Grounded theory approach for the development of a new effectiveness model for e-learning services and its validation through partial least squares structural equation modelling

GROUNDED THEORY APPROACH FOR THE DEVELOPMENT OF A NEW EFFECTIVENESS MODEL FOR E-LEARNING AND SERVICES AND ITS VALIDATION THROUGH PARTIAL LEAST SQUARES STRUCTURAL EQUATION MODELLING

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Abstract

E-learning is a vital delivery medium for meeting educational, corporate training, and professional development needs. Even before the pandemic, the education sector and, notably, the higher education sector were in flux, and traditional education models were increasingly challenged for value and delivery quality. Governments, policymakers and educational institutions from both the public and private sectors were keenly observing the developing perceptions of traditional classroom versus multiple digital delivery modes during the COVID19 pandemic. One thing is certain the education sector, and especially the higher education sector, will fundamentally change in many ways due to the speedy adoption of existing and emerging technological developments.

One of the key issues is learners' engagement when using E-learning systems and services, which has consequences for retention and achieving desired outcomes. This issue indicates inadequate learning design and practices and failure to understand the learners' needs and requirements in an ever-changing environment - technological or otherwise.

The main challenge is how to present a model that could leverage a rich heritage of E-learning research but not burdened by it and offer users agility to apply the model for their specific needs and make them aware of broader implications of their choices, and approaches and actions.

In this context, there is a need to bridge the capability gap from practitioners, educators, and learners' perspectives to adopt and efficiently utilise new modes of delivery for learning. This study is a timely contribution to understanding the interplay of changing learners and practitioners' requirements, learning design, technological development in the learning domain and impact on E-learning efficacy.

This study is based on mix methodology. The first part of the study leads to the development of a new E-learning and Services (ELES) effectiveness model using the Grounded Theory method. The second part entails the application of the proposed model using the Cognitive Lenses-Multiple Interaction dimension and validation using the partial least squares structural equation modelling method.

The original contribution of this thesis is to present an adaptive E-learning Environment and Services Effectiveness model in the dynamic and changing environment and able to guide learners and practitioners for the contemporary challenges as well as rooted in the rich heritage of E-learning developments. The Cognitive Lenses-Multiple Interaction dimension is introduced in this research study - a new dimension that may have wider implications for other research areas, industry, business and research methodology in analysing ELES effectiveness, unpacking intertwined relationships and assisting in developing insights for the proposed model. The findings contribute to enriching the understanding of ELES effectiveness factors from both theoretical and practical perspectives. The application of new dimensions opens up new avenues for E-learning users and practitioners, such as cultural perspective and the impact of contextual and self-awareness.

Acknowledgement

I like to acknowledge my supervisor George for his wonderful mentorship throughout this journey. I have gained a life-long friend and research companion.

I would be nowhere without my mum's prayers – thank you for being a light in my life.

There were many ups and downs during this journey, and my wife stood by me and encouraged me to follow my heart. You are my rock; thank you for bringing happiness and love to my life. The smiles and energy of my daughters Hiba and Farrin is like oxygen and keeps me going.

My special thanks to my brother-in-law, who encouraged me to start the research endeavour and continue with it, and of course, my sister for her prayers and support. I am eternally indebted to my sisters' prayers and well wishes.

I am in debt for the prayers and well wishes of elders, friends and family.

Dedication

I dedicate this thesis to my father, who is always very close to my heart and surely will be smiling from the heavens.

Declaration

I declare that this thesis was composed by myself and that the work contained herein is my own except where explicitly stated otherwise in the text.

Anwar ul Haq

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Chapter 1: Introduction

Chapter Overview

E-learning is an important mode of delivery for meeting educational, corporate training, and professional development needs. Even before the pandemic, the education sector and particularly the higher education sector was in flux, and traditional education models were increasingly challenged for value and quality of delivery (Gallagher & Palmer, 2020). Governments, policymakers and educational institutions from both the public and private sector are keenly observing developing perceptions of traditional classroom versus multiple modes of digital delivery on a large scale. One thing is certain the education sector, and especially the higher education sector will fundamentally change in many ways due to the speedy adoption of existing and emerging technological developments. In this context, there is a need to bridge the capability gap from practitioners, educators and learners' perspectives for the adoption and efficient utilisation of new modes of delivery for learning. The impact of key developments and challenges in the field of e-learning are highlighted in this chapter, leading to a discussion about open problems and research gaps. The aims and objectives of the research investigation are presented. The structure of the report is also presented, depicting key themes and areas covered in this thesis.

