where an LMS is used as the main platform. To achieve this objective hypothesis testing using the simple regression analysis technique was applied (Remenyi et al. 1998; Sekaran & Bougie 2016). Simple (bivariate) regression analysis is a statistical method to examine the relationships between two variables, one independent and one dependent (Field 2018; Hair et al. 2010; Jeon 2015). According to the conceptual model of this study, each composite variable of engagement processes (independent variables) influenced each composite variable of engagement processes (dependent variables) individually. Hence, simple regression was a suitable technique to test the research hypotheses (Hair et al. 2010). Regression analysis is a powerful method when the aim is to comprehend the relationships between composite variables, both independent and dependent (Baig 2010; Chin 1998a; Jeon 2015).

To assess the regression analysis results in regards descriptions of the relationship between independent and dependent variables, there are three key indicators: coefficient of determination (R^2), F-value, and t-value (Hair et al. 2010; Saunders, Lewis & Thornhill 2015; Sekaran & Bougie 2016). The R^2-value ranges between 0-1 (Field 2018; Hair et al. 2010). In terms of an acceptable level of R^2-value, determining the satisfactory value is difficult and depends on the research complexity (Hair Jr et al. 2016). Nonetheless, Chin (1998b); Ringle (2004) suggest three levels of R^2-values: 0.670 substantial, 0.333 moderate, and 0.190 weak (Urbach & Ahlemann

2010). The F-value and t-value should be statistically significant with a P-value of at least 0.05 (Field 2018; Hair et al. 2010; Saunders, Lewis & Thornhill 2015).

In this study, by using ADANCO application, hypotheses testing was conducted as the principles of verification between simple regression testing and PLS based regression testing are one at the same. The following table provides the results of the research hypotheses to investigate the relationship between engagement processes and the associated constructs. It shows the values of regression paths: R^2-value, estimate (β), Standard Error (S.E.), F-value, t-value, and P-value of nine hypotheses. Actual outputs, using SPSS, for the regression analysis are shown in Appendix F.

Table 7.12. T-value for testing hypotheses

Effect	Original coefficient	Standard bootstrap results				
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)
Academics -> Engagement	0.0745	0.0905	0.0957	0.7780	0.4368	0.2184
Students -> Engagement	0.4035	0.411	0.0960	4.2013	0.0000	0.0000
LMS -> Engagement	0.1458	0.1426	0.1059	1.3766	0.1689	0.0845
Teaching Resources -> Engagement	0.2467	0.2291	0.0936	2.6347	0.0086	0.0043
Management -> Engagement	0.1651	0.1691	0.0874	1.8887	0.0592	0.0296

As can be seen from the above table, this study used the t-value for testing hypotheses and the following t-values were returned by the data analyses:

- t(Academics à Engagement) = 0.7780 < 1.65
- t(Students à Engagement) = 4.2013 > 1.65 (and 2.59)
- t(LMS à Engagement) = 1.3766 < 1.65

- t(Teaching Resources à Engagement) = 2.6347 > 1.65 (and 2.59)
- t(Management à Engagement) = 1.8887 > 1.65

Using the standard t-value table used to accept or reject hypotheses (shown below),

Table 7.13. Standard t-value table

	Significance	t-value
Level of significance	p<0.1	1.65
	p<0.05	1.96
	p<0.01	2.59

This study can provide a determination on hypotheses testing as below.

Once the path coefficients were found to be satisfactory, this study verified the testing of hypotheses. The following list is a summary of hypotheses testing.

H1: Students are influenced by teaching resources in order to realise engagement in classroom activities – ACCEPTED

H2: Academic influence engagement in classroom activities through their involvement in various teaching and management aspects - REJECTED

H3: Academic activities influence the management of teaching activities, resulting in improved engagement by students in the class - ACCEPTED

H4: Learning Management Systems (LMS) is a key part of improving students' engagement – REJECTED

H5: Management of various study-related activities to reach focus in the study will positively influence students' engagement - ACCEPTED

The first hypothesis, H1, highlights the influence of teaching resources on the importance of engagement by students in the classroom activities. The model returned a value of t = 9.001 with CI > 99.99. Thus, the hypotheses that Students are influenced by teaching resources in order to realise engagement in classroom activities (t = 9.0010, p < 0.005) is accepted. This indicates that teaching resources are indeed

significant in determining a student's engagement in classroom engagement and associated activities.

The second hypothesis, H2, Academic influence engagement in classroom activities through their involvement in various teaching and management aspects, shows that the impact of academic on classroom engagement is highly significant for the null hypothesis (t-value = 8.4450; CI > 99%). Thus, H2 ($p < 0.01$) is REJECTED.

The third hypothesis, H3, Academic activities influence management of teaching activities, resulting in improved engagement by students in the class, tested the effects of various teaching activities conducted by the academics and these are content-specific. As per the data analyses, these activities positively impact engagement (t-value = 2.2426; CI > 99%), and thus H3 ($\beta = 0.4613$; $p < 0.1$) is ACCEPTED. Factors such as currency of content, modern teaching methodologies, the relevance of content play a key role in contributing to this construct.

The fourth hypothesis, H4, Learning Management Systems (LMS) is a key part in improving students' engagement, shows that the impact of LMS in engaging students is NOT at all significant. This hypothesis is REJECTED.

The fifth hypothesis H5, Management of various study-related activities to reach focus in study will positively influence students' engagement, is ACCEPTED (t-value = 2.3828; CI > 99%; $\beta = 0.5438$; $p < 0.1$).

7.9. Conclusion

In this study, the data analyses procedures were explained, and the outcome of hypotheses testing was provided. In the next chapter, Chapter 8, a discussion is provided.

CHAPTER 8: DISCUSSION

8.1. Chapter overview

In this study, three hypotheses were found to be supported by the research findings. Section 8.2 shows how student's engagement is supported by the student-staff ratio as a key determinant in asserting engagement in the classroom. Teaching resources and its implications are addressed in section 8.3. After that, management engagement is presented in section 8.4, where it is demonstrated that Teaching and Course Management is crucial for the student's engagement, followed by an exploration of the regulatory environment in Australia in section 8.5. Finally, Section 8.6 presents the theoretical and practical contributions to this study.

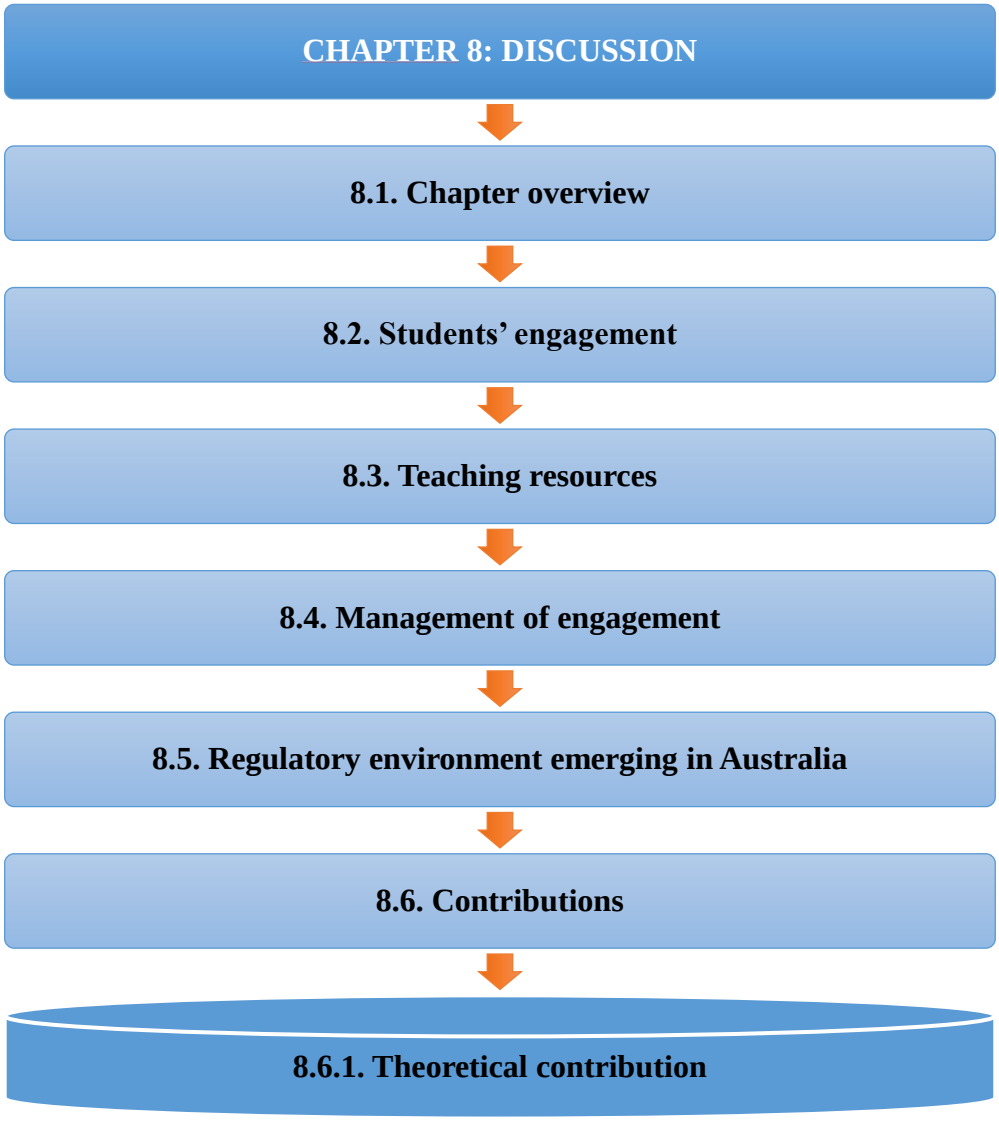

Figure 8.1. Graphical structure of chapter 8

8.2. Students' engagement

The data clearly indicates that students view aspects such as motivation, attitude, their own interest and prior knowledge to be key factors (this is titled as students in our modelling) in improving engagement in the education setting, as shown in Figure 8.2. This has already been identified in prior studies (Bryson & Hand 2008), and this study also echoes these findings. This study has found support for the notion that the student-staff ratio is a key determinant in asserting engagement in the classroom, a concept which has previously been highlighted by Krause and Coates (2008) and Zepke, Leach and Butler (2010), and Quaye and Harper (2014). Positive attitudes

exhibited by students is also a key factor in determining the level of engagement, and this study has provided strong evidence that supports this finding. In fact, modern tertiary environments support this, and when the attitudes of students are not positive, support schemes are put in place to ensure students can develop a positive frame of mind. While prior studies have referred to this, perhaps for the first time, this study is able to provide evidence to this effect. Students' prior knowledge is also a key factor in determining their engagement and this study asserts this through statistical evidence. In addition, this study has provided new evidence that students' own digital devices play a key role in improving engagement. This finding is new and demonstrates that students felt more comfortable with their own devices, which in turn improved their level of engagement. This has now highlighted the utility of movements such as "Bring Your Own Device", which advocates for students to interact with teaching platforms through the use of their personal access to technology and hardware. Most students who are able to attend university would also have access to a smartphone, tablet or laptop (if not all three), and most would rely on an interplay of these various devices to conduct their day-to-day activities – it is not a stretch to consider that this access to personal devices can be incorporated into university teaching and learning modules. An implication of this in the tertiary setting is managing the operating environments and associated authentication procedures while ensuring that privacy is maintained. Despite these challenges, there is a strong preference from students for their own device to be integrated into the LMS development and associated engagement activities.

The level of knowledge in using LMS' is found to be a key determinant in improving engagement, and in the tertiary context, this can be quite challenging as many overseas students from developing countries do not have strong LMS foundations in their institutions. This would likely disadvantage students studying for the first time in Australia, and unless strong support schemes are provided, bridging this gap may be an ongoing issue leading to a lack of engagement in the classroom. Finally, interaction with non-academic staff is also identified as a key factor in improving engagement, and this involves library staff, admissions staff, and other auxiliary staff members. A key reason for this appears to be that academics are engaged in research and other professional activities without time to dedicate to

students' administrative tasks. In the context where this study was conducted, academics also travelled between campuses. The lack of availability from academics on campus necessitates support staff taking an increased load in interacting with students so as to guide them in non-urgent, non-academic issues, likely to involve queries regarding the teaching platforms. This study found evidence of this. This has been recognised by TEQSA HESF threshold standards in the form:

'TEQSA will need to be satisfied that students who are admitted are equipped to succeed in their chosen course of study (e.g. level of academic preparation, learning skills, proficiency in English), and that ill-prepared students are not knowingly admitted. Factors are taken into account in selection (such as prior qualifications or the use of the Australian Tertiary Admission Rank [ATAR]), and all information needed by students before applying for a course must be disclosed transparently (see also Domain 7 – Representation, Information and Information Management). Students must be able to readily access all information needed for them to estimate realistic prospects for admission to each course.'

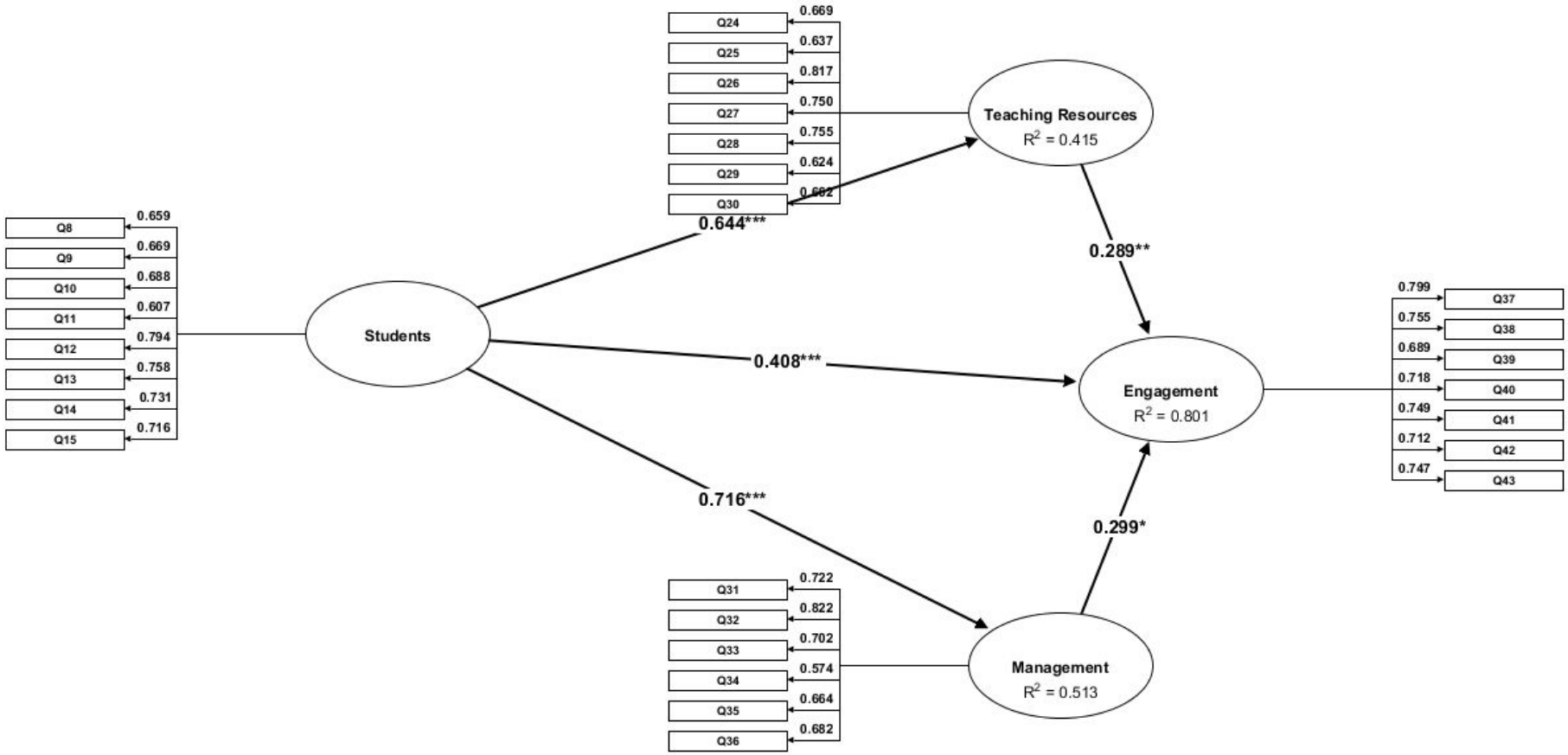

Figure 8.2. Student Engagement Analysis

8.3. Teaching resources

The hypothesis that teaching resources positively influence classroom engagement is accepted in this study. The participants of the study asserted that currency and relevance of teaching resources used in courses is paramount in determining the level of engagement and this is attested to by a number of prior studies as well (Darling-Hammond, Chung & Frelow 2002; Tschannen-Moran & Hoy 2001). In conjunction with this, the participants of this study also supported the notion that modern teaching methodologies would improve engagement. Evidence to support this can be found in prior studies (Wilson & Boldeman 2012). Further, the participants viewed the link between teaching resources and assessment as an important nexus in assuring engagement, and this is also echoed by prior studies (Darling-Hammond, Chung & Frelow 2002; Tschannen-Moran & Hoy 2001). Recent TEQSA HESF threshold standards also support these aspects. Finally, participants of this study stated that they would like to conserve time in searching for materials as this was judged to be an unnecessary imposition on their time, therefore negatively impacting upon the engagement. While previous studies have implied this, this is perhaps the first time statistical evidence has been provided to assert and support this notion (Figure 8.3). When this view is read in conjunction with support services in the 'students' construct, the significance of support services becomes apparent.

8.4. Management of engagement

The hypothesis that Teaching and Course Management is crucial for engagement is upheld by this study. Within the construct 'Management', participants were asked to express their feeling in terms of task management, time management, understanding university procedures, managing work-study-life balance, access to learning resources and adequacy of available time for study related activities. The model returned a t-value of 1.9995 indicating a high fit and associated validity of results (Figure 8.2).

The participants of this study consisted of both full time and part-time students. The participants viewed the improved task management of the course, especially in an LMS environment to be a key factor in engagement. This knowledge is important in tertiary settings as LMS' are seen to be a 'dump' where resources are placed for access. However, participants implied that task management leading to comprehension of knowledge is essential in order for them to engage in the classroom. This requires careful consideration of how tasks are planned, the time taken to complete them and the interaction provided within tasks. Prior studies such as the Reading (2008) have postulated that these are key course management activities and this study has found evidence for these ideas. Within the management, participants have indicated that understanding rules and regulations of the setting in which they are studying is also crucial for engagement. While this hasn't been identified in prior studies, in the context given, where students have the option to study either in the classroom or online, and with the possibility of interacting with academic and other university staff in a limited fashion, this factor becomes quite crucial. An implication of this view is that various expectations are not made clear, or it is not possible to make various expectations explicit in an online environment, and thus expectations that are not aligned leads to a lack of engagement. This is new knowledge that has not yet been asserted in the literature we reviewed. Participants affirmed that improved access to learning resources would improve engagement and similar views were affirmed in other areas, for example, when discussing the construct Students. While we did not investigate the underlying issues, it was evident in this study there was a strong view that improved access to learning resources is essential in improving engagement (t= 11.043).

8.5. Regulatory environment emerging in Australia

In Australia, TEQSA is now empowered with an educational quality overview. TEQSA dictates a number of standards and tertiary institutions are expected to provide 'evidence' as to meeting these standards. Within this context, the outcomes of this study are aligned with a number of standards as required by TEQSA. These are discussed below.

TEQSA standard 1.1.1. specifies various entities associated with admissions and enrolment policy, procedures and processes; admissions criteria, including but not limited to English language requirements, and course-specific entry requirements. In this study, participants referred to these aspects during the qualitative phase. A participant suggested that 'for me it's a bit of the rule and regulations made by the university that makes a difference', indicating that his choice was based on the rules and regulations of the university. Another participant suggested that support systems are very important to overseas students and stated that 'some students, like overseas students, stay here alone – sometimes they feel alone, and they do not willing (sic) to come to universities because they have no friends and no communication', indicating the necessity of such systems for Non-English Speaking Background (NESB) students. While discussing communication-related aspects, a participant noted that 'they have no friends and no communication - English is meant to be [the primary language] - and they wanted to stay home, and they wanted to continue their studies with online (sic) by using the portal, and they always ignore the classes because they have nobody to communicate [with] in the university', indicating the need for various support systems to alleviate such problems that are beyond an academic's classroom but contribute to the overall level of engagement in the learning experience.

In the context of this study, there is ample evidence to demonstrate that students commented on a number of aspects in the policy and procedure domains. For example, students indicated that they would like to see strong support systems as an indication of the fact that they have difficulties in comprehending tertiary procedures – especially in course-related areas. The participants of the study were already studying and well versed with various systems. However, there were still certain procedures they were not able to understand, and identified that they required

additional support systems. In this context, the outcomes of this study are aligned with TEQSA.

TEQSA standard 1.2.1 deals with the recognition of prior learning (RPL) policy; RPL assessment arrangements; and credit transfer policy and procedures. Within this setting, there was strong evidence in this study to seek policy clarifications from students. The participants suggested that 'practical learning' is important in the program they are studying and suggest prior learning is key to their growth in the subject. It should be noted that the participants of this study were not asking for credit transfers, as this was beyond the scope of this study. However, the views expressed by participants were notable as they felt that prior learning was very important in their area of study. Thus, participants of this study have recognised the value of prior learning in building their current knowledge.

TEQSA standard 1.3.2 states that support strategies are required at the institutional level to foster the needs and preparedness of individual students and student cohorts; to undertake early assessments that provide formative feedback on academic progress, and to undertake early reviews that identify needs for additional support. Participants of this study have expressed positive attitudes towards these aspects and suggested that additional support in assessment-related domains would be an advantage in terms of LMS-dictated learning environments, due to the potentially asynchronous mode of learning. The view expressed by participants points to the fact that additional support services are required for students to successfully undertake assessments, and these include access to tutors, academics, LMS-based technical troubleshooting, navigation, and the availability of course materials.

TEQSA standard 1.3.3 is specific to assessment rubric and mapping. Participants of this study viewed the LMS navigation skills as a key component in undertaking their study tasks. While TEQSA did not dictate how assessments should be completed, in the context of this study students completed online assessments and the navigation aspects of the LMS were viewed as being critical. Within this scope, the clarity of expectation, submission procedures, how courses are mapped in terms of assessments, how they are communicated to students, and the marking rubrics to

indicate where the focus is placed assume significance. Participants have commented favourably in terms of additional teaching resources involving these aspects.

In terms of TEQSA standard 2.1.2, IT security measures and associated service management issues are critical. The participants have positively commented on IT access and associated authentication procedures in an LMS driven learning environment. The SEM shows that the factor 'authentication protocol' was loaded with a factor loading of 0.686, indicating high loading, and the multicollinearity was at 1.82, again indicating strength. The participants implied that easy IT authentication is essential for them to navigate through the LMS and other university systems, and hence indirectly commented on the security measures. This is commented upon in multiple contexts as participants use a range of devices, and sometimes the fixed IP number-based authentication leads to issues. Similarly, certain systems were accessible only from the university campuses, and these lead to access issues, with comments were made in these contexts.

In terms of TEQSA standard 2.1.3, which centres upon the student handbook, learning management system features and unit outlines to show how those online features will support the learning environment, this study provides strong support in terms of the availability of quality content on the LMS (factor loading of 3.1204), Organisation of subject materials in the LMS (1.8626), a mix of text, audio, and video in subject presentation (2.0808) and clear and easy to use content (3.2885) were shown to be especially valued by participants. In the context given, participants used online portals to access course-related materials and expressed strong views as to the availability of various resources leading to these as shown above. The participants went a step further than the TEQSA guidelines in stating that a mix of audio and visual teaching resources would be ideal, indicating their preference to download materials using optimal avenues. A participant stated that 'they can achieve a better result in the near future… [by improving] the website [through the inclusion of] …pictures along with explanations – some videos – you are more likely to be attracted to learning' attesting the TEQSA standards that the learning setting should provide a rich environment to students.

Other TEQSA standards, such as 1.4.1, were also addressed by the participants of this study. In the construct regarding teaching resources, participants strongly rated the link between teaching resources and assessments and identified that the relevance of materials and modern teaching methodologies directly influenced engagement in a classroom where an LMS is used. TEQSA standard 1.4.1 discusses the learning outcomes aspects. It can be inferred from the outcomes of this study that participants viewed the outcomes in terms of learning resources and how they are articulated in a classroom environment. Further, this study affirms the guidelines provided by TEQSA in 1.4.2a-d where TEQSA states that a Clear overview of specified course learning outcomes and unit learning outcomes' [is essential], and this is encapsulated in the survey domains that reviewed appropriateness and currency of materials, with the statistical values for these at 0.82 and 0.87, indicating high reliability. Hence, this study supports these TEQSA standards.

In TEQSA standards 2.1.3, student handbook details are covered. While this study did not pertain to student handbooks, participants strongly viewed the content, navigational tools, and access to information as key elements improving engagement (0.79, 0.69, and 0.71 respectively) indicating high validity. It can be inferred by the factor loading that participants would like to have clear and concise information for them to navigate course materials. If this notion is extrapolated, then it can be seen why the handbook details are seen significant in the TEQSA context. Similarly, the three survey items stated above refer to TEQSA standards 3.1.1a-h where unit outlines are discussed in the standards, and this study supports these standards.

In the Literature Review Chapter, it was highlighted that new student generations are considered 'connected' generations, and this requires learning materials to facilitate student engagement for behavioural, emotional, and cognitive aspects of the ICT-rich learning environments. In this study, there is sufficient statistical evidence to assert this notion. For example, a participant commented that the 'interaction between students and the faculty which relate[s] to the modules that they are learning – it will be more beneficial and interactive if they are told what's there in the thing which is really going to be implemented', indicating a willingness to connect. Survey questions on rich ICT environments where participants wanted a mix of audio and video, portal management and navigation tools, students' own

devices to access LMS', and their knowledge in using the LMS were loaded very strongly. In the interview, a participant stated that 'the availability level of the content – for instance, either it's downloadable or not downloadable… is it available in the form of video or just the text file… so that all helps in student engagement'. The factor loadings attained in this study also affirm Wilson and Boldeman (2012) assertion that ICT integration is significant in improving a student's engagement by creating dynamic and realistic scenarios regarding the studied topics. Through this study, we were able to produce support for this notion, as well as the fundamental IT knowledge required by students to comprehend and adapt to such an ICT-rich environment so that students could adequately engage in the course content. Thus, from the outcomes of this study, it is possible to infer that ICT rich learning environments are emerging as a major game-changer in which students are engaging with curriculum and content-based discussions, and these environments play a defining role in student engagement.

Further, Wireless Learning Technologies (WLTs) are gradually replacing the traditional methods of information sharing, and this leads to future collaborative multiuser sharing. WLTs used in education include mobile technologies such as smartphones, tablets and laptops as well as systems designed to be used specifically in technology-rich collaborative learning spaces. Such spaces are networked both technologically as well as through student-to-student interactions, are expected to result in better student engagement (Carter et al. 2014). In this study, through qualitative interviews, we were able to extract conversations to this effect, leading to survey questions that were designed to understand students' needs while creating the content, integrating one's own devices for accessing the LMS, using AR/VR to augment learning environments and authentication schemes employed to provide access. In our SEM model, these factors were loaded strongly indicating positive influences, and also affirming the notion of Bhati et al. (2013) to facilitate technology-rich environments for students to interact with the content as well as with each other. A participant stated that 'they can achieve a better result in the near future… [by improving] the website [through the inclusion of] …pictures along with explanations – some videos – you are more likely to be attracted to learning' providing further validation to this notion. Therefore, this study concurs with Bhati et al (2018) in this regard.