1.1 Introduction

The success of businesses and organisations depends on remaining at the forefront of innovation and advancement. "Learning" is a crucial attribute of competent and successful organisations. Individuals and organisations' ability to acquire new knowledge and skills is critical for advanced societies to sustain success. The need for upskilling ability is even more important for existing workers to remain relevant and utilise new technological advances, contributing to the growth of the industries or entering into new occupations (Zaidi, Beadle, & Hannah, 2018).

E-learning Environments and Services (ELES) offer a delivery mechanism for learning content and activities via the electronic medium (Sun, Tsai, Finger, Chen, & Yeh, 2008). The Internet is increasingly used for learning collaboration between users (Rahimi, Berg, & Veen, 2015), contributing to the globalisation of learning; presenting real opportunities for growth and transformation in the digital era. In this context, E-learning Environments and Services (ELES) play an increasingly important role. New products, applications and services are continually being added for educational purposes to improve E-learning services (Brenton, 2014). Increasingly practitioners call for better utilisation of E-learning tools and develop approaches to engage learners meaningfully. For example, Prof John Domingue, director of the Open University's Knowledge Media Institute (KMI), stated, "It's slightly galling to see some universities trying to replicate online almost exactly what they delivered face-to-face before Covid.

Standing before a camera and broadcasting is not online teaching. You need to do things differently." (Doughty, 2021).

In this framework, virtual learning environments define the learning process as many-to-many interactions and relations among learners and their instructors (Piccoli, Ahmad, & Ives, 2001). Berg (2022) defines the E-learning as, "…distance learning, also called distance education, e-learning, and online learning, form of education in which the main elements include physical separation of teachers and students during instruction and the use of various technologies to facilitate student-teacher and student-student communication". Understanding the nature of complex interactions when people use E-learning systems and the impact of technological developments on learning and learners' perception of E-learning effectiveness has become a critical area to study as the pandemic due to COVID19 has utterly disrupted many facets of life globally, especially education affecting over 1.5 billion young people (Lee, 2020).

This research uses E-learning Environments and Services (ELES) as a more inclusive term to cover several technologies used in a variety of learning contexts: Learning Management Systems (LMSs), Web-based Training (WBT), Virtual Learning Environments (VLEs), Computer-based Training (CBT), Education Channels on Video sharing sites and Massively Open Online Courses (MOOCs). For this study, ELES are defined in three contexts (Figure 1):

- **Open:** access to the environment, educational material, and services are available without restriction through online medium, and users may or may not extend the environment and services.
- **Close:** access to ELES is specifically restricted, with only institutional access. ELES users may need organizational authorization to use or extend functionality.
- **Blended:** access to the ELES is partially open to users outside, and they may or may not like to explore the options of ELES systems.

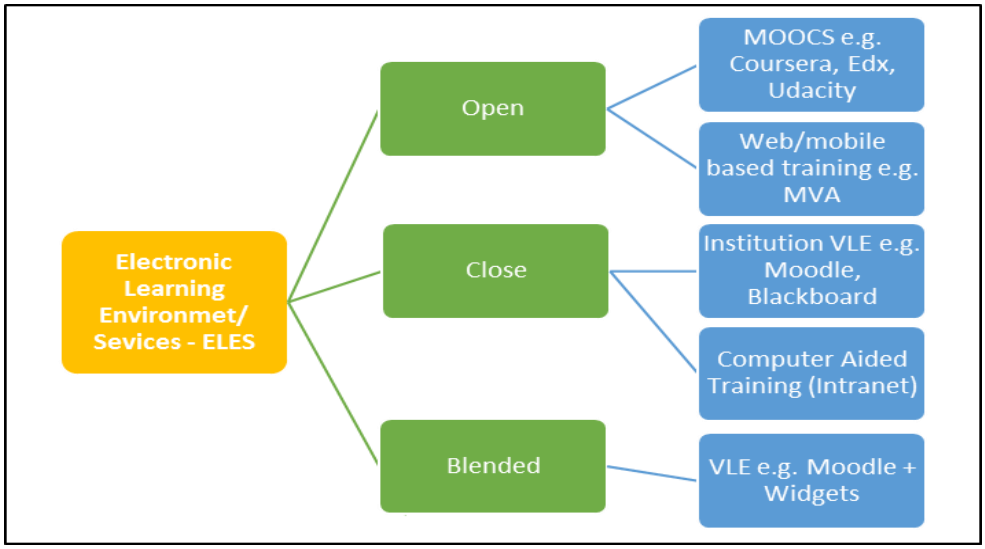

Figure 1

ELES Genre

1.2 Background to the Area of Research

The approaches and use of technology is going under rapid changes in the field of education. COVID19 has accelerated the rate of change in education, and 1.2 billion learners of all ages from 186 countries got affected by schools and educational institutions' closure, making e-learning the primary tool to deliver educational needs (World Economic Forum, 2020). The changes to the practices will have a deep and lasting impact. There is a healthy research body available for the e-learning domain. However, there are still many unexplored avenues, e.g., how to tap into the full potential of e-learning. The research has suggested that learners retain 25-80% more content in E-learning settings compared to physical classroom settings accounting for 8-10% (Gutierrez, 2016). Still, there are unknown factors in enhancing the full spectrum learning experience and addressing causes of concerns such as dropout rates and superficial formative feedback for the massively open online courses (Julia, Peter, & Marco, 2021).