Prior studies have also pointed out that factors beyond the ICT based learning environment are becoming key factors in the domain of student engagement. For example, the impacts of teachers' competency and the quality of study materials provided for student engagement have been singled out by Tschannen-Moran and Hoy (2001). In this study, adequate evidence was found for this notion. Further, these two factors were included in our survey instrument for statistical testing. It was established that the quality of study materials was found to be significant in classroom engagement and expressed in terms of clarity of content, presentation and discussion. Similarly, teachers' competency was expressed in terms of their LMS management and navigational skills. The implication of these two key aspects is that if there was a lack of competency in managing the LMS based features, or if the study materials are not properly developed, then the engagement is going to be affected. The outcomes of this study affirm that these two key elements are significant, and the direct implications of these elements relate to the capability of academics to deliver content and their acumen in the choice of study materials. If this is assumed to be true, and if this notion is extended further, then an academic's capability might include their proficiency in the content area, their ability to communicate the content to meet a range of student needs, their capacity/availability to understand students' needs and cater to these needs, preparing student content, and making this available through an ICT medium. In this context, TEQSA provides some pointers in terms of their standards but couched in a different format. This study is able to affirm the link between what the literature alludes to and how these are reflected in some of the TEQSA standards, thus making the outcomes of this study relevant to the Australian tertiary sector.

Further evidence is also provided in this study through (Tschannen-Moran & Hoy 2001), who stated that these factors (pertaining to academics' capability) are essential to improve the engagement in the classroom and beyond. A participant expressed that 'if you don't have a teacher who really loves what he is doing, that is actually out there aiding students when they need help or recommending resources [it affects engagement]', indicating that the capability of an academic is essential to improving the engagement process. Further, this study is also able to provide statistical validity to this notion and asserts that the 'academic efficacy' is key to

determine engagement leading to a student's learning process. In an ICT rich environment, it is possible to even motivate a disengaged student (who is otherwise not motivated) by encapsulating the content using innovative methodologies and techniques that could be acquired through professional development. This study is able to provide evidence where participants discussed the inclusion of AR/VR and audio and video mixes to make the content interesting.

The outcomes of this study align with the notion that an academic's sense of preparation is related to their sense of efficacy, and directly related to the student learning (Darling-Hammond, Chung & Frelow 2002). In supporting this notion, this study identified the key role study materials play and include attributes such as the currency of topics, and contextualisation leading to meeting student expectations. Prior studies, for example, state that the standardisation of course material may produce undesirable results regarding student engagement (Pilotti et al. 2017). While this study did not find direct evidence to support this notion, questionnaire items such as students' prior knowledge, their proficiency in accessing the LMS, the integration of their own digital devices and their own interst in the subject point to the fact that customisation may be required to improve engagement. We were able to find further evidence to support our view that customisation might lead to imroved engagement in (Duarte & Escobar 2008) who state that adapted materials may increase the student motivation by providing familiar and common situations that make the material more meaningful for them. The implication of such a notion is profound because this digresses from the fact that content development should be bottom-up in the sense that a teacher will understand the student cohort, understand their needs and prepare the content. This is the traditional approach, but due to the need for customisation, teachers need to deviate from this approach and 'assemble' materials in order to provide content that meets varying levels based on individual needs. If this notion is going to be true, then teachers become content managers rather than content developers, and the outcome is that content is prepared by others to be used. While this would reduce the timeframe of content development, the undesired outcome could be a lack of fit as the content may have been developed without understanding the needs and requirements.

In addition, if students who are provided with generic or non-contextualised material that is mainly assembled from other sources, students could lose their motivation toward certain topics due to a lack of relevance. Thus, this study is able to assert that the lack of competency in teaching and choice of unsuitable course materials may decrease the level of student engagement.

The literature reviewed for this study clearly indicated that the lack of competency in academics is considered as a problem influencing student engagement. This is because the competency of academics is related to their preparation, and hence this aspect impacts directly upon students' engagement. Evidence for this notion can be found in Bukowski et al. (2016) who mention that the lack of competency may lead the students' intellectual helplessness, although the real problem is not recognising this 'incompetence'. In this study, we were able to provide statistical evidence to this notion where the competency of academics was found to be a key factor meeting statistical validity criteria. An implication of not meeting competency for academics is that they are not adequately prepared in their areas, do not have proper knowledge of how to impart subject-related knowledge to engage students in the course and enforce the teacher-student interaction. Therefore, this study is able to find evidence that content knowledge and how the knowledge is presented using technology is paramount to assert an academics' competency in the subject.

On the other hand, students' needs vary over time within the same subject area. It is not uncommon to see students become experts from novice stages as a result of engagement and making themselves familiar with the content. In order to meet students' needs, academics have to update their knowledge and teaching methods. In the realm of freely available online materials, social media interactions, and other conversations students have among themselves, it is imperative that academics can feel prepared only when they remain abreast of the content. The implication of this outcome is that the novice teacher may improve their preparation by having mentoring practices, as suggested by Rots et al. (2010). In fact, a recent discussion in Australia (ABC News 10 February 2020) highlights the need for senior teachers to train junior teachers so that content and relevance can be established in classrooms. This view also coincides with the notion that certified teachers feel better prepared than non-certified teachers (Darling-Hammond, Chung & Frelow 2002). That is why the

enthusiasm of academics, their commitment, and their capacity to keep students motivated can be directly related to their preparation and their sense of efficacy and productivity. Therefore, this study asserts that the lack of competency can be considered as a problem that impacts student engagement.

Prior studies have stated that student engagement is also affected by the way in which educational materials are prepared. A specific comment in this regard was made by Vogt and Rogalla (2009) in demonstrating the applicability of a high Adaptive Teaching Competency approach involving preparation, planning, and topic knowledge, leading to increases in students' learning and engagement. During the qualitative phase, this was expressed as 'the fact is that we can [convert] our theoretical knowledge into the practical knowledge… we can get the theoretical knowledge… online also – but after coming to the classroom or any college we can change it into the practical knowledge by our professionalism…' indicating that students progress through various stages in their learning and articulate the information gradually. This study concurs with this notion and provides evidence that a high adaptive teaching competency can be provided by the technology. Prior literature discusses this point and refers to answering student queries in a traditional classroom environment. However, in alternative methods of teaching where ICT is used, this could include the handling of various tools provided in LMS'and a primary challenge in the modern teaching context is that students' needs may include the time of communication exchange as this can be beyond the traditional hours, individual learning characteristics and supporting these with appropriate additional content, leading students to advanced levels with additional content. Specific evidence was provided in this study in terms of library support, time management and the search time to find suitable materials and the discussion on additional support services to help students in these matters. A key implication of this finding is that educational institutions will need to make additional investments to meet these expectations.

In this study, the selection of appropriate learning resources was found to be an important factor in the engagement process. This has been supported by a participant who stated that 'I would say yes, it is relatively important to at least provide them with the basic information, but you should really leave it up to them to do further research on their own', indicating that appropriate content is essential in the

engagement process. As indicated in the literature review, an incompatible selection of materials can demotivate students. Our review of the literature indicates that academics do not prepare or select the material as per students' needs and that the materials could be unattractive for some students. Our experience in working with the tertiary sector also indicates that on many occasions, materials include only a coursebook or websites that are not connected directly with the topic, and are probably not completely useful. We found supporting arguments for this sentiment in Robertson (2008). This study has provided strong evidence to the notion that students would like to have learning resources in a variety of formats such as AR/VR, audio and video, and presented in an easy to access way with proper navigational links, authentication and easy access. In the ICT driven learning environments, students learn in different ways, and they may not have the same needs; therefore, we feel that generic materials are not suitable for all students. Further, due to the heterogeneous nature of many tertiary classes, students may feel that their educational needs are not addressed through one source (specifically in tertiary settings) and can become demotivated, especially when they cannot achieve the goals they have been working towards. This study posits the reasons for this and determines that the selection of appropriate learning resources is essential in assuring high-quality engagement in classrooms.

We also argue that not all modern learning resources are appropriate for all learning environments. The Internet Age has made possible the approaching of new learning resources in the education arena with ease as there is a plethora of material available to be accessed. A participant affirmed this notion by stating that 'what influences me to come to the class… can be because of the environment and the facilities provided in the classroom' indicating that the learning environment should be conducive to engagement as well. In addition, there are many training sites with high quality materials available (for example Khan Academy) and combined with the use of social networks for educational purposes; learners have access to high quality materials. Support for this can be found in Aydin (2012), Gao, Luo and Zhang (2012), Greenhow and Askari (2015), Manca and Ranieri (2013), Rodríguez-Hoyos, Haya Salmón and Fernández-Díaz (2015), and Yang et al. (2011). Therefore, in order to engage students in the classroom where an LMS is the main platform, academics have

to be innovative with how learning resources should be assembled. In doing so, the materials' validity is crucial. Brailas et al., and Polk, Johnston, and Evers (cited inSelwyn & Stirling 2016, p. 4) point out the worrying gradual acceptance that some social networks, such as YouTube and Wikipedia, may gain in education as valid reference sources, potentially leading to materials that are not fully tested by academics. Further, social media can divert a student's attention, since a lot of information is channelled together in messages, advertising, or more interesting news, and this could potentially defeat the purpose of high quality learning facilitated by engagement in the classrooms. Manca and Ranieri (2016) state that Facebook is not suitable for some educational purposes since it is not a good environment to create productive argumentation and discussion. We concur with this view and through this study provide the support that the choice of learning resources is very crucial in improving engagement.

8.6. Contributions

This study has contributed to both theories as well as practice. Being an applied domain, the contribution of this study is very strong. The key contributions made by this study to both theory and practice are highlighted below.

8.6.1. Theoretical contribution

1. This study has provided adequate evidence of the notion that the development of study materials requires further investigation in terms of accommodating students' individual requirements. The main premise of this study is technology-enabled teaching and learning environments, and during the qualitative discussions participants expressed that they would like to see a mix of audio, video, and text in their learning materials to augment the learning experience. The main proposition this study puts forth is the proportion of such a mix as participants also expressed concern about the downloading issues while using the internet for their study purposes. The very identification of this proposition is a key contribution as finding a balance to suit individual requirements is a challenge. Prior studies have expressed these, and these have been identified in the literature review chapter.

2. While prior studies have highlighted that issues beyond the classroom can influence engagement, this study identified loneliness as a specific issue, especially from NESB student cohorts due to their lack of communication skills or their relative naivety in the tertiary setting. While prior studies have pointed out this isolation, this study is able to provide evidence as to where such isolation is felt by students and the importance of support systems required to alleviate such issues. This is a major theoretical contribution of this study.
3. Another key contribution of this study in terms of the theory is the selection of study materials. Participants have strongly suggested that study materials – both in content and quantity – should be balanced so that students are guided initially and then allowed to articulate so that they are made into 'thinkers'. While this study found support for the balance, the term 'thinkers' and the discussion leading to this in the qualitative study was new, and to our knowledge, prior studies have not highlighted this need.

8.6.2. Practical contribution

In addition to the three key theoretical contributions, this study has provided a number of practical contributions, as shown below:

1. This study is able to highlight the need for support services beyond the classrooms in order to alleviate students' isolation. The issue of poor mental health in university students is a serious problem leading to lost productivity, the burden placed on governments and adverse influences on individuals and families. While mental health issues are often focused at workplace level and primary and secondary school levels, in an online learning environment, these issues could be hidden as indicated by this study. Students may withdraw from social situations if their mental health is poor, and may rely on technologies as a substitute for social interaction. These mechanisms prohibit the identification of mental health issues, and if not identified sufficiently, may lead to serious issues. For an overseas student with poor social supports locally, these issues can have long term adverse effects. This study has identified the need for support systems to address such issues. This is an important message to the

tertiary institutions, and this study provides a key contribution in this area so that tertiary institutions can ensure that overseas students are identified as an at-risk population.

2. The second key contribution made by this study is in its alignment with TEQSA standards. A number of TEQSA standards have been attested by this study in the form of LMS navigation, content development, support services, making rules of an institution clearer, and communication facilitation. In our discussion, we highlighted specific standards of TEQSA that this study is able to support, and this outcome is very crucial as students are not fully conversant with TEQSA standards. The contribution of this study in this specific domain is to realign various activities so that students' views are taken into account while developing policies, procedures and support schemes.
3. Another key practical contribution from this study is the type of engagement. While many prior studies reviewed indicated engagement in a generic manner, this study for the first time has provided evidence that the LMS is a key interface in engagement and in order to be successful, a number of inter-related factors have to be carefully considered. These include how learning materials are organised for the LMS, the individual requirement of students in content development and presentation, navigational aspects leading to clarity, interactive materials with the use of audio, video and AR/VR, consideration for upload and download issues, and authentication issues. What this study reveals is the shift from teaching to teaching management for an academic, and learning to learning management for a student. While the academic side is, to some extent, supported by instructional designers, the network-related issues raised by participants in this study is somewhat surprising. However, as the LMS is the main interface and the participants of this study also attend online lectures, these issues were highlighted and considered prominent within the context of this study. This raises a key question: What is the attribute an organisation should have at the time of recruitment? The traditional notion so far is that an academic will have strong domain knowledge, research knowledge and is a good communicator. However, the qualitative part of this study has revealed that academics require more skills than these and should be conversant in technology skills, time management skills, fostering student

requirements and so on. If these are actual requirements to satisfactorily conduct a high level of teaching, then institutions should seriously consider redefining their academic portfolios. This is a new finding arising from this study and hence new knowledge.

CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS

9.1. Chapter overview

This study has investigated the nexus between classroom engagement and the factors that influence the engagement processes. The scope of this research covered a specific university environment within the Australian higher education sector in Queensland. This chapter provides conclusions that emerged from the study as well as recommendations.

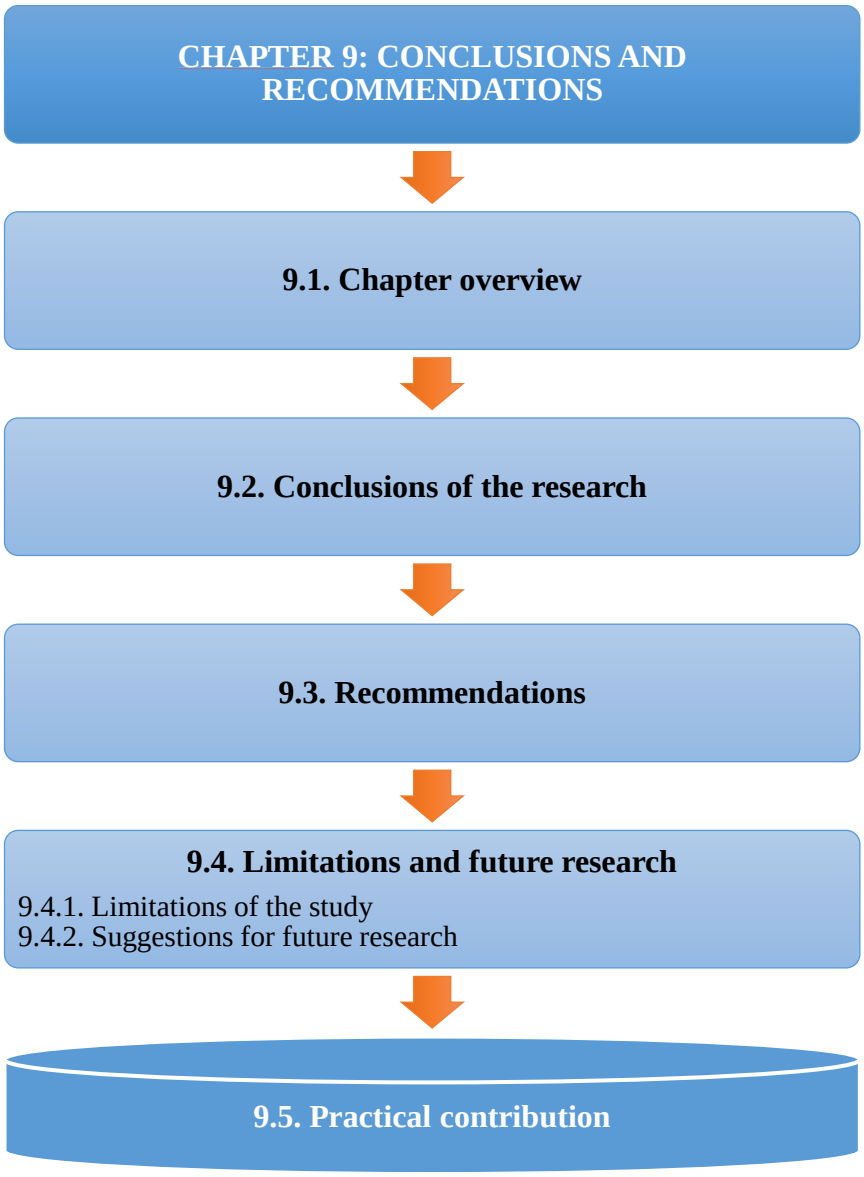

Figure 9.1. Graphical structure of chapter 9

Chapter 1 provided introductory information for the study and discussed the research motivations and justification. Then, the research setting and participants were outlined, and the statement of the problem was outlined. The scope of the study and operational definitions were examined next, before the research objectives and research questions were set out.

In Chapter 2, an extensive review of the literature associated with engagement processes and the factors that influence the engagement processes was provided. The review started with key themes that influence engagement processes and drew

evidence from both academic and other sources to portray a broad picture of classroom engagement. In doing so, the review identified specific elements of engagement, including the influences of teaching resources, competency of academics (or teachers) in influencing engagement in the classroom, the technology elements of LMS and the information sources required to engage students in classroom activities leading to engagement. This chapter culminated in identifying the research questions of this study.

In Chapter 3, methodological underpinning in Management Sciences was provided to further guide this study. This chapter provided a review of various methodological philosophies, approaches, techniques and tools with an identification of a suitable and relevant approach required to answer the research questions posited in this study.

Chapter 4 explained a scientific method of data collection by applying the methodological approach for this study. Mixed method research was adopted in the form of multi-method qualitative and mono-method quantitative design. Qualitative data collection and analysis, as the first stage, was followed by the second stage of quantitative data collection and analysis.

Chapters 5 resulted in an initial conceptual model development based on the research objectives, and further refined from the qualitative data collection. Five key themes were identified to influence classroom engagement processes, and these were conceptualised in this chapter. Further, the chapter also provided a brief discussion on the survey questionnaire items, with a list of 44 questions developed from the qualitative interview and literature review. Based on these questions and the five key themes, a set of hypotheses were developed for testing in this chapter.

Chapter 6 provided details on qualitative data analyses techniques employed in this study with a view to refining the conceptual model. This chapter also ensured the alignment of qualitative data with the key themes so as to draw the final scope of the study. The chapter provided strong evidence that the key themes are indeed the key themes influencing the engagement processes and established the linkages between the themes graphically.

Chapter 7 provided details on the quantitative data collection technique employed in this study. The contents were mainly drawn from the methodological chapter and applied to the quantitative phase of this study. This chapter also provided detailed steps undertaken to analyse the quantitative data using a Partial Least Square application, namely, ADANCO. In addition to conducting various statistical validity tests, this chapter also tested and confirmed the hypotheses testing.

Chapter 8 provided a discussion on the findings of the study through hypotheses testing. In discussing the findings, the chapter used both published academic literature as well as government regulations (TEQSA) so that the practical relevance of the study could be made clearer.

Finally, in Chapter 9, conclusions and recommendations are reviewed. This chapter focuses on summarising the conclusions derived from the theoretical description of the key research variables and the practical results and then provides appropriate recommendations. Finally, a number of potential future studies are suggested.

9.2. Conclusions of the research

The data clearly indicates that students view motivation to be a key factor in improving engagement in the classroom and that in order to be motivated in classroom engagement, student-staff ratio is a key determinant.

This study has established that positive attitudes exhibited by the student is a key factor in determining engagement and provided strong evidence to this. In fact, modern tertiary environments support this, and when the attitudes of students are not positive, support schemes are put in place to ensure students' positive frame of mind. While prior studies have referred to this, perhaps for the first time, this study is able to provide evidence to this effect.

This study established that students' prior knowledge is a key factor in determining their engagement, and this study asserts this through statistical evidence. In addition, this study has provided new evidence that students' own digital devices play a key role in improving engagement as the technical skills are established through

using one's own device. This finding is new as students felt comfortable with their own devices, and this has strengthened support for the Bring Your Own Device scheme. An implication of this to tertiary institutions is the management of operating environments and associated authentication procedures. Despite these challenges, there is a strong preference from students for their own device to be integrated into the LMS and associated engagement activities.

The participants of the study asserted that currency and relevance of teaching resources used in courses are paramount for engagement. In this context, modern teaching methodologies are also identified to be a key factor in improving engagement.

Finally, participants of this study stated that they would like to conserve time in searching for materials as this appears to be an imposition on their time. While previous studies have implied this, this is perhaps the first time statistical evidence has been provided to assert this notion.

In this study, evidence was found to support a number of TEQSA standards followed in the Australian academic sector to uphold standards. While the study supported many TEQSA standards, teaching and curriculum-related standards particularly found strong support in this study. These refer to domains standards 1.1.1 on admission and enrolment policies, 1.2.1 recognition of prior learning, 1.3.2 strategies to prepare individual students', 1.3.3 assessment rubric and mapping, 2.1.2 security measures and associate service management issues, 2.1.3 student handbook, 1.4.1 construction of teaching resources, and 3.1.1 development of unit outlines.

The study identified the key role study materials play, and included attributes such as the currency of topics and contextualisation, leading to meeting students' expectations. In the context of LMS based learning, these assume more importance as the presentation of the course content requires a level of expertise as students are predominantly in an asynchronous mode.

This study provided evidence that the customisation of course materials would lead to improved engagement, and hence increase the student motivation by providing familiar and common situations that make the material more meaningful for

them. The implication of such a notion is profound because this notion digresses from the fact that content development should be bottom-up in the sense that a teacher will understand the student cohort, understand their needs, and subsequently prepare the content. While this is the traditional approach, this study was able to find evidence that teachers need to deviate from this approach and 'assemble' materials in order to provide content that meets varying levels based on individual needs. This is a new finding.

The selection of appropriate learning resources was found to be an important factor in the engagement process. This study is able to provide evidence to this notion and able to find relevant TEQSA standards to support this key finding, especially in an LMS driven engagement process.

9.3. Recommendations

Educational institutions should use engagement measures to motivate students in the subject, and in order to achieve high levels of motivation should focus on teaching resources, academics' ability to use technology efficiently, development of relevant curriculum resources that meet the need and developing strong support systems to guide students so as to engage them in various curriculum activities. While these are the key finding of this study, based on the research conclusions in this thesis, the following practical recommendations are also made:

1. Educational institutions can explore how the findings of this study could be applied to various disciplines as each discipline comes with their own individual elements.
2. The educational institutions at all levels – secondary to tertiary - should focus on how they attract, retain and develop students by employing appropriate engagement strategies, starting from classroom leading to the institution levels. Currently, at the tertiary levels, this appears to be customary where students sit on some committees, without stronger participation in curriculum development. In this regard, Australian universities may benefit from experiences of international universities in other countries where students are heavily involved in curriculum development activities by actively contributing to the same.

These are further recommendations:

3. Australian universities should be aware of various organisational cultures, and social supports, as determining factors in engaging students as students from overseas expressed ‘loneliness’. This indicates that there is no clear mechanism to integrate students into activities leading to an integral institution.
4. The universities should be able to benchmark their curriculum development practices with other national and international universities; they should determine which are the most effective strategies in improving student engagement, provide academics with opportunities to realise strong engagement in classroom activities using LMSs, and ensure job satisfaction among their academic and professional staff to effectively retain them.
5. The universities should provide closer attention in retaining talented academics who can foster engagement in their classes, and there should be proper internal job rotation, human resource planning, and succession planning for leadership positions in order to develop the best talent, leading to improved overall engagement.
6. It is not enough for universities to attract highly skilled students and employees and expect that their skills and capabilities will remain current throughout their employment. They should focus instead on both development and retention processes of talent, leading to engagement in classroom activities, which should occur at all managerial levels of the university.
7. Engagement processes should be seen as a business strategy instead of a small part of curriculum management. This requires institutional wide thinking and policies incorporated within the university’s vision, mission and strategy; and included in educational practices and strategic decisions of the top management, as an integral part of the educational institution's culture.

9.4. Limitations and future research

This research has yielded empirical evidence to enable educational institutions to evaluate their classroom engagement processes in regards to key themes of teaching resources, LMS, academics’ ability to develop curriculum materials that engage students in various activities and the content development in general. This section

outlines the limitations of the current study and propositions for addressing the limitations of future research. This section is divided into two parts. The first part highlights the limitations of the study, followed by the second part in which suggestions for future research are made.

9.4.1. Limitations of the study

The principal limitation of this study was the scope. It only targeted one country (Australia), one state (Queensland), and one section of the tertiary education sector (the university). The study's conceptual model was developed based on a qualitative study. Then, the quantitative study was conducted within the scope of the overall study, and final results were derived. Hence, the generalisability of these results is limited to the Australian university sector.

The second limitation was associated with the qualitative phase. In terms of brainstorming and focus group invitations, the researcher invited only USQ's participants. In terms of interviews, some of them were reluctant to provide in-depth information through open-ended questions so that a better comprehension of the research topic could be obtained. The reason behind this reluctance is the sensitive information that is associated with information that is important to the topic of the current study. This claim is supported by Piansoongnern and Anurit (2010); Piansoongnern et al. (2011); Al Haidari (2015) who point out that extracting in-depth information is a sensitive activity and that most of the strategic information of highly skilled individuals is normally (confidentially) shared inside an organisation, and very difficult for an external member to extract the same. In this study, students were reluctant to criticise their lecturers, and the information was generic.

The target research sample included students studying in one program. Therefore, other individuals without these criteria were not included, leading to a selection bias.

9.4.2. Suggestions for future research

Based on the research conclusions, recommendations, and limitations, a number of suggestions for future research can be made as follows:

1. It would be useful to investigate the current methodology and topic of this research in other Australian universities, sectors, programs and faculties in order to generalise the results within the overall Australian environment.
2. It would be beneficial to carry out studies on engagement processes with specific TEQSA standards so that alignment of engagement processes and curriculum development can be achieved.
3. It would further be useful to target other cohorts that were not included in the current study such as academics, instructional designers, and teaching & learning teams to explore their views so that the engagement process can be developed properly.

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APPENDICES

Appendix A: Ethics approval letter of USQ

prabal@cogninet.com.au

From: Human Ethics <Human.Ethics@usq.edu.au>
Sent: Wednesday, 6 November 2019 4:10 PM
To: prabal@cogninet.com.au
Subject: RE: [RIMS] USQ HRE Amendment - H19REA042 (v1)-survey questionnaire

Flag Status: Flagged

Hi Prabal,

Thank you for sending this through. I have attached the survey questionnaire to your approved application. I'd like to wish you all the best with the conduct of your research.

Kind regards,

Will
Will Farmer
Ethics Officer
Office of Research I University of Southern Queensland
Toowoomba I Queensland I 4350 I Australia
Ph: +61 7 4631 2690 I Fax: +61 7 4631 2690

USQ Human Research Ethics – human.ethics@usq.edu.au
USQ Institutional Biosafety – ethics@usq.edu.au
USQ Animal Ethics – animal.ethics@usq.edu.au

From: human.ethics@usq.edu.au <human.ethics@usq.edu.au>
Sent: Monday, 19 August 2019 10:28 AM
To: Prabal Barua <Prabal.Barua@usq.edu.au>
Cc: Raj Gururajan <Raj.Gururajan@usq.edu.au>
Subject: [RIMS] USQ HRE Amendment - H19REA042 (v1) - Expedited review outcome - Approved

Dear Prabal

The revisions outlined in your HRE Amendment have been deemed by the USQ Human Research Ethics Expedited Review process to meet the requirements of the National Statement on Ethical Conduct in Human Research (2007). Your project is now granted full ethical approval as follows.

USQ HREC ID: H19REA042 (v1)
Project title: Determination of factors influencing student engagement using a Learning Management System in a tertiary setting
Approval date: 19/08/2019
Expiry date: 14/06/2022
Project status: Approved with conditions.

The standard conditions of this approval are:

(a) conduct the project strictly in accordance with the proposal submitted and ethics approval, including any amendments made to the proposal required by the USQ HREC, or affiliated University ethical review processes;

(b) advise the USQ HREC (via human.ethics@usq.edu.au) immediately of any complaint or other issue in relation to the conduct of this project which may warrant review of the ethical approval of the project;

(c) make submission for ethical review and approval of any amendments or revision to the approved project prior to implementing any changes;

(d) complete and submit a milestone (progress) report as requested, and at least for every year of approval; and

(e) complete and submit a milestone (final) report when the project does not commence within the first 12 months of approval, is abandoned at any stage, or is completed (whichever is sooner).

Additional conditions of this approval are:

(a) An amendment is required to be submitted and approved before conducting questionnaires with group 2 & 3 participants.

Failure to comply with the conditions of approval or the requirements of the National Statement on Ethical Conduct in Human Research (2007) may result in withdrawal of ethical approval for this project.

If you have any questions or concerns, please contact an Ethics Officer.

Kind regards

Human Research Ethics

University of Southern Queensland
Toowoomba – Queensland – 4350 – Australia
Phone: (07) 4631 2690
Email: human.ethics@usq.edu.au

Appendix B: A consent form of the brainstorming, focus group, and survey techniques

University of Southern Queensland

Consent Form for USQ Research Project Brainstorming

Project Details

Title of Project:	Determination of factors influencing student engagement using a Learning Management System in a tertiary setting
Human Research Ethics Approval Number:	H19REA042 (v1)

Research Team Contact Details

Principal Investigator Details	**Other Investigator/Supervisor Details**
Prabal Datta Barua Email: Prabal.Barua@usq.edu.au Telephone: Mobile: 0423958405	Prof Raj Gururajan Email: Raj.Gururajan@usq.edu.au Telephone: (07) 3470 4539 Mobile: Dr Xujuan (Susan) Zhou Email: Susan.zhou@usq.edu.au Telephone: (07) 3470 4625 Mobile: Dr Abdul Hafeez-Baig Email: Abdul.Hafeez-Baig@usq.edu.au Telephone: (07) 4631 1461 Mobile: Dr Subrata Chakraborty Email: Subrata.Chakraborty@usq.edu.au Telephone: (07) 3470 4155 Mobile:

Statement of Consent

By signing below, you are indicating that you:

- Have read and understood the information document regarding this project.
  ☐ Yes / ☐No
- Have had any questions answered to your satisfaction
  ☐ Yes / ☐No
- Understand that if you have any additional questions you can contact the research team
  ☐ Yes / ☐No
- Understand that the interview will be audio recorded.
  ☐ Yes / ☐No
- Understand that you are free to withdraw at any time, without comment or penalty.
  ☐ Yes / ☐No

Understand that you can contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email human.ethics@usq.edu.au

- If you do have any concern or complaint about the ethical conduct of this project.
  ☐ Yes / ☐ No
- Are over 18 years of age.
  ☐ Yes / ☐ No
- Agree to participate in the project.
  ☐ Yes / ☐ No

Participant Name	
Participant Signature	
Date	

Please return this sheet to a Research Team member prior to undertaking the interview.

University of Southern Queensland

Consent Form for USQ Research Project

Focus Group

Project Details

Title of Project:	Determination of factors influencing student engagement using a Learning Management System in a tertiary setting
Human Research Ethics Approval Number:	H19REA042 (v1)

Research Team Contact Details

Principal Investigator Details	**Other Investigator/Supervisor Details**
Prabal Datta Barua Email: Prabal.Barua@usq.edu.au Telephone: Mobile: 0423958405	Prof Raj Gururajan Email: Raj.Gururajan@usq.edu.au Telephone: (07) 3470 4539 Mobile: Dr Xujuan (Susan) Zhou Email: Susan.zhou@usq.edu.au Telephone: (07) 3470 4625 Mobile: Dr Abdul Hafeez-Baig Email: Abdul.Hafeez-Baig@usq.edu.au Telephone: (07) 4631 1461 Mobile: Dr Subrata Chakraborty Email: Subrata.Chakraborty@usq.edu.au Telephone: (07) 3470 4155 Mobile:

Statement of Consent

By signing below, you are indicating that you:

- Have read and understood the information document regarding this project.
  Yes / ☐No
- Have had any questions answered to your satisfaction
  Yes / ☐No
- Understand that if you have any additional questions you can contact the research team
  Yes / ☐No
- Understand that the interview will be audio recorded.
  Yes / ☐No
- Understand that you are free to withdraw at any time, without comment or penalty.
  Yes / ☐No

Understand that you can contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email human.ethics@usq.edu.au

- If you do have any concern or complaint about the ethical conduct of this project.
  ☐ Yes / ☐ No
- Are over 18 years of age.
  ☐ Yes / ☐ No
- Agree to participate in the project.
  ☐ Yes / ☐ No

Participant Name	
Participant Signature	
Date	

Please return this sheet to a Research Team member prior to undertaking the interview.

University of Southern Queensland

Consent Form for USQ Research Project

Online Survey

Project Details

Title of Project:	Determination of factors influencing student engagement using a Learning Management System in a tertiary setting
Human Research Ethics Approval Number:	H19REA042 (v1)

Research Team Contact Details

Principal Investigator Details	**Other Investigator/Supervisor Details**
Prabal Datta Barua Email: Prabal.Barua@usq.edu.au Telephone: Mobile: 0423958405	Prof Raj Gururajan Email: Raj.Gururajan@usq.edu.au Telephone: (07) 3470 4539 Mobile: Dr Xujuan (Susan) Zhou Email: Susan.zhou@usq.edu.au Telephone: (07) 3470 4625 Mobile: Dr Abdul Hafeez-Baig Email: Abdul.Hafeez-Baig@usq.edu.au Telephone: (07) 4631 1461 Mobile: Dr Subrata Chakraborty Email: Subrata.Chakraborty@usq.edu.au Telephone: (07) 3470 4155 Mobile:

Statement of Consent

Thank you very much for agreeing to participate in this survey, which is part of an academic study on students' engagement. There are no right or wrong answers. We are interested in your honest opinion.

*** I have received all the relevant information of this research and I am voluntarily participating in this research.**

- Yes
- No

Appendix C: Brainstorming, focus group, and survey questions

University of Southern Queensland

Brainstorming Question

Project Details

Title of Project:	Determination of factors influencing student engagement using a Learning Management System in a tertiary setting
Human Research Ethics Approval Number:	H19REA042 (v1)

Research Team Contact Details

Principal Investigator Details	**Other Investigator/Supervisor Details**
Prabal Datta Barua Email: Prabal.Barua@usq.edu.au Telephone: Mobile: 0423958405	Prof Raj Gururajan Email: Raj.Gururajan@usq.edu.au Telephone: (07) 3470 4539 Mobile: Dr Xujuan (Susan) Zhou Email: Susan.zhou@usq.edu.au Telephone: (07) 3470 4625 Mobile: Dr Abdul Hafeez-Baig Email: Abdul.Hafeez-Baig@usq.edu.au Telephone: (07) 4631 1461 Mobile: Dr Subrata Chakraborty Email: Subrata.Chakraborty@usq.edu.au Telephone: (07) 3470 4155 Mobile:

Question: What are the factors influencing student engagement in a Learning Management System (LMS) driven classroom?

University of Southern Queensland

Focus Group Questions

Project Details

Title of Project:	Determination of factors influencing student engagement using a Learning Management System in a tertiary setting
Human Research Ethics Approval Number:	H19REA042 (v1)

Research Team Contact Details

Principal Investigator Details	**Other Investigator/Supervisor Details**
Prabal Datta Barua Email: Prabal.Barua@usq.edu.au Telephone: Mobile: 0423958405	Prof Raj Gururajan Email: Raj.Gururajan@usq.edu.au Telephone: (07) 3470 4539 Mobile: Dr Xujuan (Susan) Zhou Email: Susan.zhou@usq.edu.au Telephone: (07) 3470 4625 Mobile: Dr Abdul Hafeez-Baig Email: Abdul.Hafeez-Baig@usq.edu.au Telephone: (07) 4631 1461 Mobile: Dr Subrata Chakraborty Email: Subrata.Chakraborty@usq.edu.au Telephone: (07) 3470 4155 Mobile:

Focus Group Questions:

This is a detailed discussion among group members. Give about 20 - 25 minutes for each of the questions to be discussed.

Questions 1: What factors influence student engagement?

Questions 2: What is the relationship between these factors?

Questions 3: How do they influence the engagement?

Appendix D: An information sheet form of the brainstorming, focus group, and quantitative survey questionnaire.

University of Southern Queensland

Participant Information for USQ Research Project Brainstorming Group

Project Details

Title of Project:	Determination of factors influencing student engagement using a Learning Management System in a tertiary setting
Human Research Ethics Approval Number:	H19REA042 (v1)

Research Team Contact Details

Principal Investigator Details	**Other Investigator/Supervisor Details**
Prabal Datta Barua Email: Prabal.Barua@usq.edu.au Telephone: Mobile: 0423958405	Prof Raj Gururajan Email: Raj.Gururajan@usq.edu.au Telephone: (07) 3470 4539 Mobile: Dr Xujuan (Susan) Zhou Email: Susan.zhou@usq.edu.au Telephone: (07) 3470 4625 Mobile: Dr Abdul Hafeez-Baig Email: Abdul.Hafeez-Baig@usq.edu.au Telephone: (07) 4631 1461 Mobile: Dr Subrata Chakraborty Email: Subrata.Chakraborty@usq.edu.au Telephone: (07) 3470 4155 Mobile:

Description

This project is being undertaken as part of a PhD.

The purpose of this project is to understand determination of factors influencing student engagement using a Learning Management System in a tertiary setting.

The research team requests your assistance because you meet the study criteria and can provide valuable data, which is significant for this research.

The main objective of this research is to determine those direct and indirect factors that influence student engagement of both academics and students in a tertiary setting. To achieve this objective, the following sub-objectives are carried out in this study:

Participation

Your participation will involve contributing your thoughts and ideas in a group discussion-brainstorming group) that will take approximately 60 minutes of your time.
The brainstorming group will include:

- Number of participants: 10-15
- Location: at the University of Southern Queensland (Toowoomba/Springfield campus) and USQ Sydney Study Centre. In addition, brainstorming participants can attend Skype or Zoom.

Your participation in this project is entirely voluntary. If you do not wish to take part, you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. You will be unable to withdraw data collected about yourself after you have participated in the brainstorming group. If you wish to withdraw from the project, please contact the Research Team (contact details at the top of this form).
Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland.

Expected Benefits

It is expected that this project will not directly benefit you. The research will culminate in a set of factors that determine the influence of engagement between students and academics in an LMS environment. Initial literature search indicates various assertions in previous studies about the type of factors, for now it is still inconclusive as to how these factors influence engagement and to the level of granularity. This study will explore these factors and provide a list of factors that require attention while preparing tertiary courses.

Risks

There are minimal risks associated with your participation in this project. The only risk is imposition of time. However, you have the right to withdraw at any time without any consequences.

Privacy and Confidentiality

All comments and responses will be treated confidentially unless required by law.

Any data collected as a part of this project will be stored securely as per University of Southern Queensland's Research Data Management policy.

- The brainstorming group discussion will be audio recorded.
- If you would like to have access to a copy of the transcript of discussion, please contact the research team. Details can be found in the "**Research Team Contact Details**" section at the top of Page No. 1 of this document.
- If you would like to have access to a summary of the research results, please contact the research team. Details can be found in the "Research Team Contact Details" section at the top of Page No. 1 of this document.

Consent to participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate in this project. Please return your signed consent form to a member of the Research Team prior to participating in your interview.

Questions or Further Information about the project

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email human.ethics@usq.edu.au. The Ethics Coordinator is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

University of Southern Queensland

Participant Information for USQ Research Project Focus Group

Project Details

Title of Project:	Determination of factors influencing student engagement using a Learning Management System in a tertiary setting
Human Research Ethics Approval Number:	H19REA042 (v1)

Research Team Contact Details

Principal Investigator Details	**Other Investigator/Supervisor Details**
Prabal Datta Barua Email: Prabal.Barua@usq.edu.au Telephone: Mobile: 0423958405	Prof Raj Gururajan Email: Raj.Gururajan@usq.edu.au Telephone: (07) 3470 4539 Mobile: Dr Xujuan (Susan) Zhou Email: Susan.zhou@usq.edu.au Telephone: (07) 3470 4625 Mobile: Dr Abdul Hafeez-Baig Email: Abdul.Hafeez-Baig@usq.edu.au Telephone: (07) 4631 1461 Mobile: Dr Subrata Chakraborty Email: Subrata.Chakraborty@usq.edu.au Telephone: (07) 3470 4155 Mobile:

Description

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The main objective of this research is to determine those direct and indirect factors that influence student engagement of both academics and students in a tertiary setting. To achieve this objective, the following sub-objectives are carried out in this study:

Participation

Your participation will involve contributing your thoughts and ideas in a group discussion-Focus group) that will take approximately 90-120 minutes of your time.
The focus group will include:

- Number of participants: 10-15
- Location: at the University of Southern Queensland (Toowoomba/Springfield campus) and USQ Sydney Study Centre. In addition, focus participants can attend Skype or Zoom.

Your participation in this project is entirely voluntary. If you do not wish to take part, you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. You will be unable to withdraw data collected about yourself after you have participated in the focus group. If you wish to withdraw from the project, please contact the Research Team (contact details at the top of this form).
Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland.

Expected Benefits

It is expected that this project will not directly benefit you. The research will culminate in a set of factors that determine the influence of engagement between students and academics in an LMS environment. Initial literature search indicates various assertions in previous studies about the type of factors, for now it is still inconclusive as to how these factors influence engagement and to the level of granularity. This study will explore these factors and provide a list of factors that require attention while preparing tertiary courses.

Risks

There are minimal risks associated with your participation in this project. The only risk is imposition of time. However, you have the right to withdraw at any time without any consequences.

Privacy and Confidentiality

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Any data collected as a part of this project will be stored securely as per University of Southern Queensland's Research Data Management policy.

- The focus group discussion will be audio recorded.
- If you would like to have access to a copy of the transcript of discussion, please contact the research team. Details can be found in the "**Research Team Contact Details**" section at the top of Page No. 1 of this document.
- If you would like to have access to a summary of the research results, please contact the research team. Details can be found in the "Research Team Contact Details" section at the top of Page No. 1 of this document.

Consent to participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate in this project. Please return your signed consent form to a member of the Research Team prior to participating in your interview.

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Thank you for taking the time to help with this research project. Please keep this sheet for your information.

University of Southern Queensland

USQ Research Project Online Survey

Project Details

Title of Project:	Determination of factors influencing student engagement using a Learning Management System in a tertiary setting
Human Research Ethics Approval Number:	H19REA042 (v1)

Research Team Contact Details

Principal Investigator Details	**Other Investigator/Supervisor Details**
Prabal Datta Barua Email: Prabal.Barua@usq.edu.au Telephone: Mobile: 0423958405	Prof Raj Gururajan Email: Raj.Gururajan@usq.edu.au Telephone: (07) 3470 4539 Mobile: Dr Xujuan (Susan) Zhou Email: Susan.zhou@usq.edu.au Telephone: (07) 3470 4625 Mobile: Dr Abdul Hafeez-Baig Email: Abdul.Hafeez-Baig@usq.edu.au Telephone: (07) 4631 1461 Mobile: Dr Subrata Chakraborty Email: Subrata.Chakraborty@usq.edu.au Telephone: (07) 3470 4155 Mobile:

Description

This project is being undertaken as part of a PhD.
The purpose of this project is to understand determination of factors influencing student engagement using a Learning Management System in a tertiary setting.
The research team requests your assistance because you meet the study criteria and can provide valuable data, which is significant for this research.

The main objective of this research is to determine those direct and indirect factors that influence student engagement of both academics and students in a tertiary setting. To achieve this objective, the following sub-objectives are carried out in this study:
1. To understand how various ICT driven LMS factors influence engagement in tertiary settings
2. To determine those factors that contribute to this engagement.

Participation

Your participation will involve completion of a questionnaire that will take approximately 20 minutes of your time.
Questions will include your opinion regarding the determinants of factors that influence student engagement of both academics and students in a tertiary setting. The questionnaire would be structured closed ended and would be based on a Likert scale with ratings ranging from Strongly Disagree to Strongly Agree.

Expected Benefits

It is expected that this project will not directly benefit you. The research will culminate in a set of factors that determine the influence of engagement between students and academics in an LMS environment. Initial literature search indicates various assertions in previous studies about the type of factors, for now it is still inconclusive as to how these factors influence engagement and to the level of granularity. This study will explore these factors and

Risks

provide a list of factors that require attention while preparing tertiary courses.

There are minimal risks associated with your participation in this project. The only risk is imposition of time. However, you have the right to withdraw at any time without any

Privacy and Confidentiality

consequences.

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- If you would like to have access to a summary of the research results, please contact the research team. Details can be found in the "**Research Team Contact Details**" section at the top of Page No. 1 of this document.

Consent to participate

Prior approval has been taken from the appropriate authority of the organisation to conduct the survey. A return of the completed questionnaire would be taken as an implied consent to participate.

Questions or Further Information about the project

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email human.ethics@usq.edu.au. The Ethics Coordinator is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Appendix E: The final version of the survey questionnaire

Variables of Student Engagement						
Please tick (√) one box on the right side that best describe your point of view about each of the following statements.		**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
1. ACADEMICS (Teacher/Lecturer) Do you think that…						
1	A quality interaction with students will improve your engagement (motivation) on your course	☐	☐	☐	☐	☐
2	A clear explanation of the course concepts for your easy understanding would increase your desire for participating in the course	☐	☐	☐	☐	☐
3	Experience in the use of LMS technology will improve engagement	☐	☐	☐	☐	☐
4	Use of videos to provide summary of lectures will improve engagement	☐	☐	☐	☐	☐
5	Use of AR/VR in the class leading to cutting edge environments will improve engagement	☐	☐	☐	☐	☐
6	Superior communication abilities (to disseminate concepts) will improve engagement	☐	☐	☐	☐	☐
7	Attitude of academics towards students queries will improve engagement	☐	☐	☐	☐	☐
2. STUDENTS Do you think that…						
8	Motivation of students in study will improve engagement	☐	☐	☐	☐	☐
9	Optimal student – staff ratio will improve engagement	☐	☐	☐	☐	☐
10	Attitude (want to just pass or want to score high grades) of students will improve engagement	☐	☐	☐	☐	☐
11	Students' own interest in the subject will improve engagement	☐	☐	☐	☐	☐
12	Prior knowledge of student in the subject domain will improve engagement	☐	☐	☐	☐	☐
13	Students' own digital devices to support LMS based materials will improve engagement	☐	☐	☐	☐	☐

Please tick (√) one box on the right side that best describe your point of view about each of the following statements.		Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
14	Students' knowledge in using the LMS will improve engagement	☐	☐	☐	☐	☐
15	Interaction with administrative people (Program Management, IT etc) will improve engagement	☐	☐	☐	☐	☐
	3. LMS (Learning Management System) - E.g. Uconnect Do you think that…					
16	Quality access to LMS will improve engagement	☐	☐	☐	☐	☐
17	Availability of quality content on the LMS will improve engagement	☐	☐	☐	☐	☐
18	Structure of content of subject materials on the LMS will improve engagement	☐	☐	☐	☐	☐
	LMS (Learning Management System) - E.g. Uconnect Do you think that…					
19	Mix of text, audio and video in subject presentation will improve engagement	☐	☐	☐	☐	☐
20	Clear and easy to use content (including appearance and navigation tools) will improve engagement	☐	☐	☐	☐	☐
21	Portal Management & Navigation aids will improve engagement	☐	☐	☐	☐	☐
22	Authentication protocols will improve engagement	☐	☐	☐	☐	☐
23	Understanding students' needs while creating content for the LMS will improve engagement	☐	☐	☐	☐	☐
	4. TEACHING RESOURCES Do you think that…					
24	Currency of information will improve engagement	☐	☐	☐	☐	☐
25	Modern Teaching methodologies will improve engagement	☐	☐	☐	☐	☐
26	Appropriateness of teaching materials and how they fit in the Program will improve engagement	☐	☐	☐	☐	☐
27	Adequacy of content provided to students will improve engagement	☐	☐	☐	☐	☐

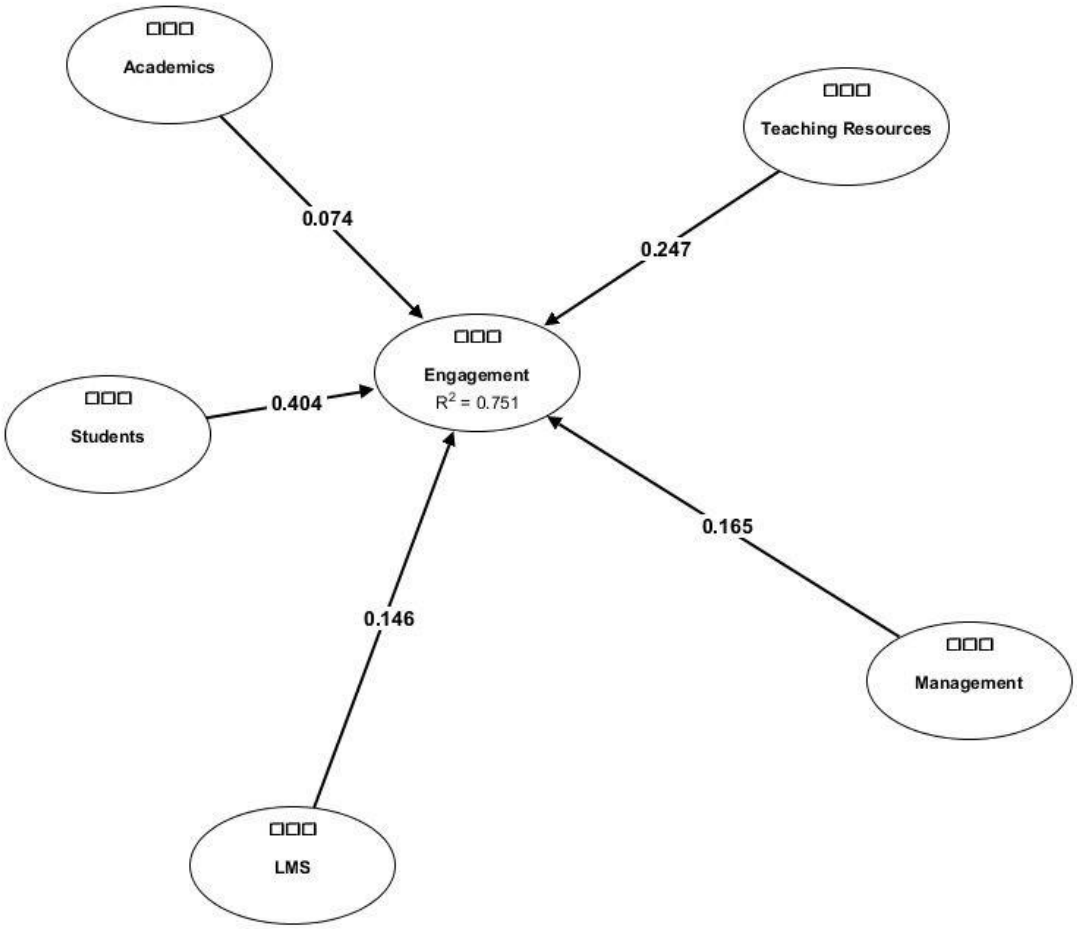
Please tick (√) one box on the right side that best describe your point of view about each of the following statements.		Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
28	Relevance of materials and the way it is communicated to students will improve engagement	☐	☐	☐	☐	☐
29	Link between teaching resources and assessments (including examinations) will improve engagement	☐	☐	☐	☐	☐
30	Reduced time on searching for teaching resources will improve engagement	☐	☐	☐	☐	☐
	5. MANAGEMENT **Do you think that…**					
31	Improved task Management for the course will improve engagement	☐	☐	☐	☐	☐
32	Improved time management for the course will improve engagement	☐	☐	☐	☐	☐
33	Understanding various rules and regulations of the university will improve engagement	☐	☐	☐	☐	☐
34	Addressing perceived isolation due to relative newness in the country will improve engagement	☐	☐	☐	☐	☐
35	Addressing part time students struggle in managing their work-study balance will improve engagement	☐	☐	☐	☐	☐
36	Improved access to learning resources and how they are managed by the library will improve engagement	☐	☐	☐	☐	☐
37	Quality time available to spend in course activities will improve engagement	☐	☐	☐	☐	☐
	6. ENGAGEMENT **Do you think that…**					
38	Quality university environment will improve engagement	☐	☐	☐	☐	☐
39	Cutting edge facilities provided in the class room will improve engagement	☐	☐	☐	☐	☐
40	Quality interaction between academic and students will improve engagement	☐	☐	☐	☐	☐
41	Addressing students communication skills will improve engagement	☐	☐	☐	☐	☐

	Please tick (√) one box on the right side that best describe your point of view about each of the following statements.	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
42	Addressing classroom attendance issues will improve engagement	☐	☐	☐	☐	☐
43	A clear plan of various activities and their due dates will improve engagement	☐	☐	☐	☐	☐
44	Quality forum discussions will improve engagement	☐	☐	☐	☐	☐

Appendix F: ADANCO Report (85)

Project Information	
ADANCO version	**This report was created with ADANCO 2.1.1**
Date/Time	2020/05/01 10:50
Project Name	Prabal Quan data analysis
Project file name	C:\Users\gururaja\Desktop\Prabal Thesis Chapters
Data file name	Prabal PhD Dataset.xlsx
Number of observations	85
Algorithm status	The iterative algorithm converged after 8 iteration(s).
Bootstrap status	999 bootstrap samples have been evaluated (999 attempts).