Many E-learning effectiveness models have roots in the adoption of information systems technology (Mulhem, 2020). Technology acceptance as a research area has been widely studied, and the Theory of Reasoned Action (TRA) was one of the first theories used in technology acceptance. The TRA was developed by Fishbein and Ajzen (as cited in Ameen, Willis, Abdullah, & Shah, 2019) to understand and predict a person's intended behaviour in the context of decision making. The TAM (Technology Acceptance Model) became a major model for the acceptance of technology and was an adaptation of TRA and was proposed by Davis (as cited in Davis, Bagozzi, & Warshaw, 1989). The perceived ease of use (degree of the system being effort-free to use) and perceived usefulness (how capable a system is - in enabling to achieve intended outcomes) were two main determinants of computer acceptance behaviours in TAM. Venkatesh and Davis (2000) extended TAM to incorporate subjective norms as one

of the main constructs that directly affect perceived usefulness and usage intention in mandatory system use settings. The development explained why social influence was not a significant factor in voluntary contexts in earlier studies (Mathieson, 1991, as cited in Venkatesh & Davis, 2000). Subsequently, Venkatesh et al. (2003) presented the UTAUT. The UTAUT model had four main predictors performance expectancy (perceived usefulness impacting performance and productivity), effort expectancy (ease of use), social influence (subjective norms and social factors) and facilitating conditions (environmental resources, know-how and system support) and set the scene for further research in this domain. Subsequently, the UTAUT model was further extended by many researchers and applied in many application areas for both academia and industry (Oye, Iahad, & Rahim, 2014).

E-learning is a well-established field and evolved in parallel with information systems, behavioural sciences and learning design research and is influenced by the developments in these fields. The early studies for E-learning were more concerned with the technology features and interface design (Wang, 2003; see also Chiu, Hsu, Sun, Lin, & Sun, 2005) in comparison to later studies, where the focus shifted to the System and Information Quality (Urbach, Smolnik, & Riempp, 2010; see also Cidral, Oliveira, Di Felice, & Aparicio, 2018). This presented a challenge and need for a cohesive model for E-learning to capture the needs and requirements of a specific time period and be able to capture the evolving trends.

Therefore, a concerted effort is needed in this domain to investigate the practices for e-learning in continually changing situations - presenting new challenges. The old and tired ways of replicating physical settings and the traditional lecture setup through video capabilities will not be enough. There is a need to understand the structure and capabilities of the e-learning environment and how this medium could be used to meet the 21st-century challenges of inclusion, adaptability, resilience, critical thinking and the need for command of soft and emerging skills. This research aims to contribute to our understanding of the nature and essence of e-learning and of the tectonic forces playing a part in shaping e-learning practices and technologies.

1.3 Problem Statement

E-learning success depends on practitioners' and learners' better adoption and engagement (Alqudah et al., 2020). E-learning's importance is acutely evident in the wake of the COVID19 pandemic, wherein in many countries and areas, institutions had to shift to online learning in a very short span of time (UNESCO, 2022). This trend of structural changes to the landscape of education is here to stay (Baker, 2020). The general problem is to understand deeply how the quality and value are added to the learning experience and design a learning journey for specific learning environments and goals, contributing to the ELES success (Koh & Kan, 2020). The challenges and new ways of thinking are constantly arising and could unlock learning opportunities and make a difference in learners' progression and success

(UNESCO, 2020). For this purpose, it is important to understand how the learners work individually or in collaborative settings when using electronic learning platforms, how do they interact and engage with the environment and people working in these settings, how the instructors stimulate learning curiosity, engagement and collaborative learning, what is the impact beyond the classroom or provided learning environment settings, what make learners tick, what are their anxieties and proficiencies, how much learners understand the rationale of the learning process they go through.