Graphical representation of the model



Overall Model

Goodness of model fit (saturated model)

	Value	HI95	HI99
SRMR	0.1065	0.0894	0.0963
$\mathbf{d_{ULS}}$	5.2731	3.7148	4.3109
$\mathbf{d_G}$	2.3800	4.2201	5.3707

Goodness of model fit (estimated model)

	Value	HI95	HI99
SRMR	0.1065	0.0894	0.0963
d_{ULS}	5.2731	3.7148	4.3109
d_G	2.3800	4.2201	5.3707

Measurement Model

Construct Operationalization

Construct	Type of measurement model	Number of indicators	Predefined reliability
Academics	factor (Mode A)	4	1.0000
Students	composite (Mode B)	4	1.0000
LMS	factor (Mode A)	8	1.0000
Teaching Resources	factor (Mode A)	3	1.0000
Management	factor (Mode A)	4	1.0000
Engagement	factor (Mode A)	7	1.0000

Construct Reliability

Construct	Dijkstra-Henseler's rho (ρ_A)	Jöreskog's rho (ρ_C)	Cronbach's alpha(α)
Academics	0.7461	0.8383	0.7421
Students			
LMS	0.8725	0.8935	0.8647
Teaching Resources	0.7935	0.8727	0.7822
Management	0.7934	0.8555	0.7792
Engagement	0.8462	0.8826	0.8447

Convergent Validity

Construct	Average variance extracted (AVE)
Academics	0.5657
Students	
LMS	0.5126
Teaching Resources	0.6960
Management	0.5973
Engagement	0.5184

Discriminant Validity: Heterotrait-Monotrait Ratio of Correlations (HTMT)

Construct	Academics	LMS	Teaching Resources	Management	Engagement
Academics					
LMS	0.8827				
Teaching Resources	0.6427	0.7411			
Management	0.6766	0.8024	0.7918		
Engagement	0.8105	0.8134	0.8325	0.8374	

Discriminant Validity: Fornell-Larcker Criterion

Construct	Academics	Students	LMS	Teaching Resources	Management	Engagement
Academics	0.5657					
Students	0.4118					
LMS	0.5180	0.4055	0.5126			
Teaching Resources	0.2529	0.2510	0.3970	0.6960		
Management	0.2999	0.3714	0.4802	0.4107	0.5973	
Engagement	0.4263	0.5904	0.5275	0.4679	0.5055	0.5184

Loadings

Indicator	Academics	Students	LMS	Teaching Resources	Management	Engagement
A quality interaction with students	0.8094					
A clear explanation of the course concepts	0.7739					
Knowledge in the use of LMS technology	0.7548					
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments	0.6627					
Student's prior knowledge of the subject domain		0.7878				
Students' own digital devices to access LMS based materials		0.7358				
Students' knowledge in using the LMS		0.7477				
Interaction with professional support staff people (Program Management, IT etc)		0.8333				
Quality access to LMS			0.7130			
Availability of quality content on the LMS			0.7610			
Organisation of subject materials in the LMS			0.6958			
A mix of text, audio, and video in subject presentation			0.6647			
Clear and easy to use content			0.7973			

Portal Management & Navigation aids			0.6942			
Authentication protocols			0.6862			
Understanding students' needs while creating content for the LMS			0.7062			
Appropriateness of teaching materials				0.8294		
Adequacy of content provided to students				0.7923		
Relevance of materials				0.8790		
Improved time management for the course					0.7421	
Addressing part-time students struggle in managing their work-study balance					0.7451	
Improved access to learning resources					0.7750	
Adequate time available to spend in course activities					0.8262	
Quality university environment						0.7834
Cutting edge facilities provided in the classroom						0.6719
Quality interaction between academic and students						0.6822
Addressing students' communication skills						0.7222
Addressing classroom attendance issues						0.7175

A clear plan of various activities and their due dates						0.7097
Quality forum discussions						0.7470

Indicator Reliability

Indicator	Academics	Students	LMS	Teaching Resources	Management	Engagement
A quality interaction with students	0.6551					
A clear explanation of the course concepts	0.5989					
Knowledge in the use of LMS technology	0.5697					
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments	0.4392					
Student's prior knowledge of the subject domain						
Students' own digital devices to access LMS based materials						
Students' knowledge in using the LMS						
Interaction with professional support staff people (Program Management, IT etc)						
Quality access to LMS			0.5083			
Availability of quality content on the LMS			0.5791			

Organisation of subject materials in the LMS			0.4841			
A mix of text, audio, and video in subject presentation			0.4418			
Clear and easy to use content			0.6358			
Portal Management & Navigation aids			0.4819			
Authentication protocols			0.4709			
Understanding students' needs while creating content for the LMS			0.4987			
Appropriateness of teaching materials				0.6878		
Adequacy of content provided to students				0.6277		
Relevance of materials				0.7726		
Improved time management for the course					0.5507	
Addressing part-time students struggle in managing their work-study balance					0.5552	
Improved access to learning resources					0.6007	
Adequate time available to spend in course activities					0.6826	
Quality university environment						0.6137
Cutting edge facilities provided in the classroom						0.4515

Quality interaction between academic and students						0.4654
Addressing students' communication skills						0.5216
Addressing classroom attendance issues						0.5147
A clear plan of various activities and their due dates						0.5037
Quality forum discussions						0.5580

Cross Loadings

Indicator	Academics	Students	LMS	Teaching Resources	Management	Engagement
A quality interaction with students	0.8094	0.4153	0.4360	0.3359	0.3944	0.4530
A clear explanation of the course concepts	0.7739	0.4316	0.5692	0.3944	0.4189	0.5162
Knowledge in the use of LMS technology	0.7548	0.5866	0.6591	0.4107	0.4207	0.5382
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments	0.6627	0.4835	0.4720	0.3621	0.4096	0.4419
Student's prior knowledge of the subject domain	0.4321	0.7878	0.4336	0.3378	0.3803	0.6053
Students' own digital devices to access LMS based materials	0.5264	0.7358	0.5276	0.3608	0.4234	0.5654
Students' knowledge in using the LMS	0.5358	0.7477	0.5408	0.5257	0.5743	0.5746

Interaction with professional support staff people (Program Management, IT etc)	0.5369	0.8333	0.5208	0.3373	0.4896	0.6403
Quality access to LMS	0.4117	0.5762	0.7130	0.5698	0.5977	0.5983
Availability of quality content on the LMS	0.4981	0.4920	0.7610	0.5441	0.6744	0.6163
Organisation of subject materials in the LMS	0.3965	0.2554	0.6958	0.3672	0.4331	0.3722
A mix of text, audio, and video in subject presentation	0.5551	0.3890	0.6647	0.3355	0.4040	0.4515
Clear and easy to use content	0.6135	0.4318	0.7973	0.4511	0.5329	0.4987
Portal Management & Navigation aids	0.4979	0.3976	0.6942	0.4016	0.3306	0.4126
Authentication protocols	0.6004	0.5608	0.6862	0.4257	0.3231	0.6394
Understanding students' needs while creating content for the LMS	0.5278	0.4140	0.7062	0.4373	0.6305	0.4288
Appropriateness of teaching materials	0.5596	0.4637	0.6143	0.8294	0.5730	0.6093
Adequacy of content provided to students	0.2717	0.3938	0.4276	0.7923	0.4144	0.4819
Relevance of materials	0.3995	0.3944	0.5185	0.8790	0.5958	0.6067
Improved time management for the course	0.5563	0.6056	0.6110	0.6044	0.7421	0.6726
Addressing part-time students struggle in managing their work-study balance	0.2203	0.2850	0.3464	0.4727	0.7451	0.3772

Improved access to learning resources	0.3980	0.4325	0.5543	0.4091	0.7750	0.4841
Adequate time available to spend in course activities	0.4224	0.4686	0.5563	0.4556	0.8262	0.5743
Quality university environment	0.5060	0.5456	0.5166	0.5749	0.5800	0.7834
Cutting edge facilities provided in the classroom	0.5160	0.5461	0.5908	0.5494	0.5696	0.6719
Quality interaction between academic and students	0.3318	0.4734	0.4426	0.4998	0.6035	0.6822
Addressing students' communication skills	0.3657	0.4346	0.4359	0.4838	0.4651	0.7222
Addressing classroom attendance issues	0.4554	0.6595	0.4718	0.4986	0.3996	0.7175
A clear plan of various activities and their due dates	0.4890	0.5469	0.5646	0.3891	0.5470	0.7097
Quality forum discussions	0.5868	0.6407	0.6069	0.4420	0.4112	0.7470

Weights

Indicator	Academics	Students	LMS	Teaching Resources	Management	Engagement
A quality interaction with students	0.3092					
A clear explanation of the course concepts	0.3523					
Knowledge in the use of LMS technology	0.3673					

Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments	0.3016					
Student's prior knowledge of the subject domain		0.3538				
Students' own digital devices to access LMS based materials		0.0658				
Students' knowledge in using the LMS		0.3829				
Interaction with professional support staff people (Program Management, IT etc)		0.4639				
Quality access to LMS			0.2077			
Availability of quality content on the LMS			0.2140			
Organisation of subject materials in the LMS			0.1292			
A mix of text, audio, and video in subject presentation			0.1567			
Clear and easy to use content			0.1731			
Portal Management & Navigation aids			0.1432			
Authentication protocols			0.2220			
Understanding students' needs while creating content for the LMS			0.1489			
Appropriateness of teaching materials				0.4289		

Adequacy of content provided to students				0.3393		
Relevance of materials				0.4272		
Improved time management for the course					0.4127	
Addressing part-time students struggle in managing their work-study balance					0.2314	
Improved access to learning resources					0.2970	
Adequate time available to spend in course activities					0.3523	
Quality university environment						0.2127
Cutting edge facilities provided in the classroom						0.2167
Quality interaction between academic and students						0.1843
Addressing students' communication skills						0.1709
Addressing classroom attendance issues						0.1953
A clear plan of various activities and their due dates						0.1989
Quality forum discussions						0.2106

Indicator Multicollinearity

Indicator	Academics	Students	LMS	Teaching Resources	Management	Engagement
A quality interaction with students	1.9078					
A clear explanation of the course concepts	1.7361					
Knowledge in the use of LMS technology	1.3572					
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments	1.2766					
Student's prior knowledge of the subject domain		1.6373				
Students' own digital devices to access LMS based materials		2.2352				
Students' knowledge in using the LMS		1.8399				
Interaction with professional support staff people (Program Management, IT etc)		1.5180				
Quality access to LMS			2.3558			
Availability of quality content on the LMS			3.1204			
Organisation of subject materials in the LMS			1.8626			
A mix of text, audio, and video in subject presentation			2.0808			
Clear and easy to use content			3.2885			

Portal Management & Navigation aids			2.1194			
Authentication protocols			1.8202			
Understanding students' needs while creating content for the LMS			2.2578			
Appropriateness of teaching materials				1.5381		
Adequacy of content provided to students				1.6170		
Relevance of materials				1.9183		
Improved time management for the course					1.3300	
Addressing part-time students struggle in managing their work-study balance					1.5995	
Improved access to learning resources					1.9921	
Adequate time available to spend in course activities					2.1620	
Quality university environment						1.8767
Cutting edge facilities provided in the classroom						1.5291
Quality interaction between academic and students						1.7898
Addressing students' communication skills						1.7873
Addressing classroom attendance issues						1.6926

A clear plan of various activities and their due dates						1.6862
Quality forum discussions						1.8363

Variance inflation factors (VIF)

Structural Model

R-Squared

Construct	Coefficient of determination (R^2)	Adjusted R^2
Engagement	0.7508	0.7332

Path Coefficients

Independent variable	Dependent variable
	Engagement
Academics	0.0745
Students	0.4035
LMS	0.1458
Teaching Resources	0.2467
Management	0.1651

Total Effects

Independent variable	Dependent variable
	Engagement
Academics	0.0745
Students	0.4035
LMS	0.1458
Teaching Resources	0.2467
Management	0.1651

Indirect Effects

Independent variable	Dependent variable
	Engagement
Academics	
Students	
LMS	
Teaching Resources	
Management	

Effect Overview

Effect	Beta	Indirect effects	Total effect	Cohen's f^2
Academics -> Engagement	0.0745		0.0745	0.0095
Students -> Engagement	0.4035		0.4035	0.3137
LMS -> Engagement	0.1458		0.1458	0.0278
Teaching Resources -> Engagement	0.2467		0.2467	0.1269
Management -> Engagement	0.1651		0.1651	0.0459

Inter-Construct Correlations

Construct	Academics	Students	LMS	Teaching Resources	Management	Engagement
Academics	1.0000					
Students	0.6418	1.0000				
LMS	0.7197	0.6368	1.0000			
Teaching Resources	0.5029	0.5010	0.6301	1.0000		
Management	0.5476	0.6094	0.6930	0.6409	1.0000	
Engagement	0.6529	0.7684	0.7263	0.6840	0.7110	1.0000

Diagnostics

Empirical correlation matrix

	A quality interaction with students	A clear explanation of the course concepts	Knowledge in the use of LMS technology	Use of Artificial Reality/ Virtual Reality in the class-leading to cutting edge environments	Student's prior knowledge of the subject domain	Students' own digital devices to access LMS based materials	Students' knowledge in using the LMS	Interaction with professional support staff people (Program Management, IT etc)	Quality access to LMS	Availability of quality content on the LMS	Organisation of subject materials in the LMS	A mix of text, audio, and video in subject presentation	Clear and easy to use content	Portal Management & Navigation aids	Authentication protocols	Understanding students' needs while creating content for the LMS	Appropriateness of teaching materials	Adequacy of content provided to students	Relevance of materials	Improved time management for the course	Addressing part-time students struggle in managing their work-study balance	Improved access to learning resources	Adequate time available to spend in course activities	Quality university environment	Cutting edge facilities provided in the classroom	Quality interaction between academic and students	Addressing students' communication skills	Addressing classroom attendance issues	A clear plan of various activities and their due dates	Quality forum discussions
A quality interaction	1.0000	0.6382	0.4271	0.3928	0.2221	0.3426	0.3218	0.4117	0.21006	0.3215	0.2251	0.3486	0.3978	0.2647	0.3163	0.4211	0.3758	0.1849	0.2621	0.3440	0.1457	0.3495	0.3262	0.3960	0.3571	0.2814	0.2807	0.2101	0.2955	0.4355

with students																													
A clear explanation of the course concepts	0.6382	1.0000	0.3886	0.27703	0.2934	0.33329	0.3449	0.37747	0.2582	0.4088	0.3482	0.3885	0.5076	0.4277	0.4600	0.4763	0.35006	0.2333	0.3859	0.4100	0.2182	0.3527	0.2681	0.4692	0.2919	0.2928	0.37331	0.2675	0.36222	0.5278
Knowledge in the use of LMS technology	0.4271	0.3886	1.0000	0.39331	0.4015	0.48002	0.5027	0.47752	0.48227	0.4790	0.3779	0.4765	0.54004	0.4527	0.5537	0.3455	0.5749	0.1348	0.2772	0.4417	0.1234	0.2817	0.3582	0.2851	0.5238	0.2192	0.23060	0.4546	0.43952	0.5086
Use of Artificial Reality/Virtual Reality in the class	0.3928	0.2703	0.3931	1.00000	0.3732	0.42006	0.4315	0.34118	0.25598	0.2609	0.2168	0.4490	0.37533	0.3285	0.4547	0.3412	0.3606	0.2745	0.2676	0.4750	0.1758	0.2065	0.3168	0.3765	0.3660	0.2027	0.20017	0.4283	0.36012	0.2634

- leading to cutting edge environments																														
Student's prior knowledge of the subject domain	0.2221	0.2934	0.4015	0.37 32	1.0000	0.53 98	0.3951	0.53 29	0.3148	0.2619	0.1 295	0.2 159	0.2730	0.4 014	0.51 83	0.28 07	0.24 66	0.42 04	0.2 094	0.4 562	0.1 572	0.1 908	0.28 10	0.3 982	0.45 71	0.2 464	0.32 54	0.6 008	0.51 17	0.4 818
Students' own digital devices to access LMS based	0.3426	0.3329	0.4802	0.42 06	0.5398	1.0000	0.6710	0.47 88	0.4531	0.3504	0.2 459	0.1 869	0.3630	0.4 318	0.51 68	0.38 94	0.33 40	0.28 07	0.2 863	0.3 154	0.1 902	0.38 49	0.38 28	0.3 421	0.41 39	0.2 723	0.34 19	0.4 250	0.43 46	0.5 927

materials																													
Students' knowledge in using the LMS	0.3218	0.3449	0.5027	0.43015	0.3951	0.67100	1.00000	0.39001	0.60037	0.5016	0.2804	0.3017	0.3060	0.2947	0.39764	0.27575	0.55100	0.2957	0.4423	0.4749	0.3241	0.43939	0.49551	0.4627	0.51100	0.3848	0.24036	0.40002	0.35512	0.4942
Interaction with professional support staff people (Program Management, IT etc)	0.4117	0.3747	0.4752	0.34018	0.5329	0.47888	0.3901	1.00000	0.43966	0.3971	0.1853	0.3984	0.41885	0.2465	0.41332	0.39400	0.30094	0.2444	0.2847	0.5207	0.2000	0.37410	0.33280	0.4419	0.34810	0.4762	0.43910	0.5729	0.43939	0.5216
Quality access to LMS	0.2106	0.2582	0.4827	0.25980	0.3148	0.45310	0.6037	0.43960	1.00000	0.7300	0.5345	0.2717	0.3688	0.3162	0.33960	0.35490	0.49680	0.3889	0.5261	0.4040	0.3857	0.53530	0.51870	0.3918	0.46530	0.5019	0.28860	0.3730	0.49300	0.4814

Availability of quality content on the LMS	0.3215	0.4088	0.4790	0.2609	0.2619	0.3504	0.5016	0.3971	0.7300	1.0000	0.5889	0.2859	0.4522	0.2790	0.3209	0.5706	0.5405	0.3128	0.4825	0.5086	0.4207	0.5224	0.6015	0.4680	0.4631	0.4904	0.3582	0.3705	0.4722	0.4680
Organisation of subject materials in the LMS	0.2251	0.3482	0.3779	0.2168	0.1295	0.2459	0.2804	0.1853	0.5345	0.5889	1.0000	0.3917	0.4884	0.4167	0.2778	0.4178	0.3255	0.1460	0.4169	0.4141	0.1807	0.3378	0.3409	0.2521	0.3337	0.3327	0.1378	0.1391	0.3521	0.3049
A mix of text, audio, and video in subject presentation	0.3486	0.3885	0.4765	0.4490	0.2159	0.1869	0.3017	0.3984	0.2717	0.2859	0.3917	1.0000	0.6832	0.4587	0.4587	0.3621	0.3318	0.2066	0.2883	0.4116	0.1043	0.3385	0.3108	0.3805	0.4917	0.2721	0.2499	0.2310	0.2344	0.3769

Clear and easy to use content	0.3978	0.5076	0.5404	0.37 53	0.2730	0.3630	0.3060	0.4185	0.3688	0.4522	0.4884	0.6832	1.0000	0.5792	0.4491	0.6581	0.4698	0.3355	0.3178	0.4590	0.2491	0.4691	0.4157	0.3172	0.4701	0.3116	0.2932	0.2854	0.4002	0.4105
Portal Management & Navigation aids	0.2647	0.4277	0.4527	0.32 85	0.4014	0.4318	0.2947	0.2465	0.3162	0.2790	0.4167	0.4587	0.5792	1.000	0.6159	0.4219	0.3768	0.3513	0.2827	0.3301	0.1165	0.2911	0.2296	0.2291	0.3163	0.1375	0.2988	0.3085	0.3385	0.4337
Authentication protocols	0.3163	0.4600	0.5537	0.4547	0.5183	0.5168	0.3964	0.4132	0.3396	0.3209	0.2778	0.4587	0.4491	0.6159	1.0000	0.3440	0.4792	0.2916	0.2838	0.4728	0.0432	0.1867	0.1774	0.4800	0.4527	0.1474	0.4488	0.5987	0.4926	0.5722
Understanding students' needs while creating	0.4211	0.4763	0.3455	0.3412	0.2807	0.3894	0.2775	0.3940	0.3549	0.5706	0.4178	0.3621	0.6581	0.4219	0.3440	1.0000	0.4011	0.3726	0.3250	0.4599	0.4509	0.4720	0.5567	0.3264	0.3203	0.2782	0.3302	0.2309	0.3476	0.3231

content for the LMS																													
Appropriateness of teaching materials	0.3758	0.3506	0.5749	0.36606	0.2466	0.33340	0.5510	0.30994	0.49968	0.5405	0.3255	0.3318	0.46968	0.3768	0.47992	0.40111	1.00000	0.45151	0.5759	0.5961	0.3487	0.34227	0.41101	0.5157	0.50586	0.3703	0.40034	0.43110	0.39319	0.42745
Adequacy of content provided to students	0.1849	0.2333	0.1348	0.27445	0.4204	0.28007	0.2957	0.24444	0.38889	0.3128	0.1460	0.2066	0.33555	0.3513	0.29116	0.37226	0.45151	1.00000	0.6035	0.3269	0.3094	0.32465	0.31447	0.3699	0.44110	0.3651	0.33387	0.35400	0.27261	0.27744
Relevance of materials	0.2621	0.3859	0.2772	0.26776	0.2094	0.28263	0.4423	0.28447	0.52261	0.4825	0.4169	0.2883	0.31178	0.2827	0.28238	0.32550	0.57559	0.60635	1.0000	0.5566	0.5108	0.35444	0.40447	0.5343	0.42253	0.5081	0.45584	0.45333	0.29781	0.38511
Improved timeman	0.3440	0.4100	0.4417	0.47550	0.4562	0.31549	0.4749	0.52207	0.40040	0.5086	0.4141	0.4116	0.45900	0.3301	0.47228	0.45999	0.59561	0.32669	0.5566	1.0000	0.4793	0.30886	0.36000	0.6614	0.43444	0.4394	0.38455	0.61522	0.46207	0.37765

agement for the course																														
Addressing part-time students struggle in managing their work-study balance	0.1457	0.2182	0.1234	0.17758	0.1572	0.19102	0.3241	0.20000	0.38557	0.4207	0.1807	0.1043	0.2491	0.1165	0.04232	0.45009	0.34887	0.3094	0.5108	0.4793	1.0000	0.45557	0.51125	0.2964	0.21886	0.4163	0.30883	0.2040	0.32466	0.1565
Improved access to learning resources	0.3495	0.3527	0.2817	0.20065	0.1908	0.38449	0.4339	0.37441	0.53353	0.5224	0.3378	0.3385	0.4691	0.2911	0.18667	0.47020	0.34227	0.3265	0.3544	0.3086	0.4557	1.0000	0.69659	0.3109	0.47437	0.4344	0.33329	0.1383	0.40456	0.3355

Adequate time available to spend in course activities	0.3262	0.2681	0.3582	0.31768	0.2810	0.38281	0.4951	0.33281	0.51871	0.60151	0.3409	0.3108	0.41571	0.2296	0.17741	0.55671	0.41011	0.31471	0.4047	0.3600	0.5125	0.69591	1.00000	0.4148	0.56501	0.5585	0.38661	0.1630	0.45781	0.34044
Quality university environment	0.3960	0.4692	0.2851	0.37651	0.3982	0.34211	0.4627	0.44191	0.39181	0.4680	0.2521	0.3805	0.31721	0.2291	0.48001	0.32641	0.51571	0.36991	0.5343	0.6614	0.2964	0.31091	0.41481	1.0000	0.43891	0.4245	0.48461	0.5445	0.48601	0.52933
Cutting edge facilities provided in the classroom	0.3571	0.2919	0.5238	0.36601	0.4571	0.41391	0.5110	0.34811	0.46531	0.4631	0.3337	0.4917	0.47011	0.3163	0.45271	0.32031	0.50861	0.44101	0.4253	0.4344	0.2186	0.47371	0.56501	0.4389	1.00000	0.5193	0.38151	0.3677	0.28851	0.34077

Quality interaction between academic and students	0.2814	0.2928	0.2192	0.20227	0.2464	0.27223	0.3848	0.47662	0.50019	0.4904	0.3327	0.2721	0.31116	0.1375	0.14774	0.27282	0.37703	0.36351	0.5081	0.4394	0.4163	0.43444	0.55585	0.4245	0.51993	1.00000	0.55598	0.2919	0.35955	0.3365
Addressing students' communication skills	0.2807	0.3731	0.2360	0.20217	0.3254	0.34219	0.2436	0.43991	0.28866	0.3582	0.1378	0.2499	0.2932	0.2988	0.44888	0.33302	0.40334	0.33387	0.4584	0.3845	0.3083	0.33329	0.38666	0.4846	0.38115	0.5598	1.00000	0.4587	0.40778	0.4352
Addressing classroom attendance issues	0.2101	0.2675	0.4546	0.42833	0.6008	0.42500	0.4002	0.57229	0.37305	0.3705	0.1391	0.2310	0.28544	0.3085	0.59887	0.23209	0.43110	0.35540	0.4533	0.6152	0.2040	0.13833	0.16330	0.5445	0.36777	0.2919	0.45887	1.0000	0.44949	0.5032

A clear plan of various activities and their due dates	0.2955	0.3622	0.4395	0.3601	0.5117	0.43446	0.3551	0.43439	0.49300	0.4722	0.3521	0.2344	0.40002	0.3385	0.49326	0.34376	0.39119	0.27261	0.2981	0.4607	0.3246	0.40556	0.45578	0.4860	0.2885	0.3595	0.40078	0.4449	1.00000	0.5796
Quality forum discussions	0.4355	0.5278	0.5086	0.2634	0.4818	0.59327	0.4942	0.52116	0.48140	0.4680	0.3049	0.3769	0.41005	0.4337	0.57222	0.32331	0.42575	0.27274	0.3851	0.3765	0.1565	0.33555	0.3404	0.5293	0.34007	0.3365	0.43552	0.5032	0.57960	1.00000

Impl_Cor Saturated Model

	A quality interaction with students	A clear explanation of the course concepts	Knowledge in the use of LMS technology	Use of Artificial Reality/ Virtual Reality in the class-leading to cutting edge environments	Student's prior knowledge of the subject domain	Students' own digital devices to access LMS based materials	Students' knowledge in using the LMS	Interaction with professional support staff people (Program Management, IT etc)	Quality access to LMS	Availability of quality content on the LMS	Organisation of subject materials in the LMS	A mix of text, audio, and video in subject presentation	Clear and easy to use content	Portal Management & Navigation aids	Authentication protocols	Understanding students' needs while creating content for the LMS	Appropriateness of teaching materials	Adequacy of content provided to students	Relevance of materials	Improved time management for the course	Addressing part-time students struggle in managing their work-study balance	Improved access to learning resources	Adequate time available to spend in course activities	Quality university environment	Cutting edge facilities provided in the classroom	Quality interaction between academic and students	Addressing students' communication skills	Addressing classroom attendance issues	A clear plan of various activities and their due dates	Quality forum discussions
A quality interaction with	1.0000	0.6264	0.6109	0.5364	0.4092	0.3822	0.3884	0.4328	0.4153	0.4433	0.4053	0.3872	0.4645	0.4044	0.3997	0.4114	0.3376	0.3225	0.3578	0.3289	0.3303	0.3435	0.3662	0.4140	0.3551	0.3605	0.3816	0.3791	0.3750	0.3947

students																													
A clear explanation of the course concepts	0.6264	1.0000	0.5841	0.51128	0.3912	0.3654	0.3714	0.41139	0.3971	0.4239	0.3875	0.3702	0.4441	0.3867	0.38222	0.39333	0.32828	0.3083	0.3421	0.3145	0.3158	0.3284	0.3501	0.3958	0.3395	0.3447	0.36349	0.3625	0.3586	0.3774
Knowledge in the use of LMS technology	0.6109	0.5841	1.0000	0.50002	0.3816	0.3564	0.3622	0.40037	0.3873	0.4134	0.3780	0.3611	0.4332	0.3771	0.37328	0.38737	0.31448	0.3007	0.3336	0.3068	0.3080	0.3204	0.3415	0.3860	0.3311	0.3362	0.35559	0.3536	0.3497	0.3681
Use of Artificial Reality/Virtual Reality in the class-	0.5364	0.5128	0.5002	1.00000	0.3350	0.3129	0.3180	0.35444	0.3401	0.3630	0.3319	0.3170	0.3803	0.3311	0.32733	0.33368	0.27664	0.2640	0.2929	0.2693	0.2704	0.2813	0.2998	0.3389	0.2907	0.2952	0.31125	0.3104	0.3071	0.3232

leading to cutting edge environments																														
Student's prior knowledge of the subject domain	0.4092	0.3912	0.3816	0.33350	1.0000	0.53398	0.3951	0.53529	0.35577	0.3818	0.3490	0.3335	0.40000	0.3482	0.34442	0.35443	0.32773	0.31327	0.3469	0.3563	0.3577	0.37221	0.39966	0.4742	0.40680	0.4130	0.43772	0.4343	0.42996	0.4522
Students' own digital devices to access LMS based materials	0.3822	0.3654	0.3564	0.31329	0.5398	1.00000	0.6710	0.47888	0.33340	0.3565	0.3260	0.3114	0.37336	0.3252	0.32150	0.33309	0.30557	0.29200	0.3240	0.3328	0.3341	0.37505	0.37005	0.4429	0.37990	0.3857	0.40083	0.4056	0.40122	0.4223