E-learning is used in modern learning settings extensively (Choudhury & Pattnaik, 2020). It is important to identify critical attributes learners require from the contemporary learning environment and explore what instruments exist to understand the relations between these attributes for the successful adoption of ELES (Beetham & Sharpe, 2013, as cited in Chu & Chen, 2016). There is also little evidence of utilising relationships between 'ELES use' and 'pedagogical constructs' (Kopp & Lackner, 2014; Viegas et al., 2018). The lack of a framework assisting cohesion presents serious, methodical challenges for the E-learning practitioners, requiring a new tool, expertise and frameworks to address the challenges. For example, how to approach large dropouts of learners when using MOOCs (Xing, Chen, Stein, & Marcinkowski, 2017), why users gradually stop using ELES (Onah, Sinclair, & Boyatt, 2014). Waheed et al. (2016) investigated the link between the perception of learners on the quality of knowledge gained, the nature of the content available on e-learning platforms and the related impact on e-learning environments' success. The study (Waheed et al., 2016) identified key attributes of 'Content' provision as: accessible, actionable, representation knowledge quality and contextual. The 'Content' dimensions provided a measurable mechanism for the quality of the knowledge, but the work does not offer insights on how practitioners could implement these dimensions in consideration of interplay with other factors for E-learning platforms' success and limitations on their adoption. The issue of better understanding of the adoption of E-learning effectiveness models is consistent throughout the evolution of E-learning models presented in Table 2 (Chapter 2). However, this issue is getting more acute due to the increasing complexity of various modes of learning. As a result, the practitioners have a large number of studies with dozens of models and hundreds of contributing factors at their disposal, but it gets cumbersome very quickly to use these models effectively in practical terms and at the ground level with efficacy. Despite the availability of these theoretical models of e-learning effectiveness (Brenton, 2014), no approaches adequately explore the factors impacting effectiveness, such as the rapidly evolving nature of the educational landscape, various learning contexts, and the introduction of new technologies in education (Al-Adwan, Albelbisi, Hujran, Al-Rahmi, & Alkhalifah, 2021). ELES practitioners would benefit from a framework capturing existing and emerging dimensions, enabling practitioners to make sense of interplay holistically.

1.4 Research Aim and Objectives

The research aim of this study is to investigate and present an e-learning environment and services effectiveness model, which is intuitive to use by the learners and practitioners and able to adapt and capture changing requirements and provide direction and solutions for current and emerging issues in E-learning provision and able to identify and inform for good practices in e-learning provision.

The objectives of this PhD thesis are outlined below,

- ***Objective 1:*** Critically review the literature related to E-learning Success Factors and understand the domain focusing on evolutionary trends.

- ***Objective 2:*** Investigate and evaluate factors influencing the adoption of the E-learning technologies and Services, including barriers to the adoption.

- ***Objective 3:*** Collect relevant data to investigate and determine perceived E-learning Systems and Services effectiveness factors.

- ***Objective 4:*** Utilise analytical process to develop and propose a model for successful utilisation of E-learning Systems and Services, facilitating better adoption by various stakeholders, e.g., learners, tutors, decision-makers, administrators.

- ***Objective 5:*** Test and evaluate the model within the learning technologies domain and highlight the theoretical, potential, and practical contributions of the presented model.

In summary, this thesis proposes a cognitive tool embedded in the proposed ELES effectiveness model and presents various new factors contributing to ELES effectiveness. In addition, the proposed ELES effectiveness model opens up new directions for research in this domain.
All of the proposed new dimensions for the ELES effectiveness are discussed in detail in Chapter 4 and section 5.16, and a comparative evaluation is conducted in Chapters 4, 5 and 6. The theoretical and practical implications of this research study are discussed in Chapters 4 and 6. The proposed new factors for ELES effectiveness and shift in the emphasis on existing dimensions will trigger the debate in this domain and open up a path to further research to explore the impact of these dimensions in many different settings.

1.6 Structure of the Thesis

The structure of the thesis is presented below.

1.6.1 Chapter 1: Introduction

Chapter 1 introduces the main issues this research will address by focusing on the importance of E-learning traditionally and in the contemporary context. The areas of focus and research gap are highlighted. The aims and objectives of the research study are provided, along with the structure of the dissertations.

1.6.2 Chapter 2: Literature Review

The first chapter provided a brief introduction to the research domain and established the scope and focus of the research study. In comparison, the second chapter details the prevailing trends in the E-learning domain and the evolution of approaches and trends in this field. A review and critical insights are presented for the main E-learning Effectiveness models developed over the years. The discussion was further enriched by providing the relational review of learning theories, instructional design, learning design and the corresponding impact on educational and E-learning practices. The conclusion and contribution of the chapter are presented at the end.

1.6.3 Chapter 3: Research Methodology

This chapter provides the details of the research philosophies, research paradigms and methods. The review and insights are presented for qualitative and quantitative methods. The Grounded Theory Method (GTM) is explained with justifications for the method of choice for this research as part of the mixed methodology approach. The aspects of reliability and validity for GTM are discussed. The data collection method for the GTM based research investigation is discussed. The use of social media-based data is justified, and discussions related to ethical considerations are presented. This chapter shows a systematic approach to the research design, leading to reliable and valid results.