Students' knowledge in using the LMS	0.3884	0.3714	0.3622	0.31 80	0.3951	0.6710	1.0000	0.3901	0.33 95	0.3624	0.3313	0.3165	0.3797	0.3305	0.3267	0.3363	0.3107	0.2968	0.3293	0.3382	0.3395	0.3532	0.3765	0.4501	0.3861	0.3920	0.4150	0.4122	0.4078	0.4292
Interaction with professional support staff people (Program Management, IT etc)	0.4328	0.4139	0.4037	0.3544	0.5329	0.4788	0.3901	1.0000 0	0.37 783	0.4038	0.3692	0.3527	0.4231	0.3684	0.3641	0.3747	0.3462	0.3308	0.3669	0.3769	0.3784	0.3936	0.4196	0.5016	0.4303	0.4368	0.4624	0.4594	0.4544	0.4783
Quality access to LMS	0.4153	0.3971	0.3873	0.3401	0.3577	0.3340	0.3395	0.3783	1.0 0 0 0 0	0.5426	0.4961	0.4739	0.5685	0.4949	0.4892	0.5035	0.3726	0.3559	0.3948	0.3666	0.3681	0.3829	0.4082	0.4056	0.3479	0.3532	0.3740	0.3715	0.3675	0.3868

Availability of quality content on the LMS	0.443	0.423	0.413	0.3630	0.3818	0.3565	0.3624	0.4038	0.5426	1.0000	0.5295	0.5058	0.6068	0.5283	0.5222	0.5374	0.3976	0.3799	0.4214	0.3913	0.3929	0.4087	0.4357	0.4330	0.3714	0.3770	0.3991	0.3965	0.3922	0.4128
Organisation of subject materials in the LMS	0.4053	0.3875	0.3780	0.3319	0.3490	0.3260	0.3313	0.3692	0.4961	0.5295	1.000	0.4625	0.5548	0.4830	0.4774	0.4913	0.3636	0.3473	0.3853	0.3578	0.3593	0.3737	0.3983	0.3958	0.3395	0.3447	0.3649	0.3625	0.3586	0.3774
A mix of text, audio, and video in subject presentation	0.3872	0.3702	0.3611	0.3170	0.3335	0.3114	0.3165	0.3527	0.4739	0.5058	0.4625	1.0000	0.5300	0.4614	0.4561	0.4694	0.3473	0.3318	0.3681	0.3418	0.3432	0.3570	0.3806	0.3782	0.3244	0.3293	0.3486	0.3464	0.3426	0.3606

Clear and easy to use content	0.4645	0.4441	0.4332	0.3803	0.4000	0.3736	0.3797	0.4231	0.5685	0.6068	0.5548	0.5300	1.0000	0.5535	0.5471	0.5631	0.4166	0.3980	0.4416	0.4100	0.4117	0.4282	0.4565	0.4536	0.3891	0.3950	0.4182	0.4155	0.4110	0.4326
Portal Management & Navigation aids	0.4044	0.3867	0.3771	0.3311	0.3482	0.3252	0.3305	0.3684	0.4949	0.5283	0.4830	0.4614	0.5535	1.0000	0.4764	0.4902	0.3627	0.3465	0.3844	0.3570	0.3584	0.3728	0.3974	0.3949	0.3388	0.3439	0.3641	0.3617	0.3578	0.3766
Authentication protocols	0.3997	0.3822	0.3728	0.3273	0.3442	0.3215	0.3267	0.3641	0.4892	0.5222	0.4774	0.4561	0.5471	0.4764	1.0000	0.4846	0.3586	0.3426	0.3800	0.3529	0.3543	0.3685	0.3929	0.3904	0.3349	0.3400	0.3599	0.3576	0.3537	0.3723
Understanding students' needs while creating	0.4114	0.3933	0.3837	0.3368	0.3543	0.3309	0.3363	0.3747	0.5035	0.5374	0.4913	0.4694	0.5631	0.4902	0.4846	1.0000	0.3690	0.3525	0.3911	0.3632	0.3646	0.3793	0.4043	0.4018	0.3446	0.3499	0.3704	0.3680	0.3640	0.3831

content for the LMS																														
Appropriateness of teaching materials	0.3376	0.3228	0.3148	0.2764	0.3273	0.3057	0.3107	0.3462	0.3726	0.3976	0.3636	0.3473	0.4166	0.3627	0.3586	0.3690	1.0000	0.6571	0.7290	0.3944	0.3960	0.4119	0.4391	0.4444	0.3812	0.3870	0.4097	0.4070	0.4026	0.4237
Adequacy of content provided to students	0.3225	0.3083	0.3007	0.2640	0.3127	0.2920	0.2968	0.3308	0.3559	0.3799	0.3473	0.3318	0.3980	0.3465	0.3426	0.3525	0.6571	1.0000	0.6964	0.3768	0.3783	0.3935	0.4195	0.4245	0.3642	0.3697	0.3914	0.3888	0.3846	0.4048
Relevance of materials	0.3578	0.3421	0.3336	0.2929	0.3469	0.3240	0.3293	0.3669	0.3948	0.4214	0.3853	0.3681	0.4416	0.3844	0.3800	0.3911	0.7290	0.6964	1.0000	0.4180	0.4197	0.4366	0.4654	0.4710	0.4040	0.4101	0.4342	0.4313	0.4267	0.4491
Improved time man	0.3289	0.3145	0.3068	0.2693	0.3563	0.3328	0.3382	0.3769	0.3666	0.3913	0.3578	0.3418	0.4100	0.3570	0.3529	0.3632	0.3944	0.3768	0.4180	1.0000	0.5530	0.5752	0.6131	0.4133	0.3545	0.3599	0.3811	0.3786	0.3745	0.3941

agement for the course																														
Addressing part-time students struggle in managing their work-study balance	0.3303	0.3158	0.3080	0.27 04	0.3577	0. 33 41	0.3395	0.37 84	0. 3681	0.3929	0.3593	0.3432	0. 4117	0.3584	0.35 43	0.36 46	0.39 60	0. 3783	0.4197	0.5530	1.0000	0. 5775	0. 6156	0.4150	0. 3560	0.3614	0.38 26	0.3801	0. 3760	0.3957
Improved access to learning resources	0.3435	0.3284	0.3204	0.28 13	0.3721	0. 34 75	0.3532	0.39 36	0. 3829	0.4087	0.3737	0.3570	0. 4282	0.3728	0.36 85	0.37 93	0.41 19	0. 3935	0.4366	0.5752	0.5775	1. 0000	0. 6403	0.4317	0. 3703	0.3759	0.39 80	0.3953	0. 3911	0.4116

Adequate time available to spend in course activities	0.3662	0.3501	0.3415	0.29 98	0.3966	0.37 05	0.3765	0.41 96	0.4082	0.4357	0.3983	0.3806	0.45 65	0.3974	0.39 29	0.40 43	0.43 91	0.41 95	0.4654	0.6131	0.6156	0.64 03	1.00 00	0.4602	0.39 47	0.4007	0.42 42	0.4214	0.41 69	0.4388
Quality university environment	0.4140	0.3958	0.3860	0.33 89	0.4742	0.44 29	0.4501	0.50 16	0.4056	0.4330	0.3958	0.3782	0.45 36	0.3949	0.39 04	0.40 18	0.44 44	0.42 45	0.4710	0.4133	0.4150	0.43 17	0.46 02	1.0000	0.52 64	0.5344	0.56 58	0.5620	0.55 60	0.5852
Cutting edge facilities provided in the classroom	0.3551	0.3395	0.3311	0.29 07	0.4068	0.37 99	0.3861	0.43 03	0.3479	0.3714	0.3395	0.3244	0.38 91	0.3388	0.33 49	0.34 46	0.38 12	0.36 42	0.4040	0.3545	0.3560	0.37 03	0.39 47	0.5264	1.00 00	0.4584	0.48 53	0.4821	0.47 69	0.5019

Quality interaction between academic and students	0.3605	0.3447	0.3362	0.29 52	0.4130	0.38 57	0.3920	0.43 68	0.3532	0.3770	0.3447	0.3293	0.3950	0.3439	0.3400	0.3499	0.3870	0.3697	0.4101	0.3599	0.3614	0.3759	0.4007	0.5344	0.4584	1.0000	0.4927	0.4894	0.4842	0.5096
Addressing students' communication skills	0.3816	0.3649	0.3559	0.31 25	0.4372	0.40 83	0.4150	0.46 24	0.3740	0.3991	0.3649	0.3486	0.4182	0.3641	0.3599	0.3704	0.4097	0.3914	0.4342	0.3811	0.3826	0.3980	0.4242	0.5658	0.4853	0.4927	1.0000	0.5182	0.5126	0.5395
Addressing classroom attendance issues	0.3791	0.3625	0.3536	0.31 04	0.4343	0.40 56	0.4122	0.45 94	0.3715	0.3965	0.3625	0.3464	0.4155	0.3617	0.3576	0.3680	0.4070	0.3888	0.4313	0.3786	0.3801	0.3953	0.4214	0.5620	0.4821	0.4894	0.5182	1.0000	0.5092	0.5359

A clear plan of various activities and their due dates	0.3750	0.3586	0.3497	0.30771	0.4296	0.40112	0.4078	0.45444	0.36752	0.3922	0.3586	0.3426	0.41102	0.3578	0.35537	0.36440	0.40026	0.38446	0.4267	0.3745	0.3760	0.39111	0.41669	0.5560	0.4769	0.4842	0.51126	0.5092	1.00000	0.53001
Quality forum discussions	0.3947	0.3774	0.3681	0.32322	0.4522	0.42232	0.4292	0.47833	0.38682	0.4128	0.3774	0.3606	0.43262	0.3766	0.37232	0.38311	0.42737	0.40048	0.4491	0.3941	0.3957	0.41162	0.43882	0.5852	0.50192	0.5096	0.53955	0.5359	0.53011	1.00000

Implied correlation matrix of the saturated model

Impl_Cor	Estimated																			Model									
	Aquality interaction with students	A clear explanation of the course concepts	Knowledge in the use of LMS technology	Use of Artificial Reality/ Virtual Reality in the class-leading to cutting edge environments	Student's prior knowledge of the subject domain	Students' own digital devices to access LMS based materials	Students' knowledge in using the LMS	Interaction with professional support staff people (Program Management, IT etc)	Quality access to LMS	Availability of quality content on the LMS	Organisation of subject materials in the LMS	A mix of text, audio, and video in subject presentation	Clear and easy to use content	Portal Management & Navigation aids	Authentication protocols	Understanding students' needs while creating content for the LMS	Appropriateness of teaching materials	Adequacy of content provided to students	Relevance of materials	Improved time management for the course	Addressing part-time students struggle in managing their work-study balance	Improved access to learning resources	Adequate time available to spend in course activities	Quality university environment	Cutting edge facilities provided in the classroom	Quality interaction between academic and students	Addressing students' communication skills	Addressing classroom attendance issues	A clear plan of various activities and their due dates	Quality forum discussions
Aquality interactio	1.0000	0.6264	0.6109	0.5364	0.4092	0.3822	0.3884	0.4328	0.41	0.4433	0.4053	0.3872	0.46	0.4044	0.3997	0.4114	0.3376	0.3225	0.3578	0.3289	0.3033	0.3435	0.3662	0.4140	0.3551	0.3605	0.3816	0.3791	0.3750	0.3947

n with students									53				45																	
A clear explanation of the course concepts	0.6264	1.0000	0.5841	0.51128	0.3912	0.3654	0.3714	0.41139	0.39711	0.42139	0.3875	0.3702	0.44441	0.3867	0.38222	0.39333	0.32228	0.3083	0.34221	0.31445	0.3158	0.32841	0.3501	0.3958	0.33395	0.34447	0.36449	0.3625	0.3586	0.37774
Knowledge in the use of LMS technology	0.6109	0.5841	1.0000	0.50002	0.3816	0.3564	0.3622	0.40037	0.38733	0.41134	0.3780	0.3611	0.43332	0.3771	0.37328	0.38737	0.31448	0.3007	0.3336	0.30668	0.3080	0.32041	0.3415	0.3860	0.3311	0.33362	0.35559	0.3536	0.3497	0.36881
Use of Artificial Reality/Virtual Real	0.5364	0.5128	0.5002	1.00000	0.3350	0.3129	0.3180	0.35444	0.34001	0.36330	0.3319	0.3170	0.38003	0.3311	0.32733	0.33368	0.27664	0.2640	0.2929	0.26993	0.2704	0.2813	0.2998	0.3389	0.2907	0.29522	0.31125	0.3104	0.3071	0.32322

ity in the class - leading to cutting edge environments																													
Student's prior knowledge of the subject domain	0.4092	0.3912	0.3816	0.3350	1.0000	0.5398	0.3951	0.5329	0.3577	0.3818	0.3490	0.3335	0.4000	0.3482	0.3442	0.3543	0.3273	0.3127	0.3469	0.3563	0.3577	0.3721	0.3966	0.4742	0.4068	0.4130	0.4372	0.4343	0.4296	0.4522
Students' own digital devices to access LM	0.3822	0.3654	0.3564	0.3129	0.5398	1.0000	0.6710	0.4788	0.3340	0.3565	0.3260	0.3114	0.3736	0.3252	0.3215	0.3309	0.3057	0.2920	0.3240	0.3328	0.3341	0.3475	0.3705	0.4429	0.3799	0.3857	0.4083	0.4056	0.4012	0.4223

S based materials																														
Students' knowledge in using the LMS	0.3884	0.3714	0.3622	0.3180	0.3951	0.67100	1.0000	0.39001	0.33955	0.3624	0.3313	0.3165	0.37977	0.3305	0.3267	0.3363	0.3107	0.2968	0.3293	0.3382	0.3395	0.3532	0.3765	0.4501	0.3861	0.3920	0.4150	0.4122	0.4078	0.4292
Interaction with professional support staff people (Program Management, IT etc)	0.4328	0.4139	0.4037	0.3544	0.5329	0.47880	0.3901	1.0000	0.37833	0.4038	0.3692	0.3527	0.42311	0.3684	0.3641	0.3747	0.3462	0.3308	0.3669	0.3769	0.3784	0.3936	0.4196	0.5016	0.4303	0.4368	0.4624	0.4594	0.4544	0.4783

Quality access to LMS	0.4153	0.3971	0.3873	0.34001	0.3577	0.33340	0.3395	0.37783	1.00000	0.54226	0.4961	0.4739	0.5685	0.4949	0.48492	0.50535	0.37226	0.35559	0.39348	0.36666	0.3681	0.38229	0.40082	0.4056	0.34779	0.3532	0.37340	0.3715	0.36875	0.3868
Availability of quality content on the LMS	0.4433	0.4239	0.4134	0.36330	0.3818	0.35365	0.3624	0.40338	0.54266	1.00000	0.5295	0.5058	0.6068	0.5283	0.52222	0.53774	0.39776	0.37999	0.42214	0.39313	0.3929	0.40887	0.43757	0.4330	0.37314	0.3770	0.39391	0.3965	0.39222	0.4128
Organisation of subject materials in the LMS	0.4053	0.3875	0.3780	0.33319	0.3490	0.32600	0.3313	0.36922	0.49611	0.52955	1.0000	0.4625	0.5548	0.4830	0.47474	0.49313	0.36336	0.34773	0.38353	0.35778	0.3593	0.37337	0.39383	0.3958	0.33395	0.3447	0.36449	0.3625	0.35866	0.3774
A mix of text, audi	0.3872	0.3702	0.3611	0.31770	0.3335	0.31314	0.3165	0.35227	0.47	0.50558	0.4625	1.0000	0.53	0.4614	0.45661	0.46994	0.34773	0.33318	0.36881	0.34218	0.3432	0.35770	0.38006	0.3782	0.32444	0.3293	0.34886	0.3464	0.34266	0.3606

o, and video in subject presentation									39				00																
Clear and easy to use content	0.4645	0.4441	0.4332	0.38003	0.4000	0.37336	0.3797	0.42231	0.56885	0.6068	0.5548	0.5300	1.00000	0.5535	0.54771	0.5631	0.4166	0.3980	0.44416	0.4100	0.4117	0.4282	0.45465	0.4536	0.38911	0.39500	0.41482	0.4155	0.41110	0.4326
Portal Management & Navigation aids	0.4044	0.3867	0.3771	0.33111	0.3482	0.32352	0.3305	0.36384	0.49499	0.5283	0.4830	0.4614	0.55355	1.0000	0.47764	0.4902	0.3627	0.3465	0.38444	0.3570	0.3584	0.37328	0.39374	0.3949	0.33888	0.34399	0.36441	0.3617	0.35786	0.3766
Authentication protocols	0.3997	0.3822	0.3728	0.32773	0.3442	0.32157	0.3267	0.36411	0.48922	0.5222	0.4774	0.4561	0.54711	0.4764	1.0000	0.4846	0.3586	0.3426	0.38000	0.3529	0.3543	0.36852	0.39291	0.3904	0.33491	0.34000	0.3599	0.3576	0.35377	0.3723

Understanding students' needs while creating content for the LMS	0.4114	0.3933	0.3837	0.33368	0.3543	0.33309	0.3363	0.37347	0.50035	0.53574	0.4913	0.4694	0.56311	0.4902	0.48646	1.00000	0.36990	0.35325	0.39111	0.36232	0.3646	0.37933	0.40043	0.4018	0.34646	0.3499	0.37004	0.3680	0.36340	0.38311
Appropriateness of teaching materials	0.3376	0.3228	0.3148	0.27664	0.3273	0.30557	0.3107	0.34662	0.37226	0.39776	0.3636	0.3473	0.41666	0.3627	0.35886	0.36990	1.00000	0.65671	0.72990	0.39444	0.3960	0.41919	0.43991	0.4444	0.38312	0.3870	0.40097	0.4070	0.40426	0.42237
Adequacy of content provided to	0.3225	0.3083	0.3007	0.26640	0.3127	0.29208	0.2968	0.33308	0.35599	0.37999	0.3473	0.3318	0.39800	0.3465	0.34226	0.35225	0.65671	1.00000	0.69664	0.37768	0.3783	0.39535	0.41995	0.4245	0.36242	0.3697	0.39314	0.3888	0.38466	0.40488

students																													
Relevance of materials	0.3578	0.3421	0.3336	0.29 29	0.3469	0.3240	0.3293	0.3669	0.3948	0.4214	0.3853	0.3681	0.4416	0.3844	0.3800	0.3911	0.7290	0.6964	1.000 00	0.4180	0.4197	0.4366	0.4654	0.4710	0.4040	0.4101	0.4342	0.4313	0.4267	0.4491
Improved time management for the course	0.3289	0.3145	0.3068	0.26 93	0.3563	0.3328	0.3382	0.3769	0.3666	0.3913	0.3578	0.3418	0.4100	0.3570	0.3529	0.3632	0.3944	0.3768	0.4180	1.000 00	0.5530	0.5752	0.6131	0.4133	0.3545	0.3599	0.3811	0.3786	0.3745	0.3941
Addressing part-time students struggle in managing their work-stud	0.3303	0.3158	0.3080	0.27 04	0.3577	0.3341	0.3395	0.3784	0.3681	0.3929	0.3593	0.3432	0.4117	0.3584	0.3543	0.3646	0.3960	0.3783	0.4197	0.5530	1.000 0	0.5775	0.6156	0.4150	0.3560	0.3614	0.3826	0.3801	0.3760	0.3957

y balance																													
Improved access to learning resources	0.3435	0.3284	0.3204	0.2813	0.3721	0.3475	0.3532	0.3936	0.3829	0.4087	0.3737	0.3570	0.4282	0.3728	0.3685	0.3793	0.4119	0.3935	0.4366	0.5752	0.5775	1.0000	0.6403	0.4317	0.3703	0.3759	0.3980	0.3953	0.3911	0.4116
Adequate time available to spend in course activities	0.3662	0.3501	0.3415	0.2998	0.3966	0.3705	0.3765	0.4196	0.4082	0.4357	0.3983	0.3806	0.4565	0.3974	0.3929	0.4043	0.4391	0.4195	0.4654	0.6131	0.6156	0.6403	1.0000	0.4602	0.3947	0.4007	0.4242	0.4214	0.4169	0.4388
Quality university environment	0.4140	0.3958	0.3860	0.3389	0.4742	0.4429	0.4501	0.5016	0.4056	0.4330	0.3958	0.3782	0.4536	0.3949	0.3904	0.4018	0.4444	0.4245	0.4710	0.4133	0.4150	0.4317	0.4602	1.0000	0.5264	0.5344	0.5658	0.5620	0.5560	0.5852

Cutting edge facilities provided in the classroom	0.3551	0.3395	0.3311	0.29207	0.4068	0.37999	0.3861	0.43403	0.34779	0.37414	0.3395	0.3244	0.38911	0.3388	0.33349	0.34446	0.38112	0.36242	0.40040	0.35545	0.3560	0.37033	0.39047	0.5264	1.00000	0.4584	0.48453	0.4821	0.47699	0.5019
Quality interaction between academic and students	0.3605	0.3447	0.3362	0.29552	0.4130	0.38557	0.3920	0.43668	0.35532	0.37770	0.3447	0.3293	0.39500	0.3439	0.34000	0.34999	0.38770	0.36997	0.41001	0.35999	0.3614	0.37559	0.40007	0.5344	0.45584	1.0000	0.49427	0.4894	0.48442	0.5096
Addressing students' communication skills	0.3816	0.3649	0.3559	0.31225	0.4372	0.40883	0.4150	0.46624	0.37740	0.39991	0.3649	0.3486	0.41482	0.3641	0.35999	0.37004	0.40997	0.39914	0.43042	0.38111	0.3826	0.39880	0.42242	0.5658	0.48453	0.4927	1.00000	0.5182	0.51126	0.5395

Addressing classroom attendance issues	0.3791	0.3625	0.3536	0.31 04	0.4343	0.40 56	0.4122	0.4594	0.37 15	0.3965	0.3625	0.3464	0.41 55	0.3617	0.3576	0.3680	0.4070	0.38 88	0.43 13	0.3786	0.3801	0.39 53	0.42 14	0.5620	0.48 21	0.4894	0.5182	1.0000	0.50 92	0.5359
A clear plan of various activities and their due dates	0.3750	0.3586	0.3497	0.3071	0.4296	0.40 12	0.4078	0.4544	0.36 75	0.3922	0.3586	0.3426	0.41 10	0.3578	0.3537	0.3640	0.4026	0.38 46	0.42 67	0.3745	0.3760	0.39 11	0.41 69	0.5560	0.47 69	0.4842	0.5126	0.5092	1.00 00	0.5301
Quality forum discussions	0.3947	0.3774	0.3681	0.3232	0.4522	0.42 23	0.4292	0.4783	0.38 68	0.4128	0.3774	0.3606	0.43 26	0.3766	0.3723	0.3831	0.4237	0.40 48	0.44 91	0.3941	0.3957	0.41 16	0.43 88	0.5852	0.50 19	0.5096	0.5395	0.5359	0.53 01	1.0000

Implied correlation matrix of the estimated model

Scores

Standardized Construct Scores

Case	Academics	Students	LMS	Teaching Resources	Management	Engagement
1	-0.249216300991	0.311113367950	1.120562855207	-0.765810531477	-0.541313396855	0.676034471228
2	-0.867679859712	-1.348973827239	-2.427648800801	-0.765810531477	-2.351024277909	-1.088142508524
3	-0.303936988472	-0.676786344502	-0.904975790598	-0.765810531477	-1.746748090534	0.278019850538
4	1.277840806905	0.210216768459	1.301882198513	-0.287381697372	1.270825994000	0.430030401386
5	0.659377248184	0.217734753869	0.830847275446	1.157434447911	1.270825994000	0.537555820040
6	0.659377248184	-0.676786344502	0.229821592121	-0.765810531477	0.365970553473	-0.739030431509
7	0.885003457327	1.309590236507	0.703726050367	-0.500874112922	1.270825994000	1.488880627318
8	1.277840806905	1.396064760736	1.301882198513	1.157434447911	1.270825994000	1.488880627318
9	1.277840806905	1.396064760736	1.301882198513	1.157434447911	1.270825994000	1.488880627318
10	-0.297202972635	-1.151025547413	1.066364736979	1.157434447911	0.661692787022	-0.505776896363
11	0.266539898606	-1.373359163047	1.301882198513	1.157434447911	0.661692787022	0.629852843953
12	1.277840806905	1.396064760736	1.301882198513	1.157434447911	1.270825994000	1.488880627318
13	1.277840806905	0.432550384093	0.495849771516	-0.500874112922	0.202317359337	0.322540710822

14	-1.260517209290	-0.763260868731	0.649527932140	0.410892647595	0.661692787022	0.333305635650
15	-1.260517209290	-1.459833687276	-0.642422716339	-0.765810531477	-0.839464140205	-2.115124275617
16	-0.867679859712	-0.281503680409	-0.697099511746	-0.765810531477	-0.541313396855	-0.309534600018
17	0.659377248184	0.311113367950	-0.653992413576	-2.207450129104	-1.488156202582	-1.861991815945
18	-0.690040322213	-1.286884638817	0.355003868759	0.462336650600	-0.717798311269	-0.752608389602
19	-1.438156746790	-0.676786344502	-0.678764061080	-0.765810531477	-0.852295860484	-2.023949806274
20	-0.690040322213	-0.780742114688	-0.968505408023	-1.993957713554	-0.541313396855	-0.532059330719
21	-0.915666531356	-0.780742114688	-0.878418855052	0.410892647595	0.189485639059	-0.206472651277
22	-0.297202972635	-0.471933974825	-0.087702207552	-0.765810531477	0.838177701436	0.219432703649
23	1.277840806905	1.396064760736	1.301882198513	1.157434447911	0.540026958086	1.488880627318
24	0.095634376944	0.217734753869	-0.277858465096	0.410892647595	-0.541313396855	-0.595306945444
25	-0.867679859712	-0.281503680409	-0.697099511746	-0.765810531477	-0.541313396855	-0.309534600018
26	0.492166107749	-0.763260868731	-0.062298229449	0.675829066150	0.365970553473	-1.314211657358
27	1.277840806905	1.396064760736	1.301882198513	1.157434447911	1.270825994000	1.488880627318
28	1.277840806905	1.396064760736	1.301882198513	1.157434447911	1.270825994000	1.488880627318
29	-0.249216300991	-0.281503680409	0.533558723887	0.462336650600	-0.406815847641	0.246538639738

30	1.277840806905	0.699491942191	0.104708155812	0.675829066150	0.067819810123	0.442780936083
31	-1.609062268452	0.113778983683	0.160157558406	-0.765810531477	0.540026958086	-0.013820831497
32	-1.830994096368	-0.281503680409	-1.140493252131	-0.765810531477	-1.013520544818	-1.049145659855
33	-0.867679859712	0.914307572414	-0.602322905969	1.157434447911	0.798618846038	-0.309534600018
34	1.277840806905	1.396064760736	1.066364736979	1.157434447911	0.972675250650	0.975384774747
35	1.277840806905	1.000782096644	1.120562855207	1.157434447911	1.270825994000	1.488880627318
36	-1.260517209290	-1.855116351369	-1.119779326836	0.675829066150	-0.243162653505	-1.245387956200
37	0.707363919827	-0.281503680409	1.301882198513	1.157434447911	1.270825994000	0.223069238646
38	-0.303936988472	-0.281503680409	-0.697099511746	0.675829066150	-0.541313396855	-0.076281064872
39	1.277840806905	1.396064760736	1.301882198513	1.157434447911	1.270825994000	1.488880627318
40	-1.260517209290	-0.780742114688	-1.170538676623	-0.765810531477	-1.448597347184	-1.038380735027
41	0.885003457327	-0.281503680409	0.401518030190	-0.019268731161	-0.541313396855	-0.589776917443
42	1.277840806905	1.396064760736	1.301882198513	1.157434447911	0.972675250650	1.488880627318
43	-0.126297450972	-0.867216638917	-0.190850434199	-1.247415913238	0.798618846038	-0.169425292093
44	0.088900361106	0.113778983683	-0.834846463514	1.157434447911	1.270825994000	0.445547910915
45	-0.867679859712	0.699491942191	-0.697099511746	-0.765810531477	0.326411698075	-0.113292303673