1.6.4 Chapter 4: Research Findings and Emergent Elearning Environment and Services Effectiveness Conceptual Model

After discussing and developing insights for all of the relevant research issues, the thesis then provides findings of the GTM for ELES effectiveness factors. An ELES Effectiveness model is presented, and the application area for the model is incorporated into the discussion.

1.6.5 Chapter 5: Validation of Emergent E-learning Environment and Services Effectiveness Model

The presented model in chapter 4 is being validated using the Partial Least Squares – Structural Equation Modelling (PLS-SEM) approach and preparation and process of validation, and corresponding findings are presented in this chapter. For this purpose, PLS-SEM details are provided, and the design of data

collection instruments was also presented. The results of the base ELES model and CL-MIM enabled ELES Effectiveness models are presented, and discussions on the findings and comparative evaluations are presented.

1.6.6 Chapter 6: Conclusions and Further Research

The summary of the research is presented in chapter 6 of this thesis. The key highlights of the research investigations are presented and evaluated against the aim and objectives of the thesis. The theoretical and practical contributions of the research are highlighted, including wider implications. The chapter ends with a discussion on the limitations of this study and possible future directions and areas to develop in the context of this research study.

1.7 Conclusion

The internet has transformed the availability of information and materials over the last two decades. The key questions are how to provide good teaching, a better learning experience and successful learning outcomes, whether delivered in a physical classroom, online or using a blended environment. The focus of the research was presented to study the effectiveness factors for the E-learning Environment and Services. This chapter specifies the clear aim and objectives for the study for the aforementioned focused area and the rationale for studying the ELES Effectiveness factors. In addition, the structure or road map for the thesis is provided.

Chapter 2: Literature Review

Overview

E-learning is increasingly becoming important for the education sector at all levels (from schools to higher education institutions) and in the corporate sector. The E-learning market is projected to nearly double in size by 2030 from US$169 billion worth in 2020, as cited in section 2.1. The investments in terms of tools, design and research in this sector will benefit society on a broader scale. A review of the evolutionary trends is conducted to develop insights for the E-learning success models and contributing dimensions and theoretical underpinnings, enabling understanding of the domain deeply. The study is further enhanced by highlighting the key themes over the last 70 years in learning theory development, instructional and learning design and corresponding influences on the E-learning effectiveness model and focal areas as the theories and approaches advance. The conclusion and contributions of the chapter are presented at the end of the chapter.

2.1 E-learning

E-learning Environment and services (ELES) are generally designed in response to:

1. Specific users and industry demand of that time.
2. Advances in learning theories and corresponding learning design
3. Technology provisions available at that time

E-learning is an essential paradigm in modern education (Choudhury & Pattnaik, 2020), with visible growth in the last decade and accounting for US$169 billion worth of the global e-learning market in 2020 and forecasted to reach US$ 295 billion by 2030 (“Global E-learning,” 2020). However, merely providing technological solutions for learning problems will only lead to sub-optimal solutions concerning learning (Laurillard, 2008). E-learning systems have been massively adopted in higher education, and in the UK, 95% of HE institutes employ e-learning systems to support education provision (Al-Fraihat, Joy, Masa’deh, & Sinclair, 2020). E-learning adoption has been showing robust growth for years now, especially in the US and EU markets, but the COVID19 pandemic took this trend to another level. For example, almost all higher education institutions in the UK will transition to online learning in a very short space of time in early 2020. This transition was only possible because universities and other educational institutions were already investing and moving increasingly in the direction of leveraging digital solutions, especially e-learning, for example, for blended learning delivery, enabling a better return on investment and flexibility (Brown, 2020).

The importance of e-learning is also highlighted by the adoption of this medium beyond academia, for example, in government, health, banking, and consultancy management, indicating a clear trend of need for quality training, upskilling, and better utilization of resources, leading to better performance.

Although E-learning platforms are taking centre stage in many domains, success and adoption of such systems vary considerably in practice, leading to investigations, such as the role of "Grit" in the successful utilisation of e-learning systems and to achieve high attainment levels (Aparicio, Bacao, & Oliveira, 2017). In order to take advantage of the developments in the psychological and behavioural fronts and technological impact on the social fabric, significant research and focus still are needed in exploring how to successfully leverage e-learning Systems and Services. The critical issue is to find the right e-learning solution for the presented problems or opportunities in the evolving situations, e.g., COVID19 crisis.