46	0.266539898606	0.896826326458	1.005072324134	-0.019268731161	-0.230330933227	0.747330016045
47	0.088900361106	-0.478838064676	-2.074341613386	-1.942513710549	-0.678239455871	-1.438827157329
48	-0.867679859712	1.309590236507	0.677169114822	1.157434447911	0.540026958086	0.699553852417
49	-0.303936988472	0.810351802228	-0.192413358516	0.462336650600	0.067819810123	-0.036466730856
50	-0.297202972635	1.396064760736	0.826038791825	1.157434447911	-0.538884887053	0.456312835743
51	1.277840806905	0.699491942191	-0.054218014619	-0.714366528472	-0.069106248893	0.080133133930
52	0.659377248184	-1.262499303009	-0.767399400469	1.157434447911	0.365970553473	0.376734147806
53	-1.878980768011	-1.959072121555	-2.048249971209	-0.765810531477	-1.446168837382	-1.787929296296
54	-0.744761009694	-0.066688050186	-0.547646110561	-0.765810531477	0.661692787022	0.304256226462
55	0.885003457327	1.000782096644	0.468208588834	-0.765810531477	0.363542043671	-0.891050920406
56	0.266539898606	0.810351802228	0.649527932140	0.410892647595	0.972675250650	1.022337436643
57	-1.486143418433	0.415069138136	-1.108093306335	-0.765810531477	0.661692787022	0.217493152213
58	0.266539898606	-0.780742114688	-0.005695869412	-0.070712734166	-0.541313396855	-0.431718298378
59	0.266539898606	0.415069138136	-0.459177808403	-0.070712734166	-0.541313396855	-0.036466730856
60	-0.474842510134	-1.959072121555	-1.120244620205	-1.247415913238	-2.947325764609	-1.082566422091
61	-3.013200526329	-1.959072121555	-2.696081222005	-2.689055510865	-2.353452787711	-2.107949827354

62	-0.867679859712	-0.281503680409	-0.697099511746	-0.765810531477	-0.541313396855	-0.309534600018
63	0.492166107749	0.810351802228	-0.041875710194	-0.765810531477	-0.541313396855	-0.309534600018
64	1.277840806905	0.810351802228	1.301882198513	1.157434447911	1.270825994000	1.488880627318
65	0.266539898606	-0.281503680409	0.236748849509	-0.765810531477	-0.541313396855	-0.309534600018
66	-0.529563197615	-0.676786344502	-0.801331985531	0.410892647595	0.661692787022	-0.522117907624
67	0.659377248184	-0.170643820372	0.349848522582	0.462336650600	-0.702538081189	-0.296002700358
68	-0.690040322213	0.217734753869	0.190202982899	0.675829066150	-0.108665104291	0.721093640122
69	-0.126297450972	-1.072069008594	-0.415605416864	-0.765810531477	-0.406815847641	-0.518481372627
70	0.266539898606	-0.281503680409	-0.391452723129	-0.765810531477	-0.541313396855	-0.309534600018
71	0.492166107749	0.810351802228	-0.697099511746	1.157434447911	-0.541313396855	1.488880627318
72	1.277840806905	1.396064760736	1.301882198513	1.157434447911	1.270825994000	1.488880627318
73	-0.867679859712	-1.262499303009	-0.932616973280	-0.765810531477	-1.448597347184	-1.568171540427
74	0.659377248184	-0.281503680409	1.301882198513	-0.765810531477	-1.013520544818	-0.309534600018
75	0.266539898606	0.699491942191	-0.461582050213	0.410892647595	-0.541313396855	0.747330016045
76	-1.830994096368	-2.157020401380	-1.410746190964	-1.942513710549	-1.150446603834	-1.804228170788
77	0.714097935665	1.000782096644	0.885045393673	0.675829066150	1.270825994000	0.540322794872

Unstandardized Construct Scores

Case	Academics	Students	LMS	Teaching Resources	Management	Engagement
1	4.276079482723	4.343389132470	4.897315928564	4.000000000000	4.000000000000	4.558243451413
2	4.000000000000	3.314430297708	3.046104718841	4.000000000000	2.995949892433	3.532091435829
3	4.232382038090	3.720625412862	3.893265739209	4.000000000000	3.323100207067	4.266708305983
4	5.000000000000	4.161876238585	5.000000000000	4.148556859553	5.000000000000	4.399419927558
5	4.723920517277	4.302342206636	4.681691408793	5.000000000000	5.000000000000	4.422677827373
6	4.723920517277	3.720625412862	4.435852766623	4.000000000000	4.497974946216	3.736451082393
7	4.773281228660	4.948073545741	4.635477561524	4.075026962334	5.000000000000	5.000000000000
8	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
9	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
10	4.264819707848	3.529790339515	4.840845704396	5.000000000000	4.680949900501	3.859461934230
11	4.497201745937	3.354268660895	5.000000000000	5.000000000000	4.680949900501	4.426821791044
12	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
13	5.000000000000	4.337397917206	4.528743300733	4.075026962334	4.369753707155	4.292784993332
14	3.773281228660	3.668698958603	4.579007337357	4.641158657517	4.680949900501	4.288379483587

15	3.773281228660	3.302342206636	3.942029988538	4.000000000000	3.821075153283	3.020444010656
16	4.000000000000	4.000000000000	4.000000000000	4.000000000000	4.000000000000	4.000000000000
17	4.723920517277	4.343389132470	4.036857982488	3.283814380149	3.459256908745	3.113025855071
18	4.038100936508	3.406195115154	4.456954448123	4.642655722632	3.910578354873	3.693507416073
19	3.735180292152	3.720625412862	3.865754151369	4.000000000000	3.859874747218	2.992133442500
20	4.038100936508	3.697657793364	3.821112952505	3.357344277368	4.000000000000	3.826503264676
21	3.988740225125	3.697657793364	3.897315928564	4.641158657517	4.408553301090	3.999738453926
22	4.264819707848	3.925105926244	4.296995859619	4.000000000000	4.770371545627	4.247248870623
23	5.000000000000	5.000000000000	5.000000000000	5.000000000000	4.591446698910	5.000000000000
24	4.491538479188	4.302342206636	4.215052551771	4.641158657517	4.000000000000	3.856869477840
25	4.000000000000	4.000000000000	4.000000000000	4.000000000000	4.000000000000	4.000000000000
26	4.546562457320	3.668698958603	4.267014062121	4.716185619851	4.497974946216	3.388353868378
27	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
28	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
29	4.276079482723	4.000000000000	4.647226394425	4.642655722632	4.050703607655	4.294694533805
30	5.000000000000	4.633643248033	4.419292172735	4.716185619851	4.319050099499	4.435232599576

31	3.729517025403	4.279374587138	4.394944594780	4.000000000000	4.591446698910	4.124238018786
32	3.508461520812	4.000000000000	3.734111443605	4.000000000000	3.727603400589	3.554782403658
33	4.000000000000	4.668698958603	4.056269521554	5.000000000000	4.727603400589	4.000000000000
34	5.000000000000	5.000000000000	4.840845704396	5.000000000000	4.821075153283	4.744317639892
35	5.000000000000	4.720625412862	4.897315928564	5.000000000000	5.000000000000	5.000000000000
36	3.773281228660	3.022967619497	3.724063100612	4.716185619851	4.178924846717	3.414244337888
37	4.735180292152	4.000000000000	5.000000000000	5.000000000000	5.000000000000	4.309085040317
38	4.232382038090	4.000000000000	4.000000000000	4.716185619851	4.000000000000	4.123010851837
39	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
40	3.773281228660	3.697657793364	3.728477224061	4.000000000000	3.502025053784	3.550376893913
41	4.773281228660	4.000000000000	4.568197422732	4.358841342483	4.000000000000	3.867328491729
42	5.000000000000	5.000000000000	5.000000000000	5.000000000000	4.821075153283	5.000000000000
43	4.270482974597	3.645731339105	4.189569120616	3.716185619851	4.727603400589	4.028291613734
44	4.459100809430	4.279374587138	3.862275930014	5.000000000000	5.000000000000	4.436784106857
45	4.000000000000	4.633643248033	4.000000000000	4.000000000000	4.455206801178	4.140538065770
46	4.497201745937	4.697657793364	4.851094750003	4.358841342483	4.140125252782	4.560361890679

47	4.459100809430	3.935985454669	3.235790299177	3.358841342483	3.953346499912	3.321338153141
48	4.000000000000	4.948073545741	4.631427372169	5.000000000000	4.591446698910	4.582294614358
49	4.232382038090	4.645731339105	4.255639510788	4.642655722632	4.319050099499	4.153115518926
50	4.264819707848	5.000000000000	4.775263039330	5.000000000000	3.995949892433	4.432378597112
51	5.000000000000	4.633643248033	4.363514426779	4.001497065115	4.272396599411	4.157073264757
52	4.723920517277	3.366356751967	3.880872828704	5.000000000000	4.497974946216	4.410610932389
53	3.497201745937	3.000000000000	3.311738469570	4.000000000000	3.497974946216	3.116695801619
54	3.994403491875	4.035055710570	3.998299510091	4.000000000000	4.680949900501	4.253869306752
55	4.773281228660	4.720625412862	4.476323265920	4.000000000000	4.502025053784	3.604022165775
56	4.497201745937	4.645731339105	4.579007337357	4.641158657517	4.821075153283	4.707897922585
57	3.723920517277	4.366356751967	3.752260165308	4.000000000000	4.680949900501	4.252828357644
58	4.497201745937	3.697657793364	4.276698471020	4.357344277368	4.000000000000	3.870487880105
59	4.497201745937	4.366356751967	4.112368480335	4.357344277368	4.000000000000	4.153115518926
60	4.226718771340	3.000000000000	3.795961081650	3.716185619851	2.638100198998	3.588348118502
61	3.000000000000	3.000000000000	3.000000000000	3.000000000000	3.000000000000	3.000000000000
62	4.000000000000	4.000000000000	4.000000000000	4.000000000000	4.000000000000	4.000000000000

63	4.546562457320	4.645731339105	4.302308866337	4.000000000000	4.000000000000	4.000000000000
64	5.000000000000	4.645731339105	5.000000000000	5.000000000000	5.000000000000	5.000000000000
65	4.497201745937	4.000000000000	4.498321144428	4.000000000000	4.000000000000	4.000000000000
66	4.183021326707	3.720625412862	3.844203415540	4.641158657517	4.680949900501	3.807610761302
67	4.723920517277	4.012088091072	4.548785883666	4.642655722632	3.867728653371	3.997145997536
68	4.038100936508	4.302342206636	4.400578814324	4.716185619851	4.229628454373	4.573200889909
69	4.270482974597	3.441250825724	4.077328481785	4.000000000000	4.050703607655	3.869446930996
70	4.497201745937	4.000000000000	4.128164486409	4.000000000000	4.000000000000	4.000000000000
71	4.546562457320	4.645731339105	4.000000000000	5.000000000000	4.000000000000	5.000000000000
72	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
73	4.000000000000	3.366356751967	3.840845704396	4.000000000000	3.502025053784	3.288641029661
74	4.723920517277	4.000000000000	5.000000000000	4.000000000000	3.727603400589	4.000000000000
75	4.497201745937	4.633643248033	4.159154295604	4.641158657517	4.000000000000	4.560361890679
76	3.508461520812	2.784639958193	3.589256382963	3.358841342483	3.680949900501	3.117998296801
77	4.767617961910	4.720625412862	4.738161632960	4.716185619851	5.000000000000	4.424229334654

Bootstrap

Direct Effects Inference

Effect	Original coefficient	Standard bootstrap results					Percentile bootstrap quantiles			
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.5%	2.5%	97.5%	99.5%
Academics -> Engagement	0.0745	0.0906	0.0957	0.7780	0.4368	0.2184	-0.1509	-0.0923	0.2801	0.3622
Students -> Engagement	0.4035	0.4112	0.0960	4.2033	0.0000	0.0000	0.1676	0.2212	0.6013	0.6371
LMS -> Engagement	0.1458	0.1425	0.1059	1.3768	0.1689	0.0844	-0.1205	-0.0574	0.3492	0.4342
Teaching Resources -> Engagement	0.2467	0.2291	0.0935	2.6394	0.0084	0.0042	-0.0110	0.0506	0.4170	0.4646
Management -> Engagement	0.1651	0.1689	0.0875	1.8867	0.0595	0.0297	-0.0754	-0.0081	0.3369	0.3661

Indirect Effects Inference

Effect	Original coefficient	Standard bootstrap results					Percentile bootstrap quantiles			
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.5%	2.5%	97.5%	99.5%

Total Effects Inference

Effect	Original coefficient	Standard bootstrap results					Percentile bootstrap quantiles			
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.5%	2.5%	97.5%	99.5%
Academics -> Engagement	0.0745	0.0906	0.0957	0.7780	0.4368	0.2184	-0.1509	-0.0923	0.2801	0.3622
Students -> Engagement	0.4035	0.4112	0.0960	4.2033	0.0000	0.0000	0.1676	0.2212	0.6013	0.6371
LMS -> Engagement	0.1458	0.1425	0.1059	1.3768	0.1689	0.0844	-0.1205	-0.0574	0.3492	0.4342
Teaching Resources -> Engagement	0.2467	0.2291	0.0935	2.6394	0.0084	0.0042	-0.0110	0.0506	0.4170	0.4646
Management -> Engagement	0.1651	0.1689	0.0875	1.8867	0.0595	0.0297	-0.0754	-0.0081	0.3369	0.3661

Loadings T-Values

Indicator	Academics	Students	LMS	Teaching Resources	Management	Engagement
A quality interaction with students	18.0217					
A clear explanation of the course concepts	14.6525					
Knowledge in the use of LMS technology	15.4914					
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments	7.9843					
Student's prior knowledge of the subject domain		10.3461				
Students' own digital devices to access LMS based materials		9.8441				
Students' knowledge in using the LMS		8.0559				
Interaction with professional support staff people (Program Management, IT etc)		12.5263				
Quality access to LMS			11.3592			
Availability of quality content on the LMS			14.1964			
Organisation of subject materials in the LMS			8.9132			
A mix of text, audio, and video in subject presentation			7.4435			
Clear and easy to use content			14.3609			

Portal Management & Navigation aids			8.9495			
Authentication protocols			11.6062			
Understanding students' needs while creating content for the LMS			10.1826			
Appropriateness of teaching materials				22.0718		
Adequacy of content provided to students				9.1802		
Relevance of materials				25.8647		
Improved time management for the course					17.7576	
Addressing part-time students struggle in managing their work-study balance					10.2419	
Improved access to learning resources					11.0799	
Adequate time available to spend in course activities					17.1566	
Quality university environment						22.0976
Cutting edge facilities provided in the classroom						8.1640
Quality interaction between academic and students						10.1568
Addressing students' communication skills						13.5027
Addressing classroom attendance issues						11.3715

A clear plan of various activities and their due dates						9.9589
Quality forum discussions						13.5845

Weights T-Values

Indicator	Academics	Students	LMS	Teaching Resources	Management	Engagement
A quality interaction with students	10.6048					
A clear explanation of the course concepts	8.3708					
Knowledge in the use of LMS technology	7.1523					
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments	5.9564					
Student's prior knowledge of the subject domain		3.1203				
Students' own digital devices to access LMS based materials		0.5182				
Students' knowledge in using the LMS		2.4144				
Interaction with professional support staff people (Program Management, IT etc)		3.7851				
Quality access to LMS			7.6776			
Availability of quality content on the LMS			7.5904			

Organisation of subject materials in the LMS			5.3818			
A mix of text, audio, and video in subject presentation			6.7139			
Clear and easy to use content			9.2955			
Portal Management & Navigation aids			4.9994			
Authentication protocols			6.8376			
Understanding students' needs while creating content for the LMS			6.2092			
Appropriateness of teaching materials				8.5088		
Adequacy of content provided to students				7.3893		
Relevance of materials				12.5414		
Improved time management for the course					8.5813	
Addressing part-time students struggle in managing their work-study balance					5.0411	
Improved access to learning resources					8.0292	
Adequate time available to spend in course activities					10.7341	
Quality university environment						11.0404
Cutting edge facilities provided in the classroom						7.4119

Quality interaction between academic and students						10.2039
Addressing students' communication skills						8.0913
Addressing classroom attendance issues						9.2262
A clear plan of various activities and their due dates						11.8401
Quality forum discussions						12.0453

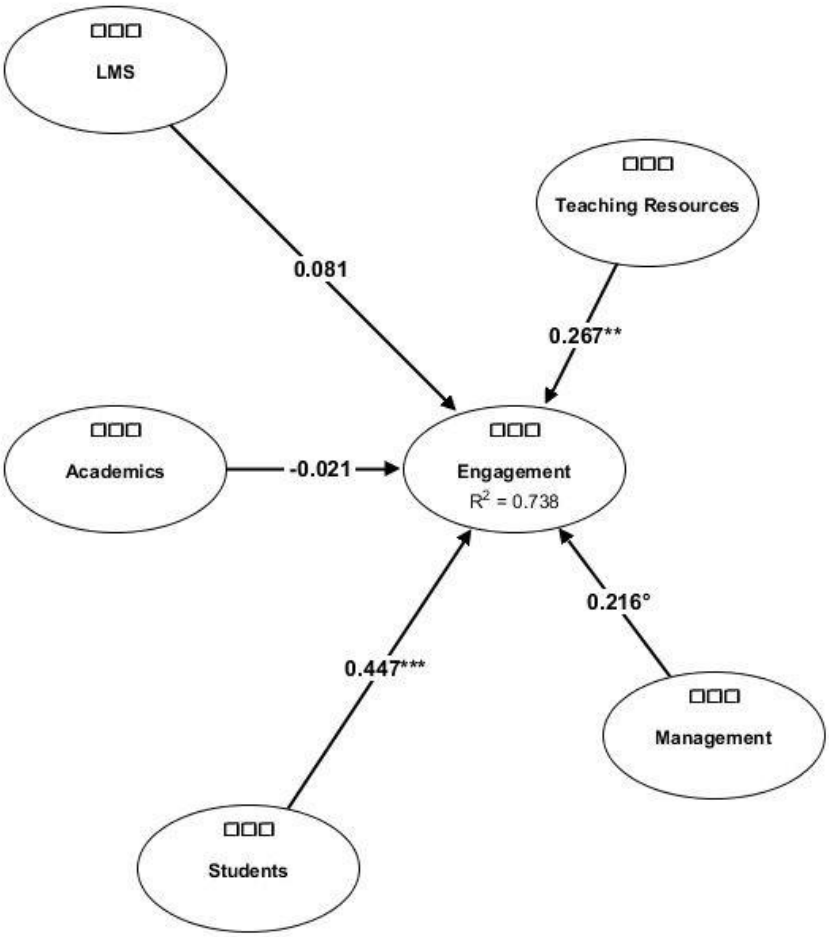
Discriminant Validity: HTMT Inference

Construct	Academics	LMS	Teaching Resources	Management	Engagement
Academics					
LMS	0.9889				
Teaching Resources	0.8258	0.8829			
Management	0.8213	0.9301	0.9053		
Engagement	0.9274	0.9104	0.9353	0.9409	

Appendix G: ADANCO Report (78)

Project Information	
ADANCO version	**This report was created with ADANCO 2.1.1**
Date/Time	2020/05/01 10:47
Project Name	Prabal RUN 29042020
Project file name	C:\Users\gururaja\Desktop\Prabal Thesis Chapters
Data file name	Prabal PhD Dataset v2 edited.xlsx
Number of observations	78
Algorithm status	The iterative algorithm converged after 7 iteration(s).
Bootstrap status	999 bootstrap samples have been evaluated (999 attempts).

Graphical representation of the model



Overall Model

Goodness of model fit (saturated model)

	Value	HI95	HI99
SRMR	0.0981	0.0863	0.0925
$\mathbf{d_{ULS}}$	3.3761	2.6112	3.0051
$\mathbf{d_G}$	1.7056	2.4608	3.0370

Goodness of model fit (estimated model)

	Value	HI95	HI99
SRMR	0.0981	0.0863	0.0925
$\mathbf{d_{ULS}}$	3.3761	2.6112	3.0051
$\mathbf{d_G}$	1.7056	2.4608	3.0370

Measurement Model

Construct Operationalization

Construct	Type of measurement model	Number of indicators	Predefined reliability
Engagement	factor (Mode A)	6	1.0000
Teaching Resources	factor (Mode A)	3	1.0000
Management	factor (Mode A)	3	1.0000
LMS	factor (Mode A)	6	1.0000
Academics	factor (Mode A)	2	1.0000
Students	factor (Mode A)	6	1.0000

Construct Reliability

Construct	Dijkstra-Henseler's rho (ρ_A)	Jöreskog's rho (ρ_c)	Cronbach's alpha(α)
Engagement	0.8245	0.8686	0.8194
Teaching Resources	0.7923	0.8729	0.7822
Management	0.8111	0.8788	0.7936
LMS	0.8446	0.8791	0.8362
Academics	0.6495	0.8506	0.6488
Students	0.8233	0.8708	0.8214

Convergent Validity

Construct	Average variance extracted (AVE)
Engagement	0.5249
Teaching Resources	0.6963
Management	0.7077
LMS	0.5494
Academics	0.7400
Students	0.5300

Discriminant Validity: Heterotrait-Monotrait Ratio of Correlations (HTMT)

Construct	Engagement	Teaching Resources	Management	LMS	Academics	Students
Engagement						
Teaching Resources	0.8538					
Management	0.8717	0.8167				
LMS	0.8251	0.7673	0.8523			
Academics	0.6957	0.5612	0.8517	0.7284		
Students	0.9331	0.6656	0.8141	0.8279	0.7951	

Discriminant Validity: Fornell-Larcker Criterion

Construct	Engagement	Teaching Resources	Management	LMS	Academics	Students
Engagement	0.5249					
Teaching Resources	0.4771	0.6963				
Management	0.5351	0.4273	0.7077			
LMS	0.5067	0.4097	0.4992	0.5494		
Academics	0.2743	0.1645	0.3796	0.2921	0.7400	

Students	0.6066	0.2853	0.4394	0.5070	0.3359	0.5300

Loadings

Indicator	Engagement	Teaching Resources	Management	LMS	Academics	Students
Use of videos to provide a summary of lectures					0.8542	
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments					0.8662	
Motivation of students in study						0.6410
Optimal student – staff ratios						0.6903
Student's prior knowledge of the subject domain						0.7657
Students' own digital devices to access LMS based materials						0.7820
Students' knowledge in using the LMS						0.7368
Interaction with professional support staff people (Program Management, IT etc)						0.7431
Quality access to LMS				0.7704		
Availability of quality content on the LMS				0.8345		
Organisation of subject materials in the LMS				0.7069		

Clear and easy to use content				0.7476		
Authentication protocols				0.6479		
Understanding students' needs while creating content for the LMS				0.7269		
Appropriateness of teaching materials		0.8267				
Adequacy of content provided to students		0.7950				
Relevance of materials		0.8795				
Improved task Management for the course			0.8235			
Improved time management for the course			0.8927			
Understanding various rules and regulations of the university			0.8050			
Quality university environment	0.7968					
Cutting edge facilities provided in the classroom	0.6901					
Quality interaction between academic and students	0.6949					
Addressing students' communication skills	0.7292					
Addressing classroom attendance issues	0.7387					
A clear plan of various activities and their due dates	0.6915					

Indicator Reliability

Indicator	Engagement	Teaching Resources	Management	LMS	Academics	Students
Use of videos to provide a summary of lectures					0.7297	
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments					0.7504	
Motivation of students in study						0.4108
Optimal student – staff ratios						0.4765
Student's prior knowledge of the subject domain						0.5863
Students' own digital devices to access LMS based materials						0.6115
Students' knowledge in using the LMS						0.5429
Interaction with professional support staff people (Program Management, IT etc)						0.5522
Quality access to LMS				0.5936		
Availability of quality content on the LMS				0.6963		
Organisation of subject materials in the LMS				0.4998		
Clear and easy to use content				0.5590		
Authentication protocols				0.4197		

Understanding students' needs while creating content for the LMS				0.5283		
Appropriateness of teaching materials		0.6834				
Adequacy of content provided to students		0.6320				
Relevance of materials		0.7735				
Improved task Management for the course			0.6782			
Improved time management for the course			0.7970			
Understanding various rules and regulations of the university			0.6480			
Quality university environment	0.6348					
Cutting edge facilities provided in the classroom	0.4762					
Quality interaction between academic and students	0.4829					
Addressing students' communication skills	0.5318					
Addressing classroom attendance issues	0.5457					
A clear plan of various activities and their due dates	0.4782					

Cross Loadings

Indicator	Engagement	Teaching Resources	Management	LMS	Academics	Students
Use of videos to provide a summary of lectures	0.4414	0.3356	0.5349	0.4943	0.8542	0.4876
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments	0.4594	0.3617	0.5254	0.4368	0.8662	0.5092
Motivation of students in study	0.5226	0.3787	0.3301	0.4953	0.3640	0.6410
Optimal student – staff ratios	0.5675	0.4002	0.5027	0.5804	0.4454	0.6903
Student's prior knowledge of the subject domain	0.5988	0.3386	0.5064	0.4219	0.4219	0.7657
Students' own digital devices to access LMS based materials	0.5179	0.3606	0.4334	0.5379	0.4345	0.7820
Students' knowledge in using the LMS	0.5515	0.5245	0.5230	0.5563	0.4875	0.7368
Interaction with professional support staff people (Program Management, IT etc)	0.6249	0.3370	0.5719	0.5217	0.3787	0.7431
Quality access to LMS	0.5779	0.5694	0.4714	0.7704	0.3330	0.6311
Availability of quality content on the LMS	0.6028	0.5431	0.5690	0.8345	0.3679	0.5574
Organisation of subject materials in the LMS	0.3547	0.3666	0.4285	0.7069	0.3440	0.3099
Clear and easy to use content	0.4788	0.4504	0.4971	0.7476	0.4627	0.4816
Authentication protocols	0.6181	0.4248	0.6292	0.6479	0.4914	0.6223

Understanding students' needs while creating content for the LMS	0.4194	0.4371	0.4863	0.7269	0.3845	0.4411
Appropriateness of teaching materials	0.6085	0.8267	0.6603	0.6267	0.4170	0.5265
Adequacy of content provided to students	0.4938	0.7950	0.4149	0.4253	0.2545	0.3929
Relevance of materials	0.6147	0.8795	0.5403	0.5334	0.3304	0.4110
Improved task Management for the course	0.5326	0.5394	0.8235	0.6261	0.4243	0.5548
Improved time management for the course	0.7033	0.6032	0.8927	0.6153	0.5645	0.5927
Understanding various rules and regulations of the university	0.5919	0.5019	0.8050	0.5473	0.5535	0.5244
Quality university environment	0.7968	0.5744	0.6692	0.5231	0.4776	0.5884
Cutting edge facilities provided in the classroom	0.6901	0.5491	0.4480	0.5771	0.4273	0.5665
Quality interaction between academic and students	0.6949	0.4999	0.3599	0.4688	0.2515	0.4860
Addressing students' communication skills	0.7292	0.4836	0.3908	0.4367	0.2311	0.4391
Addressing classroom attendance issues	0.7387	0.4983	0.7171	0.4826	0.4581	0.6427
A clear plan of various activities and their due dates	0.6915	0.3885	0.5062	0.5907	0.3612	0.6192

Weights

Indicator	Engagement	Teaching Resources	Management	LMS	Academics	Students
Use of videos to provide a summary of lectures					0.5696	
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments					0.5927	
Motivation of students in study						0.2124
Optimal student – staff ratios						0.2306
Student's prior knowledge of the subject domain						0.2433
Students' own digital devices to access LMS based materials						0.2105
Students' knowledge in using the LMS						0.2241
Interaction with professional support staff people (Program Management, IT etc)						0.2539
Quality access to LMS				0.2555		
Availability of quality content on the LMS				0.2665		
Organisation of subject materials in the LMS				0.1568		
Clear and easy to use content				0.2117		
Authentication protocols				0.2732		