The ELES have an indirect relationship with learning theories and related pedagogies of the time in which these systems were developed. This chapter discusses the relationship between learning theories, Pedagogies, Learning design, and ELES. Interesting questions arise here: how are education practitioners implementing particular pedagogies in ELES systems? Is there a model available to capture evolutionary changes in pedagogical practices? For example, whether the model inform educators on a shift from traditional rigid structured based approaches to more contemporary practices based on the Conversational framework or experiential learning and on how to implement such pedagogies using ELES? – OR, more importantly, which tells learners why they are learning a concept in a particular way? Does the learning experience make learners reflective and independent learners? Bower, Craft, Laurillard, and Masterman (2011) and Liu, Geertshuis, and Grainger (2020) pointed out the need for more explicit pedagogical understanding when using ELES for teaching and learning. There seems to be a need for a framework to show dynamic linkages among pedagogies, learning design and ELES tools to understand the interplay (Figure 2) of these components in teaching and learning practices.

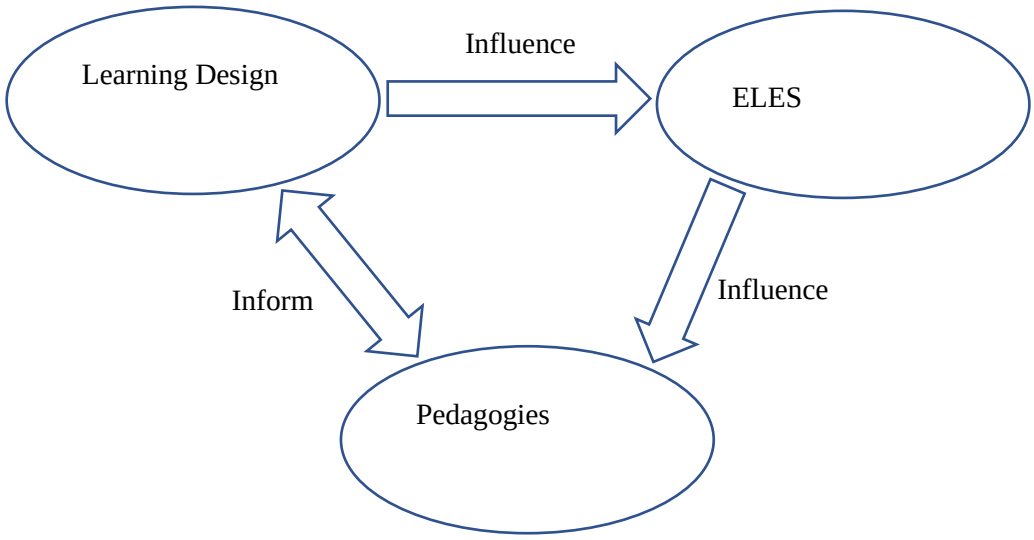

Figure 2

Relationship and Interplay between Pedagogies, Learning Design and ELES

The evolution in the Elearning effectiveness factors cannot be fully understood without considering the evolution in the learning theories and drivers behind certain trends. Section 2.2 elaborates on these trends and offers critical insights.

2.2 Learning Theories and Influences

It is important to understand the evolution of the learning theories to appreciate the effectiveness of factors for the e-learning environments and services at a deeper level. Various developments in the domain of learning theories directly relate to the design influences and methods employed for teaching and learning when using e-learning systems; for example, social constructivism relates to the design and social communication functionality push in various e-learning platforms. The section below will give an overview of the learning theories. It will inform the investigation to comprehend better why certain e-learning effectiveness factors were given more importance during specific periods and the rationale for adopting certain effectiveness factors and relationships with specific technological, scientific, and social trends.

2.2.1 Behaviourism

Behaviourism is the art of study where animals' or people's natural attributes are stimulated to achieve desired learning effects (Fosnot & Perry, 2005). Skinner (1986) applied behaviourist theories with the method of programmed instructions and reinforcement in the field of teaching and learning. Skinner (1957) showed that simple stimulus and response alone do not explain the decision made by organisms. Skinner explained the behaviour in terms of the interaction of the individual with the environment and simply based on Reflex. The findings show: that the feedback from the interactions with the environment was used by the organism and acted as reinforcements for a particular course of action. The behaviour was considered to be shaped through the interactions with the environment over the lifetime of an individual.

The implication of behaviourist theories resulted in the design of learning environments with sequenced and well-structured curriculums with assessment tools embedded in the delivery. The motivation and evaluation were used in such designs as the mechanisms of feedback for the reinforcement. The outcome expectation and self-efficacy were focal elements of behavioural attributes utilised in the e-learning effectiveness studies (Yi & Hwang, 2003, as cited in Bhuasiri, Xaymoungkhoun, Zo, Rho, & Ciganek, 2012). The behaviourist approach was used in many learning settings. However, people learn differently, and in complex settings and when dealing with complex situations, the simplistic approach of stimuli and response has proven inadequate (Lockey, Conaghan, Bland, & Astin, 2021). To understand the human development and learning process fully, it is important to take into account developments of learning theories and design from various perspectives and are discussed in the sections below.

2.2.2 Cognitivism

2.2.2.1 Blooms Taxonomy

Bloom et al. (1956) gave one of the earliest theories of learning by categorising the cognitive processes in Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. The wide growth of taxonomy and its use in curriculum theory and evaluation indicated a gap in educational planning. Bloom's Taxonomy's success was attributed to the simplicity and intuitive nature of the categories, which were easy to remember and use by the practitioners (Wineburg & Schneider, 2009). Table 1 shows Blooms' Taxonomy and further elaborates the use of characteristic words recommended by the centre of teaching and learning, the University of North Carolina at Charlotte (UNC Charlotte, 2021), presenting the simplicity of key categories and context.

Table 1

Blooms Taxonomy

Key Categories	Characteristic Words	Context
Knowledge	"List, Name, Identify, Show, Define, Recognize, Recall, State, Visualize"	Information presentation, gathering and recall
Comprehension	"Summarize, Explain, Interpret, Describe, Compare, Paraphrase, Differentiate, Demonstrate, Classify"	Show understanding
Application	"Solve, Illustrate, Calculate, Use, Interpret, Relate, Manipulate, Apply, Modify"	Making use of knowledge
Analysis	"Analyze, Organize, Deduce, Contrast, Compare, Distinguish, Discuss, Plan, Devise"	Making sense of the information; emphasise useful phenomenon
Synthesis	"Design, Hypothesize, Support, Schematize, Write, Report, Justify"	Summarising the findings; Presenting and organising the arguments
Evaluation	"Evaluate, Choose, Estimate, Judge, Defend, Criticize"	Figuring out: What went well or not? What are the outcomes? – deriving lessons, judging critically

Kropp, Stoker, and Bashaw Kropp (1966) highlighted the importance of establishing a correct relationship between cognition processes and the application of Bloom's taxonomy in curricula, tests and teaching methods. Bloom's taxonomy sees the learning process as a sequential and cumulative process where comprehension leads to the application, application leads to analysis, and so on. There is an inherent danger: if the strong relationship is only perceived at consecutive levels (e.g., between application and analysis), then the battery of tests derived for the assessment purposes on this assumption may lead to incorrect conclusions. Krop et al., pointed out the need for more work to be done on the taxonomy construction's validity.

The study conducted by Madaus, Woods, and Nuttall (1973) revealed indirect relations between different levels (Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation) as the subject becomes complex. Hence, the study challenges the cumulative learning process's significance in its traditional use and accepts the direct relationship between levels only to a certain degree. The authors revealed in the findings not a high dependency of top levels, i.e., Synthesis and Evaluation on integration with the lower levels hence questioning the cumulative nature of taxonomy and derived tests and learning paradigm based on it.

Krathwohl (2002) presented the revised version of Blooms' Taxonomy with emphasis on the intersection of knowledge and cognition. Despite the simplicity, Bloom's taxonomy potentially could be used in the wrong way leading to incorrect results. These results apparently may look correct despite using analysis, synthesis or evaluation as suggested in the taxonomy. The validity of the findings could be verified with the inclusion of meta-knowledge and by critically considering the context and perspective of knowledge gained. Another main contribution of Krathwohl's revised model was the inclusion of the ‘Create’ category depicting placing elements together to form a novel, coherent whole, making an original product or concept.

Wineburg and Schneider (2009) challenged the notion of putting Knowledge at the base of the learning process and going through the hierarchy leading to a higher level and critical thinking. The arguments were put forward in the context of historical events, where all known facts may not be known already, and evaluation or judgement may not yield accurate results based on the incomplete knowledge base. The observations made by Wineburg and Schneider point to the fact that classifications in taxonomy are useful in providing a framework for the learning process, but complex relationships exist between different categories, which may not be linear as suggested in the original taxonomy. Bloom's taxonomy overall helped the practitioner have structure and cognitive processes appreciation. It informed design, course and information dimensions in E-learning effectiveness studies directly or indirectly over the years.