Understanding students' needs while creating content for the LMS				0.1854		
Appropriateness of teaching materials		0.4237				
Adequacy of content provided to students		0.3438				
Relevance of materials		0.4280				
Improved task Management for the course			0.3452			
Improved time management for the course			0.4558			
Understanding various rules and regulations of the university			0.3836			
Quality university environment	0.2636					
Cutting edge facilities provided in the classroom	0.2389					
Quality interaction between academic and students	0.1946					
Addressing students' communication skills	0.1868					
Addressing classroom attendance issues	0.2617					
A clear plan of various activities and their due dates	0.2319					

Indicator Multicollinearity

Indicator	Engagement	Teaching Resources	Management	LMS	Academics	Students
Use of videos to provide a summary of lectures					1.2997	
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments					1.2997	
Motivation of students in study						1.3360
Optimal student – staff ratios						1.4731
Student's prior knowledge of the subject domain						1.8350
Students' own digital devices to access LMS based materials						2.2438
Students' knowledge in using the LMS						1.9657
Interaction with professional support staff people (Program Management, IT etc)						1.6100
Quality access to LMS				2.3405		
Availability of quality content on the LMS				3.0042		
Organisation of subject materials in the LMS				1.7493		
Clear and easy to use content				2.1369		
Authentication protocols				1.3129		

Understanding students' needs while creating content for the LMS				2.1834		
Appropriateness of teaching materials		1.5381				
Adequacy of content provided to students		1.6170				
Relevance of materials		1.9183				
Improved task Management for the course			1.7735			
Improved time management for the course			1.9824			
Understanding various rules and regulations of the university			1.5111			
Quality university environment	1.8095					
Cutting edge facilities provided in the classroom	1.5235					
Quality interaction between academic and students	1.7896					
Addressing students' communication skills	1.7687					
Addressing classroom attendance issues	1.6345					
A clear plan of various activities and their due dates	1.4564					

Variance inflation factors (VIF)

Structural Model

R-Squared

Construct	Coefficient of determination (R^2)	Adjusted R^2
Engagement	0.7377	0.7192

Path Coefficients

Independent variable	Dependent variable
	Engagement
Teaching Resources	0.2673
Management	0.2157
LMS	0.0809
Academics	-0.0206
Students	0.4474

Total Effects

Independent variable	Dependent variable
	Engagement
Teaching Resources	0.2673
Management	0.2157
LMS	0.0809
Academics	-0.0206
Students	0.4474

Indirect Effects

Independent variable	Dependent variable
	Engagement
Teaching Resources	
Management	
LMS	

Academics	
Students	

Effect Overview

Effect	Beta	Indirect effects	Total effect	Cohen's f^2
Teaching Resources -> Engagement	0.2673		0.2673	0.1379
Management -> Engagement	0.2157		0.2157	0.0627
LMS -> Engagement	0.0809		0.0809	0.0090
Academics -> Engagement	-0.0206		-0.0206	0.0009
Students -> Engagement	0.4474		0.4474	0.3183

Inter-Construct Correlations

Construct	Engagement	Teaching Resources	Management	LMS	Academics	Students
Engagement	1.0000					
Teaching Resources	0.6907	1.0000				
Management	0.7315	0.6537	1.0000			
LMS	0.7118	0.6400	0.7065	1.0000		
Academics	0.5237	0.4056	0.6161	0.5405	1.0000	
Students	0.7788	0.5341	0.6629	0.7120	0.5796	1.0000

Diagnostics

Empirical correlation matrix

	Use of video to provide a summary of lectures	Use of Artificial Reality/ Virtual Reality in the class-leading to cutting edge environments	Motivation of students in study	Optimal student – staff ratios	Student's prior knowledge of the subject domain	Students' own digital devices to access LMS based materials	Students' knowledge in using the LMS	Interaction with professional support staff people (Program Management, IT etc)	Quality access to LMS	Availability of quality content on the LMS	Organisation of subject materials in the LMS	Clear and easy to use content	Authentication protocols	Understanding students' needs while creating content for the LMS	Appropriateness of teaching materials	Adequacy of content provided to students	Relevance of materials	Improved task Management for the course	Improved time management for the course	Understanding various rules and regulations of the university	Quality university environment	Cutting edge facilities provided in the classroom	Quality interaction between academic and students	Addressing students' communication skills	Addressing classroom attendance issues	A clear plan of various activities and their due dates

Use of videos to provide a summary of lectures	1.0000	0.4802	0.3820	0.3583	0.3524	0.3251	0.4069	0.3092	0.3142	0.3743	0.3783	0.4218	0.3896	0.3200	0.3568	0.1612	0.3015	0.3248	0.4967	0.5119	0.4467	0.3694	0.2306	0.1959	0.3585	0.2594
Use of Artificial Reality/Virtual Reality in the class - leading to cutting edge envi	0.4802	1.0000	0.2471	0.4072	0.3732	0.4206	0.4315	0.3418	0.2598	0.2609	0.2168	0.3753	0.4547	0.3412	0.3606	0.2745	0.2676	0.4038	0.4750	0.4418	0.3765	0.3660	0.2027	0.2017	0.4283	0.3601

ronments																								
Motivation of students in study	0.38220	0.2471	1.0000	0.34330	0.3286	0.37342	0.3834	0.41330	0.5106	0.4449	0.3461	0.2956	0.31553	0.23440	0.42437	0.2334	0.2779	0.2550	0.3500	0.2151	0.4505	0.3560	0.4951	0.2589	0.2828	0.43117
Optimal student – staff ratios	0.3583	0.4072	0.3430	1.00000	0.4993	0.3850	0.4116	0.3627	0.45033	0.4866	0.1874	0.43844	0.54995	0.34220	0.45516	0.2328	0.3010	0.5082	0.4437	0.3260	0.4681	0.3890	0.2447	0.2901	0.4849	0.52844
Student's prior knowledge of the subject	0.3524	0.3732	0.3286	0.4993	1.0000	0.5398	0.3951	0.5329	0.31488	0.2619	0.1295	0.27300	0.5183	0.2807	0.2466	0.4204	0.2094	0.3553	0.4562	0.4581	0.3982	0.4571	0.2464	0.3254	0.6008	0.51117

domain																								
Students' own digital devices to access LMS based materials	0.32351	0.42006	0.3742	0.38550	0.5398	1.00000	0.6710	0.4788	0.45311	0.3504	0.2459	0.3630	0.51668	0.38994	0.33340	0.2807	0.2863	0.3997	0.3154	0.39552	0.3421	0.4139	0.2723	0.34119	0.4250	0.43446
Students' knowledge in using the LMS	0.40469	0.43115	0.3834	0.41116	0.3951	0.67010	1.0000	0.39001	0.60037	0.5016	0.2804	0.3060	0.39364	0.27575	0.55010	0.2957	0.4423	0.4600	0.4749	0.38552	0.4627	0.5110	0.3848	0.24036	0.4002	0.35551
Interaction with	0.30392	0.34118	0.4130	0.36227	0.5329	0.47888	0.3901	1.00000	0.43	0.3971	0.1853	0.41	0.41332	0.39340	0.30394	0.2444	0.2847	0.4324	0.5207	0.48229	0.4419	0.3481	0.4762	0.43991	0.5729	0.43939

professional support staff people (Program Management, IT etc)									96			85													
Quality access to LMS	0.31142	0.25 98	0.5106	0.45 03	0.3148	0.45 31	0.6037	0.43 96	1.0000	0.7300	0.5345	0.3688	0.33 96	0.35 49	0.49 68	0.3889	0.5261	0.4009	0.4040	0.38 81	0.3918	0.4653	0.5019	0.28 86	0.3730	0.49 30
Availability of quality content on	0.37 43	0.26 09	0.4449	0.48 66	0.2619	0.35 04	0.5016	0.39 71	0.73000	1.0000	0.5889	0.4522	0.32 09	0.57 06	0.54 05	0.3128	0.4825	0.5041	0.5086	0.42 54	0.4680	0.4631	0.4904	0.35 82	0.3705	0.47 22

the LMS																									
Organisation of subject materials in the LMS	0.3783	0.21668	0.3461	0.18174	0.1295	0.24259	0.28804	0.18553	0.53455	0.5889	1.0000	0.4884	0.27778	0.41778	0.32555	0.1460	0.4169	0.3710	0.4141	0.29111	0.2521	0.3337	0.3327	0.13778	0.1391	0.35321
Clear and easy to use content	0.4218	0.37553	0.2956	0.43184	0.2730	0.36300	0.30600	0.41885	0.3688	0.4522	0.4884	1.0000	0.44491	0.65881	0.46998	0.3355	0.3178	0.5189	0.4590	0.28334	0.3172	0.4701	0.3116	0.29332	0.2854	0.40202
Authentication protocols	0.3896	0.4547	0.3153	0.54955	0.5183	0.51668	0.39644	0.41332	0.33396	0.3209	0.2778	0.4491	1.00000	0.34040	0.47992	0.2916	0.2838	0.5183	0.4728	0.61919	0.4800	0.4527	0.1474	0.44888	0.5987	0.49326

Understanding students' needs while creating content for the LMS	0.32000	0.34112	0.2340	0.34220	0.2807	0.3894	0.2775	0.3940	0.35499	0.5706	0.4178	0.6581	0.34440	1.00000	0.40111	0.3726	0.3250	0.4302	0.4599	0.33342	0.3264	0.3203	0.2782	0.33302	0.2309	0.34376
Appropriateness of teaching materials	0.35368	0.36006	0.4237	0.45116	0.2466	0.33340	0.5510	0.3094	0.49688	0.5405	0.3255	0.4698	0.47992	0.40111	1.00000	0.4551	0.5759	0.6345	0.5961	0.44220	0.5157	0.5086	0.3703	0.40034	0.4310	0.39119
Adequacy of	0.16112	0.27445	0.2334	0.23228	0.4204	0.2807	0.2957	0.2444	0.38	0.3128	0.1460	0.33	0.29116	0.37226	0.45151	1.0000	0.6035	0.3486	0.3269	0.37996	0.3699	0.4410	0.3651	0.33387	0.3540	0.27461

content provided to students									89			55													
Relevance of materials	0.30315	0.26776	0.2779	0.30310	0.2094	0.2863	0.4423	0.2847	0.52261	0.4825	0.4169	0.31778	0.2838	0.32550	0.5759	0.6035	1.0000	0.3520	0.5566	0.43002	0.5343	0.4253	0.5081	0.4584	0.4533	0.29281
Improved task Management for the course	0.32480	0.4038	0.2550	0.50820	0.3553	0.3997	0.4600	0.4324	0.40009	0.5041	0.3710	0.51889	0.5183	0.43002	0.6345	0.3486	0.3520	1.0000	0.6439	0.4818	0.4694	0.3980	0.2116	0.1809	0.5276	0.43444
Improved time manage	0.49670	0.4750	0.3500	0.44370	0.4562	0.3154	0.4749	0.5207	0.40400	0.5086	0.4141	0.45900	0.4728	0.4599	0.5961	0.3269	0.5566	0.6439	1.000	0.5595	0.6614	0.4344	0.4394	0.3845	0.6152	0.46007

ment for the course																									
Understanding various rules and regulations of the university	0.51119	0.44818	0.2151	0.32660	0.4581	0.39552	0.3852	0.48829	0.3881	0.4254	0.2911	0.2834	0.61119	0.33442	0.44020	0.3796	0.4302	0.4818	0.5595	1.00000	0.5360	0.2936	0.2257	0.39090	0.6635	0.38112
Quality university environment	0.4467	0.37465	0.4505	0.46681	0.3982	0.34221	0.4627	0.44419	0.3918	0.4680	0.2521	0.3172	0.48000	0.32642	0.51557	0.3699	0.5343	0.4694	0.6614	0.53660	1.0000	0.4389	0.4245	0.48046	0.5445	0.48060

Cutting edge facilities provided in the classroom	0.3694	0.36060	0.3560	0.3890	0.4571	0.4139	0.5110	0.34881	0.46653	0.4631	0.3337	0.47701	0.45427	0.32303	0.50086	0.4410	0.4253	0.3980	0.4344	0.29036	0.4389	1.0000	0.5193	0.38015	0.3677	0.28585
Quality interaction between academic and students	0.2306	0.20227	0.4951	0.2447	0.2464	0.2723	0.3848	0.47462	0.50019	0.4904	0.3327	0.31116	0.14774	0.27822	0.37003	0.3651	0.5081	0.2116	0.4394	0.22257	0.4245	0.5193	1.0000	0.55598	0.2919	0.35955
Addressing students'	0.1959	0.20217	0.2589	0.2901	0.3254	0.3419	0.2436	0.43991	0.28886	0.3582	0.1378	0.29322	0.44888	0.33302	0.40034	0.3387	0.4584	0.1809	0.3845	0.39090	0.4846	0.3815	0.5598	1.00000	0.4587	0.40078

communication skills																									
Addressing classroom attendance issues	0.3585	0.4283	0.2828	0.4849	0.6008	0.4250	0.4002	0.5729	0.3730	0.3705	0.1391	0.2854	0.5987	0.2309	0.4310	0.3540	0.4533	0.5276	0.6152	0.6635	0.5445	0.3677	0.2919	0.4587	1.0000	0.4449
A clear plan of various activities and their due dates	0.2594	0.3601	0.4317	0.5284	0.5117	0.4346	0.3551	0.4339	0.4930	0.4722	0.3521	0.4002	0.4926	0.3476	0.3919	0.2761	0.2981	0.4344	0.4607	0.3812	0.4860	0.2885	0.3595	0.4078	0.4449	1.00000

Impl_Cor Saturated Model

	Use of videos to provide a summary of lectures	Use of Artificial Reality/ Virtual Reality in the class-leading to cutting edge environments	Motivation of students in study	Optimal student – staff ratios	Student's prior knowledge of the subject domain	Students' own digital devices to access LMS based materials	Students' knowledge in using the LMS	Interaction with professional support staff people (Program Management, IT etc)	Quality access to LMS	Availability of quality content on the LMS	Organisation of subject materials in the LMS	Clear and easy to use content	Authentication protocols	Understanding students' needs while creating content for the LMS	Appropriateness of teaching materials	Adequacy of content provided to students	Relevance of materials	Improved task Management for the course	Improved time management for the course	Understanding various rules and regulations of the university	Quality university environment	Cutting edge facilities provided in the classroom	Quality interaction between academic and students	Addressing students' communication skills	Addressing classroom attendance issues	A clear plan of various activities and their due dates

Use of videos to provide a summary of lectures	1.00000	0.73999	0.3173	0.34117	0.3791	0.38771	0.3648	0.36779	0.35557	0.3853	0.3264	0.34552	0.29191	0.33356	0.28264	0.2754	0.3047	0.4334	0.4698	0.42636	0.3564	0.3087	0.3109	0.32262	0.3305	0.30394
Use of Artificial Reality/Virtual Reality in the class - leading to cutting edge envi	0.73999	1.00000	0.3218	0.34665	0.3844	0.39269	0.3699	0.37331	0.36007	0.3907	0.3310	0.35000	0.30333	0.34003	0.29404	0.2793	0.3090	0.4395	0.4764	0.42996	0.3615	0.3131	0.3153	0.33308	0.3351	0.31337

ronments																									
Motivation of students in study	0.31773	0.3218	1.0000	0.44425	0.4908	0.50112	0.4723	0.4763	0.35116	0.3808	0.3227	0.3412	0.2957	0.3317	0.2830	0.2721	0.3011	0.3499	0.3793	0.3420	0.3978	0.3445	0.3469	0.3640	0.3688	0.34352
Optimal student – staff ratios	0.34117	0.3465	0.4425	1.00000	0.5285	0.53986	0.5086	0.5130	0.37887	0.4101	0.3475	0.3675	0.3184	0.3573	0.3048	0.2931	0.3243	0.3768	0.4085	0.3683	0.4284	0.3710	0.3736	0.3920	0.3971	0.37718
Student's prior knowledge of the subject	0.37391	0.3844	0.4908	0.5285	1.0000	0.5987	0.5642	0.5690	0.42000	0.4549	0.3854	0.4076	0.3532	0.3963	0.3381	0.3251	0.3597	0.4180	0.4531	0.4085	0.4751	0.4115	0.4144	0.4349	0.4405	0.41224

domain																								
Students' own digital devices to access LMS based materials	0.38711	0.39326	0.50122	0.53987	0.59871	1.00000	0.57622	0.58111	0.42900	0.4646	0.3936	0.41663	0.36007	0.40447	0.34353	0.33200	0.36733	0.4269	0.4627	0.41772	0.4853	0.42033	0.42322	0.44441	0.4499	0.42412
Students' knowledge in using the LMS	0.36348	0.3699	0.47233	0.50086	0.56422	0.57562	1.00000	0.54776	0.40042	0.4378	0.3709	0.39233	0.33999	0.38114	0.32553	0.31299	0.34611	0.4022	0.4360	0.3932	0.4573	0.39600	0.39888	0.41885	0.42399	0.39768
Interaction with	0.36379	0.3731	0.47633	0.51300	0.56900	0.58111	0.54776	1.00000	0.400	0.4415	0.3741	0.39	0.34328	0.38446	0.32881	0.31555	0.34911	0.4056	0.4397	0.3965	0.4611	0.39944	0.40222	0.42020	0.42755	0.40202

professional support staff people (Program Management, IT etc)									77			56													
Quality access to LMS	0.3557	0.36007	0.35166	0.3787	0.4200	0.4290	0.4042	0.40777	1.00000	0.6429	0.5447	0.57600	0.49991	0.56000	0.40776	0.3920	0.4337	0.4483	0.4859	0.43781	0.4370	0.3785	0.3811	0.39999	0.4051	0.37992
Availability of quality content on	0.3853	0.39007	0.38088	0.41001	0.4549	0.4646	0.4378	0.44415	0.64299	1.0000	0.5899	0.62399	0.54006	0.60665	0.44415	0.4246	0.4697	0.4855	0.5263	0.47746	0.4733	0.4099	0.4128	0.43332	0.4388	0.41008

the LMS																									
Organisation of subject materials in the LMS	0.3264	0.33310	0.3227	0.3475	0.3854	0.3936	0.3709	0.3741	0.5447	0.5899	1.0000	0.5285	0.4580	0.5139	0.3740	0.3597	0.3980	0.4113	0.4459	0.40 20	0.4010	0.3473	0.3497	0.3670	0.3717	0.3480
Clear and easy to use content	0.3452	0.3500	0.3412	0.3675	0.4076	0.4163	0.3923	0.3956	0.5760	0.6239	0.5285	1.0000	0.4844	0.5434	0.3956	0.3804	0.4209	0.4350	0.4716	0.4252	0.4240	0.3673	0.3698	0.3881	0.3931	0.3680
Authentication protocols	0.2991	0.3033	0.2957	0.3184	0.3532	0.3607	0.3399	0.3428	0.4991	0.5406	0.4580	0.4844	1.0000	0.4709	0.3428	0.3296	0.3647	0.3769	0.4086	0.3684	0.3674	0.3182	0.3205	0.3363	0.3407	0.3189

Understanding students' needs while creating content for the LMS	0.33356	0.34003	0.3317	0.35573	0.3963	0.40474	0.38146	0.38460	0.56000	0.6065	0.5139	0.5434	0.47009	1.00000	0.38460	0.3698	0.4092	0.4229	0.4585	0.41134	0.4123	0.3571	0.3595	0.37373	0.3822	0.35780
Appropriateness of teaching materials	0.28640	0.29004	0.2830	0.3048	0.3381	0.3453	0.3253	0.3281	0.40076	0.4415	0.3740	0.3956	0.3428	0.3846	1.00000	0.6572	0.7270	0.4450	0.4824	0.4350	0.4549	0.3940	0.3968	0.4164	0.4218	0.3948
Adequacy of	0.27540	0.27993	0.2721	0.2931	0.3251	0.3320	0.3129	0.3155	0.39	0.4246	0.3597	0.38	0.3296	0.3698	0.6572	1.0000	0.6992	0.4279	0.4639	0.4183	0.4375	0.3789	0.3816	0.4004	0.4056	0.3797

content provided to students									20			04													
Relevance of materials	0.30347	0.30990	0.30111	0.32343	0.3597	0.36373	0.34611	0.34991	0.43437	0.4697	0.3980	0.42009	0.36347	0.40992	0.72770	0.6992	1.0000	0.4735	0.5132	0.46628	0.4840	0.4192	0.4221	0.44330	0.4488	0.42201
Improved task Management for the course	0.43434	0.43995	0.34999	0.37368	0.4180	0.42669	0.40222	0.40056	0.44483	0.4855	0.4113	0.43500	0.37669	0.42229	0.44550	0.4279	0.4735	1.0000	0.7352	0.66629	0.4800	0.4157	0.4186	0.43993	0.4450	0.41666
Improved time manage	0.46498	0.47664	0.37933	0.40850	0.4531	0.46270	0.43600	0.43997	0.48599	0.5263	0.4459	0.47116	0.40086	0.45850	0.48240	0.4639	0.5132	0.7352	1.0000	0.71860	0.5203	0.4506	0.4538	0.47620	0.4824	0.45160

ment for the course																									
Understanding various rules and regulations of the university	0.42 36	0.42 96	0.3 420	0. 36 83	0.4 08 5	0. 41 72	0.3 93 2	0.39 65	0. 43 81	0.4 746	0.4 020	0. 42 52	0.36 84	0.41 34	0.43 50	0.4 18 3	0.4 62 8	0.6 629	0.7 186	1.00 00	0.4 692	0.4 06 3	0.4 09 2	0.42 94	0.4 35 0	0. 40 72
Quality university environment	0. 35 64	0.36 15	0.3 97 8	0. 42 84	0.4 75 1	0. 48 53	0.4 57 3	0.46 11	0. 43 70	0.4 733	0.4 010	0. 42 40	0.36 74	0.41 23	0.45 49	0.4 37 5	0.4 84 0	0.4 800	0.5 203	0.46 92	1.0 000	0.5 49 8	0.5 53 7	0.58 10	0.5 88 6	0. 55 10

Cutting edge facilities provided in the classroom	0.30887	0.31331	0.3445	0.3710	0.4115	0.4203	0.3960	0.3994	0.37855	0.4099	0.3473	0.36733	0.3182	0.3571	0.3940	0.3789	0.4192	0.4157	0.4506	0.4063	0.5498	1.0000	0.4795	0.5032	0.5098	0.47272
Quality interaction between academic and students	0.31309	0.31353	0.3469	0.3736	0.4144	0.4232	0.3988	0.4022	0.38111	0.4128	0.3497	0.36988	0.3205	0.3595	0.3968	0.3816	0.4221	0.4186	0.4538	0.4092	0.5537	0.4795	1.0000	0.5067	0.5133	0.48005
Addressing students'	0.3262	0.33308	0.3640	0.3920	0.4349	0.4441	0.4185	0.4220	0.39999	0.4332	0.3670	0.38881	0.3363	0.3773	0.4164	0.4004	0.4430	0.4393	0.4762	0.4294	0.5810	0.5032	0.5067	1.0000	0.5387	0.50043

communication skills																									
Addressing classroom attendance issues	0.3305	0.33351	0.3688	0.3971	0.4405	0.4499	0.4239	0.42675	0.40051	0.4388	0.3717	0.3931	0.34007	0.38222	0.4218	0.4056	0.4488	0.4450	0.4824	0.4350	0.5886	0.5098	0.5133	0.53687	1.0000	0.51008
A clear plan of various activities and their due dates	0.3094	0.31337	0.3452	0.3718	0.4124	0.4212	0.3968	0.40202	0.3792	0.4108	0.3480	0.3680	0.31889	0.35778	0.3948	0.3797	0.4201	0.4166	0.4516	0.4072	0.5510	0.4772	0.4805	0.5043	0.5108	1.000000

Implied correlation matrix of the saturated model

Impl_Cor Estimated Model

	Use of videos to provide a summary of lectures	Use of Artificial Reality/ Virtual Reality in the class-leading to cutting edge environments	Motivation of students in study	Optimal student – staff ratios	Student's prior knowledge of the subject domain	Students' own digital devices to access LMS based materials	Student's' knowledge in using the LMS	Interaction with profession al support staff people (Program Management, IT etc)	Quality access to LMS	Availability of quality content on the LMS	Organisation of subject materials in the LMS	Clear and easy to use content	Authentication protocols	Understanding students' needs while creating content for the LMS	Appropriateness of teaching materials	Adequacy of content provided to students	Relevance of materials	Improved task Management for the course	Improved time management for the course	Understanding various rules and regulations of the university	Quality university environment	Cutting edge facilities provided in the classroom	Quality interaction between academic and students	Addressing students' communication skills	Addressing classroom attendance issues	Clear plan of various activities and their due dates

Use of videos to provide a summary of lectures	1.00000	0.73999	0.3173	0.34117	0.3791	0.38711	0.3648	0.36779	0.35557	0.3853	0.3264	0.34552	0.29191	0.33356	0.28464	0.2754	0.3047	0.4334	0.4698	0.42636	0.3564	0.3087	0.3109	0.32662	0.3305	0.30494
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge envi	0.73999	1.00000	0.3218	0.34665	0.3844	0.39269	0.3699	0.37731	0.36007	0.3907	0.3310	0.35000	0.30333	0.34403	0.29404	0.2793	0.3090	0.4395	0.4764	0.42996	0.3615	0.3131	0.3153	0.33308	0.3351	0.31337

ronments																								
Motivation of students in study	0.31773	0.3218	1.0000	0.44425	0.4908	0.50112	0.4723	0.4763	0.35116	0.3808	0.3227	0.3412	0.2957	0.3317	0.2830	0.2721	0.3011	0.3499	0.3793	0.3420	0.3978	0.3445	0.3469	0.3640	0.3688	0.34352
Optimal student – staff ratios	0.34117	0.3465	0.4425	1.00000	0.5285	0.53986	0.5086	0.5130	0.37887	0.4101	0.3475	0.3675	0.3184	0.3573	0.3048	0.2931	0.3243	0.3768	0.4085	0.3683	0.4284	0.3710	0.3736	0.3920	0.3971	0.37718
Student's prior knowledge of the subject	0.37391	0.3844	0.4908	0.5285	1.0000	0.5987	0.5642	0.5690	0.42000	0.4549	0.3854	0.4076	0.3532	0.3963	0.3381	0.3251	0.3597	0.4180	0.4531	0.4085	0.4751	0.4115	0.4144	0.4349	0.4405	0.41224

domain																								
Students' own digital devices to access LMS based materials	0.38711	0.39326	0.50122	0.53987	0.59871	1.00000	0.57622	0.58111	0.42900	0.4646	0.3936	0.41663	0.36007	0.40447	0.34353	0.33200	0.36733	0.4269	0.4627	0.41772	0.4853	0.42033	0.42322	0.44441	0.4499	0.42412
Students' knowledge in using the LMS	0.36348	0.36999	0.47233	0.50886	0.56422	0.57562	1.00000	0.54776	0.40042	0.4378	0.3709	0.39223	0.33999	0.38114	0.32553	0.31299	0.34611	0.4022	0.4360	0.39932	0.4573	0.39600	0.39888	0.41885	0.42399	0.39768
Interaction with	0.36379	0.37331	0.47633	0.51330	0.56900	0.58111	0.54776	1.00000	0.400	0.4415	0.3741	0.339	0.34328	0.38446	0.32881	0.31555	0.34911	0.4056	0.4397	0.39965	0.4611	0.39944	0.40222	0.42020	0.42755	0.40202

professional support staff people (Program Management, IT etc)									77			56													
Quality access to LMS	0.3557	0.36007	0.35166	0.3787	0.4200	0.4290	0.4042	0.40777	1.00000	0.6429	0.5447	0.57600	0.49991	0.56000	0.40776	0.3920	0.4337	0.4483	0.4859	0.43781	0.4370	0.3785	0.3811	0.39999	0.4051	0.37992
Availability of quality content on	0.3853	0.39007	0.38088	0.41001	0.4549	0.4646	0.4378	0.44415	0.64299	1.0000	0.5899	0.62399	0.54006	0.60665	0.44415	0.4246	0.4697	0.4855	0.5263	0.47746	0.4733	0.4099	0.4128	0.43332	0.4388	0.41008

the LMS																								
Organisation of subject materials in the LMS	0.3264	0.33310	0.3227	0.3475	0.3854	0.3936	0.3709	0.3741	0.5447	0.5899	1.0000	0.5285	0.4580	0.5139	0.3740	0.3597	0.3980	0.4113	0.4459	0.40020	0.4010	0.3473	0.3497	0.36770	0.3717	0.34880
Clear and easy to use content	0.3452	0.35000	0.3412	0.3675	0.4076	0.4163	0.3923	0.3956	0.5760	0.6239	0.5285	1.0000	0.4844	0.5434	0.3956	0.3804	0.4209	0.4350	0.4716	0.4252	0.4240	0.3673	0.3698	0.3881	0.3931	0.36880
Authentication protocols	0.2991	0.3033	0.2957	0.3184	0.3532	0.3607	0.3399	0.3428	0.4991	0.5406	0.4580	0.4844	1.0000	0.4709	0.3428	0.3296	0.3647	0.3769	0.4086	0.3684	0.3674	0.3182	0.3205	0.3363	0.3407	0.31889

Understanding students' needs while creating content for the LMS	0.33356	0.34003	0.3317	0.35573	0.3963	0.40474	0.38146	0.38600	0.56065	0.5139	0.5434	0.47709	1.00000	0.38646	0.3698	0.4092	0.4229	0.4585	0.41134	0.4123	0.3571	0.3595	0.37373	0.3822	0.35678
Appropriateness of teaching materials	0.28364	0.29004	0.2830	0.3048	0.3381	0.34533	0.3253	0.32810	0.40076	0.4415	0.3740	0.3956	0.34428	0.38646	1.00000	0.6572	0.7270	0.4450	0.4824	0.43450	0.4549	0.3940	0.3968	0.41664	0.4218	0.39448
Adequacy of	0.27454	0.27993	0.2721	0.2931	0.3251	0.33209	0.3129	0.31555	0.39	0.4246	0.3597	0.38	0.32996	0.36698	0.65672	1.0000	0.6992	0.4279	0.4639	0.41883	0.4375	0.3789	0.3816	0.40004	0.4056	0.37397

content provided to students									20			04													
Relevance of materials	0.30347	0.30990	0.30111	0.32343	0.35997	0.36373	0.34611	0.34991	0.43437	0.4697	0.3980	0.42009	0.36347	0.40092	0.72770	0.6992	1.0000	0.4735	0.5132	0.46628	0.4840	0.4192	0.4221	0.44330	0.4488	0.42201
Improved task Management for the course	0.43434	0.43495	0.34999	0.37368	0.41800	0.42669	0.40222	0.40056	0.44483	0.4855	0.4113	0.43500	0.37669	0.42229	0.44450	0.4279	0.47335	1.0000	0.7352	0.66629	0.4800	0.4157	0.4186	0.43993	0.4450	0.41666
Improved time manage	0.46498	0.47664	0.37933	0.40850	0.45311	0.46027	0.43600	0.43697	0.48599	0.5263	0.4459	0.47116	0.40086	0.45850	0.48224	0.4639	0.51322	0.7352	1.0000	0.71886	0.5203	0.4506	0.4538	0.47662	0.4824	0.45160

ment for the course																									
Understanding various rules and regulations of the university	0.4236	0.42 96	0.3420	0.3683	0.4085	0.4172	0.3932	0.3965	0.4381	0.4746	0.4020	0.4252	0.3684	0.4134	0.4350	0.4183	0.4628	0.6629	0.7186	1.0000	0.4692	0.4063	0.4092	0.4294	0.4350	0.40 72
Quality university environment	0.3564	0.3615	0.3978	0.4284	0.4751	0.4853	0.4573	0.4611	0.4370	0.4733	0.4010	0.4240	0.3674	0.4123	0.4549	0.4375	0.4840	0.4800	0.5203	0.4692	1.0000	0.5498	0.5537	0.5810	0.5886	0.5510

Cutting edge facilities provided in the classroom	0.3087	0.31331	0.3445	0.3710	0.4115	0.4203	0.3960	0.3994	0.37885	0.4099	0.3473	0.36733	0.31821	0.3571	0.3940	0.3789	0.4192	0.4157	0.4506	0.4063	0.5498	1.0000	0.4795	0.5032	0.5098	0.47721
Quality interaction between academic and students	0.3109	0.31353	0.3469	0.3736	0.4144	0.4232	0.3988	0.4022	0.38111	0.4128	0.3497	0.36981	0.3205	0.3595	0.3968	0.3816	0.4221	0.4186	0.4538	0.4092	0.5537	0.4795	1.0000	0.5067	0.5133	0.48051
Addressing students'	0.3262	0.33308	0.3640	0.3920	0.4349	0.4441	0.4185	0.4220	0.39999	0.4332	0.3670	0.38811	0.3363	0.3773	0.4164	0.4004	0.4430	0.4393	0.4762	0.4294	0.5810	0.5032	0.5067	1.0000	0.5387	0.50431

communication skills																									
Addressing classroom attendance issues	0.3305	0.33551	0.3688	0.3971	0.4405	0.4499	0.4239	0.42675	0.40051	0.4388	0.3717	0.3931	0.34007	0.38222	0.4218	0.4056	0.4488	0.4450	0.4824	0.4350	0.5886	0.5098	0.5133	0.53687	1.0000	0.51008
A clear plan of various activities and their due dates	0.3094	0.31337	0.3452	0.3718	0.4124	0.4212	0.3968	0.40202	0.3792	0.4108	0.3480	0.3680	0.31889	0.35778	0.3948	0.3797	0.4201	0.4166	0.4516	0.4072	0.5510	0.4772	0.4805	0.50043	0.5108	1.000000

Implied correlation matrix of the estimated model

Scores

Standardized Construct Scores

Case	Engagement	Teaching Resources	Management	LMS	Academics	Students
1	0.555547608094	-0.764065519567	-0.375604936035	1.248697492454	0.420359229577	0.603566826979
2	-1.153951206670	-0.764065519567	-0.375604936035	-2.381315643766	-1.179771517857	-1.504014945036
3	-0.007723024352	-0.764065519567	-1.605103874207	-0.956489665869	0.420359229577	-0.572931691332
4	0.321610140372	-0.306391932243	1.249325603168	1.248697492454	1.192344162622	0.649222560087
5	0.278409835523	1.157862320426	-0.098233825455	0.669039977404	1.192344162622	0.262998706201
6	-0.813414354406	-0.764065519567	0.853894002137	0.147532963066	0.392278788905	-0.658292757212
7	1.475925524541	-0.514749725191	0.853894002137	0.958868734929	0.420359229577	1.187977675170
8	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	1.464736057034
9	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	1.464736057034
10	-0.558527091651	1.157862320426	0.019826664996	0.958868734929	0.420359229577	-1.321225684158
11	0.687002130723	1.157862320426	-0.771036537066	1.248697492454	-1.179771517857	-0.410411404621
12	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	1.464736057034

13	0.695089332573	-0.514749725191	0.458462401106	0.700014568842	0.392278788905	0.367543628674
14	0.408956472699	0.420461775160	-0.771036537066	0.669039977404	-1.151691077185	-0.849690073196
15	-2.024619331146	-0.764065519567	0.181091290527	-0.402241233204	-1.151691077185	-1.945440482732
16	-0.295552627045	-0.764065519567	-0.375604936035	-0.697635499782	-0.379706144140	-0.743703131898
17	-1.817233260125	-2.197908608671	-1.443839248677	-1.167787614672	-0.407786584812	-0.654703869267
18	-0.849749695776	0.461419776588	-0.887143022115	0.669039977404	-1.951756450902	-0.762788370880
19	-2.034088438693	-0.764065519567	-2.791398677300	-0.967083949296	-0.379706144140	-0.572931691332
20	-0.589772688771	-1.989550815723	-1.327732763627	-0.742333617518	-1.951756450902	-0.950547490113
21	-0.173093191720	0.420461775160	0.019826664996	-0.697635499782	0.420359229577	-0.049525000869
22	0.588489948032	-0.764065519567	0.297197775576	-0.462646453540	0.420359229577	-0.683580898540
23	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	1.464736057034
24	-0.628791134823	0.420461775160	-0.375604936035	-0.697635499782	1.192344162622	-0.094249500801
25	-0.295552627045	-0.764065519567	-0.375604936035	-0.697635499782	-0.379706144140	-0.386454924896
26	-1.220309906788	0.669777569536	0.297197775576	-0.142295794459	-0.351625703468	-0.849690073196
27	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	1.464736057034
28	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	1.464736057034

29	0.037685880733	0.461419776588	0.181091290527	0.298425691534	-0.379706144140	-0.029206717895
30	0.300660345339	0.669777569536	1.249325603168	0.297334418875	0.392278788905	0.454346713379
31	0.333602685277	-0.764065519567	0.297197775576	0.358830911869	0.392278788905	0.242631114421
32	-0.896855343679	-0.764065519567	-0.771036537066	-1.246318423393	-1.151691077185	-0.658342066018
33	-0.295552627045	1.157862320426	0.853894002137	-0.577717362752	-0.379706144140	0.287004494731
34	0.925121457242	1.157862320426	1.249325603168	0.958868734929	1.192344162622	1.464736057034
35	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	0.649123942476
36	-1.159829808285	0.669777569536	-1.166468138097	-1.001187783605	-1.151691077185	-1.588142966925
37	0.328908484858	1.157862320426	1.249325603168	1.248697492454	1.192344162622	-0.386454924896
38	-0.040665364290	0.669777569536	-0.375604936035	-0.697635499782	-0.379706144140	-0.386454924896
39	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	1.464736057034
40	-1.182988203554	-0.764065519567	-1.443839248677	-0.987464257306	-1.151691077185	-0.678660348992
41	-0.591469431589	-0.026664974301	-0.375604936035	0.662383195693	-0.379706144140	0.242680423227
42	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	1.464736057034
43	-0.427980454475	-1.252150270457	-0.098233825455	-0.296046622473	-0.351625703468	-0.598170523855
44	0.638988597367	1.157862320426	0.853894002137	-0.646280600334	0.392278788905	0.242631114421

45	-0.032578162439	-0.764065519567	0.297197775576	-0.697635499782	0.420359229577	0.811594920381
46	0.593579692282	-0.026664974301	1.249325603168	0.883648715636	0.420359229577	1.172530632939
47	-1.331276081768	-1.948592814295	-1.839270849708	-1.877330837891	1.192344162622	-0.118255289332
48	0.887799754007	1.157862320426	0.692629376607	0.700014568842	-0.379706144140	1.187977675170
49	0.042775624983	0.461419776588	0.853894002137	-0.073732556877	-0.379706144140	0.623885109953
50	0.352855737492	1.157862320426	1.249325603168	1.248697492454	-0.379706144140	1.464736057034
51	-0.190964338239	-0.723107518139	-0.375604936035	-0.417948335804	1.192344162622	1.083482061502
52	0.809448508985	1.157862320426	0.458462401106	-0.551318855808	0.392278788905	-0.955369422050
53	-1.440872923910	-0.764065519567	-1.166468138097	-2.139983686142	-1.951756450902	-1.880397699826
54	0.039382623551	-0.764065519567	-0.771036537066	-0.282323096174	-1.951756450902	-0.553797143544
55	-1.373687529252	-0.764065519567	-0.214340310504	0.669039977404	-0.379706144140	0.921011083597
56	1.212951059935	0.420461775160	1.249325603168	0.669039977404	0.420359229577	0.895772251075
57	0.307446832407	-0.764065519567	-0.375604936035	-0.973740731008	-0.379706144140	-0.005200929364
58	-0.821501556257	-0.067622975730	-1.166468138097	-0.142295794459	-0.379706144140	-0.678660348992
59	0.042775624983	-0.067622975730	-0.375604936035	-0.697635499782	-0.379706144140	0.352047277638
60	-1.132489554219	-1.252150270457	-0.375604936035	-1.522694797944	1.192344162622	-1.880397699826

61	-2.067030778631	-2.685993359561	-2.000535475238	-2.643968492017	-1.951756450902	-2.237645906827
62	-0.295552627045	-0.764065519567	-0.375604936035	-0.697635499782	-1.179771517857	-0.301093859016
63	-0.295552627045	-0.764065519567	-0.375604936035	0.113700272081	-0.351625703468	0.623885109953
64	1.475925524541	1.157862320426	0.853894002137	1.248697492454	1.192344162622	0.895772251075
65	-0.295552627045	-0.764065519567	-1.561899739128	-0.066623085285	-0.379706144140	0.242680423227
66	-0.293855884227	0.420461775160	-0.932301162596	-0.303156094066	0.392278788905	-0.844818832453
67	-0.243357234892	0.461419776588	1.249325603168	0.072312943772	1.192344162622	-0.488803669444
68	0.546474044379	0.669777569536	0.181091290527	0.099976745782	-1.151691077185	0.262998706201
69	-0.553437347401	-0.764065519567	-0.375604936035	-0.646280600334	-0.351625703468	-1.473904871771
70	-0.295552627045	-0.764065519567	-0.375604936035	-0.097597676722	-0.379706144140	-0.114567783775
71	1.475925524541	1.157862320426	-0.375604936035	-0.697635499782	-1.951756450902	0.351997968832
72	1.475925524541	1.157862320426	1.249325603168	1.248697492454	1.192344162622	1.464736057034
73	-1.484981114212	-0.764065519567	-1.605103874207	-0.987464257306	-0.379706144140	-1.227256563172
74	-0.295552627045	-0.764065519567	0.576522891558	1.248697492454	1.192344162622	0.242680423227
75	0.593579692282	0.420461775160	-0.375604936035	-0.407806742257	-0.379706144140	0.811594920381
76	-1.831396568091	-1.948592814295	-1.443839248677	-1.352513034124	-1.951756450902	-1.977825894824

77	0.616738087551	0.669777569536	0.692629376607	0.958868734929	1.192344162622	0.291875735474
Students	0.7788	0.5341	0.6629	0.7120	0.5796	1.0000

Unstandardized Construct Scores

Case	Engagement	Teaching Resources	Management	LMS	Academics	Students
1	4.493896722615	4.000000000000	4.000000000000	5.000000000000	4.490038423227	4.520897490588
2	3.479668931973	4.000000000000	4.000000000000	3.046935635233	3.509961576773	3.353842458592
3	4.086930996118	4.000000000000	3.323840150286	3.862561560091	4.490038423227	3.809753982154
4	4.338362424317	4.137201662863	5.000000000000	5.000000000000	5.000000000000	4.469064202910
5	4.260374685460	5.000000000000	4.060931534733	4.594938591222	5.000000000000	4.317485179031
6	3.674454324198	4.000000000000	4.676159849714	4.410564516080	4.509961576773	3.823021400970
7	5.000000000000	4.066806939590	4.676159849714	4.797469295611	4.490038423227	4.846914874885
8	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
9	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
10	3.810039406330	5.000000000000	4.323840150286	4.797469295611	4.490038423227	3.509122558644
11	4.430118218990	5.000000000000	3.676159849714	5.000000000000	3.509961576773	3.960534602425

12	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
13	4.484493730528	4.066806939590	4.352319699428	4.660030855702	4.509961576773	4.339872551710
14	4.311050041185	4.645593614698	3.676159849714	4.594938591222	3.490038423227	3.656668857039
15	3.050046572731	4.000000000000	4.291388164695	4.059277344267	3.490038423227	3.163008692148
16	4.000000000000	4.000000000000	4.000000000000	4.000000000000	4.000000000000	3.845523513117
17	3.112583048558	3.287599445712	3.291388164695	3.769994203918	4.019923153546	3.876456705426
18	3.613593683414	4.642005831015	3.582776329390	4.594938591222	3.000000000000	3.791399334959
19	2.951345913986	4.000000000000	2.352319699428	3.686745310191	4.000000000000	3.809753982154
20	3.772180799120	3.357994168985	3.384771685019	3.913696388332	3.000000000000	3.669247402153
21	3.996299844187	4.645593614698	4.323840150286	4.000000000000	4.490038423227	4.159211700432
22	4.445242636601	4.000000000000	4.384771685019	4.104956291606	4.490038423227	3.860884781767
23	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
24	3.831648953187	4.645593614698	4.000000000000	4.000000000000	5.000000000000	4.163008692148
25	4.000000000000	4.000000000000	4.000000000000	4.000000000000	4.000000000000	4.000000000000
26	3.418198097444	4.712400554288	4.384771685019	4.208033811691	3.980076846454	3.656668857039
27	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000

28	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
29	4.168351046813	4.642005831015	4.291388164695	4.548810819591	4.000000000000	4.154476486883
30	4.358311640483	4.712400554288	5.000000000000	4.537492792077	4.509961576773	4.493072416293
31	4.309657554469	4.000000000000	4.384771685019	4.503131872253	4.509961576773	4.331455085912
32	3.618686325943	4.000000000000	3.676159849714	3.660030855702	3.490038423227	3.832256094302
33	4.000000000000	5.000000000000	4.676159849714	4.073154039032	4.000000000000	4.347715883274
34	4.723108410212	5.000000000000	5.000000000000	4.797469295611	5.000000000000	5.000000000000
35	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	4.487533589573
36	3.428725732273	4.712400554288	3.352319699428	3.776257948423	3.490038423227	3.308250485699
37	4.364796769729	5.000000000000	5.000000000000	5.000000000000	5.000000000000	4.000000000000
38	4.135585082132	4.712400554288	4.000000000000	4.000000000000	4.000000000000	4.000000000000
39	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
40	3.445242636601	4.000000000000	3.291388164695	3.797469295611	3.490038423227	3.836991307852
41	3.858693492344	4.354406385302	4.000000000000	4.726873923830	4.000000000000	4.322220392581
42	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
43	3.860714762054	3.712400554288	4.060931534733	4.111220036111	3.980076846454	3.838382669619

44	4.549664720869	5.000000000000	4.676159849714	3.954368279060	4.509961576773	4.331455085912
45	4.189960593670	4.000000000000	4.384771685019	4.000000000000	4.490038423227	4.647548903176
46	4.468244670175	4.354406385302	5.000000000000	4.810618868247	4.490038423227	4.836991307852
47	3.348908648395	3.354406385302	2.967548014409	3.300601167864	5.000000000000	4.132777987905
48	4.696063871055	5.000000000000	4.708611835305	4.660030855702	4.000000000000	4.846914874885
49	4.191353080387	4.642005831015	4.676159849714	4.326819571662	4.000000000000	4.516162277038
50	4.376221031527	5.000000000000	5.000000000000	5.000000000000	4.000000000000	5.000000000000
51	3.974061514335	3.996412216317	4.000000000000	4.191259903274	5.000000000000	4.815292808874
52	4.663297906374	5.000000000000	4.352319699428	3.983722142274	4.509961576773	3.674671489405
53	3.278284076504	4.000000000000	3.352319699428	3.253665532630	3.000000000000	3.154476486883
54	4.081838353588	4.000000000000	3.676159849714	4.132431383299	3.000000000000	3.854643466981
55	3.298862075665	4.000000000000	3.967548014409	4.594938591222	4.000000000000	4.655277495272
56	4.810039406330	4.645593614698	5.000000000000	4.594938591222	4.490038423227	4.683906182737
57	4.294800980832	4.000000000000	4.000000000000	3.818680642799	4.000000000000	4.184707191126
58	3.620078812660	4.357994168985	3.352319699428	4.208033811691	4.000000000000	3.836991307852
59	4.191353080387	4.357994168985	4.000000000000	4.000000000000	4.000000000000	4.339183678008

60	3.549664720869	3.712400554288	4.000000000000	3.591883873281	5.000000000000	3.154476486883
61	3.000000000000	3.000000000000	3.000000000000	3.000000000000	3.000000000000	3.000000000000
62	4.000000000000	4.000000000000	4.000000000000	4.000000000000	3.509961576773	3.986732581184
63	4.000000000000	4.000000000000	4.000000000000	4.386904779531	3.980076846454	4.516162277038
64	5.000000000000	5.000000000000	4.676159849714	5.000000000000	5.000000000000	4.683906182737
65	4.000000000000	4.000000000000	3.028479549141	4.359429687838	4.000000000000	4.322220392581
66	3.913487306775	4.645593614698	3.708611835305	4.078609919935	4.509961576773	3.642010076456
67	4.017909391044	4.642005831015	5.000000000000	4.423714088716	5.000000000000	3.855345955047
68	4.473337312704	4.712400554288	4.291388164695	4.365693432343	3.490038423227	4.317485179031
69	3.833041439904	4.000000000000	4.000000000000	3.954368279060	3.980076846454	3.310554990543
70	4.000000000000	4.000000000000	4.000000000000	4.294337423358	4.000000000000	4.167743905698
71	5.000000000000	5.000000000000	4.000000000000	4.000000000000	3.000000000000	4.348418371340
72	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000	5.000000000000
73	3.314750196998	4.000000000000	3.323840150286	3.797469295611	4.000000000000	3.506927583707
74	4.000000000000	4.000000000000	4.615228314981	5.000000000000	5.000000000000	4.322220392581
75	4.468244670175	4.645593614698	4.000000000000	4.202530704389	4.000000000000	4.647548903176

76	3.069021605074	3.354406385302	3.291388164695	3.608088163858	3.000000000000	2.985928968014
77	4.451727765847	4.712400554288	4.708611835305	4.797469295611	5.000000000000	4.333057102691

Bootstrap

Direct Effects Inference

Effect	**Original coefficient**	**Standard bootstrap results**					**Percentile bootstrap quantiles**			
		Mean value	**Standard error**	**t-value**	**p-value (2-sided)**	**p-value (1-sided)**	**0.5%**	**2.5%**	**97.5%**	**99.5%**
Teaching Resources -> Engagement	0.2673	0.2568	0.0981	2.7247	0.0065	0.0033	0.0031	0.0503	0.4479	0.5069
Management -> Engagement	0.2157	0.2159	0.1151	1.8744	0.0612	0.0306	-0.0971	-0.0220	0.4247	0.4957
LMS -> Engagement	0.0809	0.0907	0.1040	0.7777	0.4370	0.2185	-0.2027	-0.1355	0.2912	0.3675
Academics -> Engagement	-0.0206	-0.0057	0.0954	-0.2162	0.8289	0.4144	-0.2418	-0.1875	0.1896	0.2361
Students -> Engagement	0.4474	0.4408	0.1097	4.0800	0.0000	0.0000	0.1397	0.2189	0.6440	0.7096

Indirect Effects Inference

Effect	Original coefficient	Standard bootstrap results					Percentile bootstrap quantiles			
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.5%	2.5%	97.5%	99.5%

Total Effects Inference

Effect	Original coefficient	Standard bootstrap results					Percentile bootstrap quantiles			
		Mean value	Standard error	t-value	p-value (2-sided)	p-value (1-sided)	0.5%	2.5%	97.5%	99.5%
Teaching Resources -> Engagement	0.2673	0.2568	0.0981	2.7247	0.0065	0.0033	0.0031	0.0503	0.4479	0.5069
Management -> Engagement	0.2157	0.2159	0.1151	1.8744	0.0612	0.0306	-0.0971	-0.0220	0.4247	0.4957
LMS -> Engagement	0.0809	0.0907	0.1040	0.7777	0.4370	0.2185	-0.2027	-0.1355	0.2912	0.3675
Academics -> Engagement	-0.0206	-0.0057	0.0954	-0.2162	0.8289	0.4144	-0.2418	-0.1875	0.1896	0.2361
Students -> Engagement	0.4474	0.4408	0.1097	4.0800	0.0000	0.0000	0.1397	0.2189	0.6440	0.7096

Loadings T-Values

Indicator	Engagement	Teaching Resources	Management	LMS	Academics	Students
Use of videos to provide a summary of lectures					16.4198	
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments					18.1475	
Motivation of students in study						8.0422
Optimal student – staff ratios						10.5432
Student's prior knowledge of the subject domain						10.8093
Students' own digital devices to access LMS based materials						15.3836
Students' knowledge in using the LMS						12.7576
Interaction with professional support staff people (Program Management, IT etc)						13.1192
Quality access to LMS				14.9040		
Availability of quality content on the LMS				21.6123		
Organisation of subject materials in the LMS				8.9640		
Clear and easy to use content				10.8642		
Authentication protocols				10.2691		

Understanding students' needs while creating content for the LMS				10.7323		
Appropriateness of teaching materials		21.2903				
Adequacy of content provided to students		9.4840				
Relevance of materials		27.2045				
Improved task Management for the course			15.8200			
Improved time management for the course			46.0033			
Understanding various rules and regulations of the university			17.1223			
Quality university environment	23.6122					
Cutting edge facilities provided in the classroom	8.4186					
Quality interaction between academic and students	10.0473					
Addressing students' communication skills	14.5207					
Addressing classroom attendance issues	12.6933					
A clear plan of various activities and their due dates	8.9175					

Weights T-Values

Indicator	Engagement	Teaching Resources	Management	LMS	Academics	Students
Use of videos to provide a summary of lectures					7.6934	
Use of Artificial Reality/Virtual Reality in the class-leading to cutting edge environments					8.4237	
Motivation of students in study						6.3579
Optimal student – staff ratios						6.9148
Student's prior knowledge of the subject domain						9.0958
Students' own digital devices to access LMS based materials						9.8584
Students' knowledge in using the LMS						7.9841
Interaction with professional support staff people (Program Management, IT etc)						8.8060
Quality access to LMS				8.1081		
Availability of quality content on the LMS				9.1149		
Organisation of subject materials in the LMS				5.0499		
Clear and easy to use content				7.3387		
Authentication protocols				6.2370		

Understanding students' needs while creating content for the LMS				6.7226		
Appropriateness of teaching materials		8.6992				
Adequacy of content provided to students		7.7616				
Relevance of materials		12.4886				
Improved task Management for the course			9.8381			
Improved time management for the course			13.4689			
Understanding various rules and regulations of the university			11.6084			
Quality university environment	11.0940					
Cutting edge facilities provided in the classroom	7.5642					
Quality interaction between academic and students	10.6526					
Addressing students' communication skills	8.0599					
Addressing classroom attendance issues	10.0332					
A clear plan of various activities and their due dates	10.5434					

Discriminant Validity: HTMT Inference

Construct	Engagement	Teaching Resources	Management	LMS	Academics	Students
Engagement						
Teaching Resources	0.9595					
Management	0.9793	0.9195				
LMS	0.9307	0.9020	0.9615			
Academics	0.9487	0.8398	1.0611	0.9680		
Students	1.0110	0.8039	0.9377	0.9329	1.0195	

Appendix H: List of Publications

Published:

Prabal Datta Barua; Xujuan Zhou; Raj Gururajan; Ka C. Chan, A 2018 'Determination of Factors Influencing Student Engagement Using a Learning Management System in a Tertiary Setting', in 2018 *IEEE/WIC/ACM International Conference on Web Intelligence (WI),* Santiago, Chile

Under Review:

Prabal Datta Barua; Xujuan Zhou; Raj Gururajan; Abdul Hafeez Baig, R 2020 'Determination of Factors Influencing Student Engagement Using a Learning Management System in a Tertiary Setting', in 2020 *Educational Technology Research and Development* (Impact factor: 2.115, Q1)

Work in progress:

Prabal Datta Barua; Xujuan Zhou; Raj Gururajan; Abdul Hafeez Baig, R 2020 'Determination of Factors Influencing Student Engagement Using a Learning Management System in a Tertiary Setting: in qualitative perspective', in 2020 *Journal of Computing in Higher Education* (Impact factor: 1.87, Q1)