2.2.2.2 Gestalt

The Gestalt is a German term for ‘Whole’, and the Gestalt principles of perception were presented in the 1920s by Max Wertheimer, Kurt Koffka and Wolfgang Kohler - German psychologists (IDF, 2021). The basic premise is that individuals perceive the environment through the formation of Gestalts. ‘Gestalt' is perceived as a unit and appears in the individual form – this unit is the function of relations and coupled with situations. Forms are made up of 'Gestalt' (Korthagen & Kessels, 1999). The Gestalt principles such as Proximity, Similarity, Continuation and Closure are widely used in the field of Design, e.g., graphics design and object design. Continuation refers to the elements organised on a line or curve that are perceived to be more related than not being on the line or curve. Closure refers to the phenomenon when looking at a complex setting or arrangement of individual elements, and individuals tend to search for a single and recognisable pattern. The proximity principle refers to the perception that things that are close to each other seem to be more related than the things which are further apart. Lastly, Similarity refers to the perception that similar things are perceived to be more related in comparison to dissimilar things (Rutledge, 2021).

The interplay of social, cultural, physical and psychological factors causes an experience within a context. Gestalt does not concentrate on a set of stimuli alone, e.g., the visual field is not considered separately, but the larger whole in which reality occurs, namely the total situation, including the animal's inner conditions (Wolfgang, 1925). If the system's constituting elements are related functionally, then the individual elements (making up the system), when analysed without the whole, may yield incorrect results (Wolfgang, 1925).

2.2.2.3 Piaget

Piaget provided the grounding of cognitive theory. The development of knowledge is considered an active process: intelligence interacts socially and with environmental objects – intelligence is a broad term in Piagetian theory. The interactions shape social and moral development through the equilibration process. The equilibration process is self-regulatory and adaptive in cognitive development.

According to Piaget (Hertez, 2010), the development of knowledge is our interpretation according to our own structures (Piaget defines structure as operational methods, deductive capacity; in essence, coordinated abilities); the actions continuously construct knowledge.

Piaget describes the development as an essential process resulting from embryogenesis; each instance of learning occurs as a function of total development. Piaget presents four stages of development: sensorimotor, pre-operational, concrete operational, and formal operation. Piaget's development of knowledge is explained as an active process; parallel development of knowledge of object world & psychosocial knowledge; socio-affective bonds motivate social and moral development; equilibration process determines social, moral development and cognitive development (Devries, 1940).

The cognitive conception places significant importance on the role of prior knowledge in the development of new learning. Learning is considered an active process, and memory plays a key role in processing information (Shuell, 1986). Piaget had his work grounded in cognitivism evolution, but he increasingly moved towards constructivism, explained in section 2.2.4; in fact, he called himself constructivist (Hertez, 2010), and his work was pioneering in this field.

2.2.3 Information Processing

Information Processing learning theory has its roots in the 1950s and 1960s with the development of computers. The psychologists were able to compare the working of the human mind and the role of short-term and long-term memory in cognition with computer models. The experiments and findings led to instructional designs where learners' working memory and attention span were not overloaded, and learners act as information processors (Mayer, 1996). Mayer provided three themes: Mind as an information-processing system is viewed as computer hardware, consisting of memory stores and control processes for the flow of the information; the software is akin to applying cognitive processes and in a series where the output of one cognitive process becomes the input of next cognitive process; and data as knowledge acquired through the process of learning, creating mental representation, similar to computer data structures, mental representations comprise of specific pieces of information and are input and output of cognitive processes.

Sweller, Merrienboer and Paas (1998, p. 251) describe cognitive load theory as *"...a theory that emphasizes working memory constraints as determinants of instructional design effectiveness"*. The theory is based on the tenant that humans have limited working memory, e.g., *"...working memory is capable of holding only about seven items or elements of information at a time"* (Sweller et al., 1998, p. 252). The study argued that information in long term memory does not just consist of facts but can also consist of complex interactions and procedures; Knowledge takes the form of Schemas (categorisation, what if/what to do possibilities, storage and derivation of meaning in long term memory). Schemas' construction is active, a constructive process defined as *"...it is through the building of increasing numbers of ever more complex schemas by combining elements consisting of lower level schemas into higher level schemas that skilled performance develops."* (Sweller et al., 1998, p. 255). The instructional design based on this theory should promote the construction of Schemas and automation of Schemas (where procedure or action is readily available and working memory will not be split/utilised to construct Schemas at the expense of solution for the problem).

The Technology Acceptance Model (TAM) is the most widely used model in Information System research, describing the individual's acceptance of information systems (Lee, Kozar, & Larsen, 2003). The Technology Acceptance Model was put forward by Davis and looked at perceived usefulness, perceived ease of use and user acceptance of information technology. It has its theoretical grounding in expectancy theory and decision sciences and reasoning theories. Davis, Bagozi and Warshaw (1989)

presented the Technology Acceptance Model and, in their study and found a strong relationship between usefulness and usage compared to ease of use and usage. The technology acceptance model incorporated cognitive instrumental determinants for perceived usefulness (e.g., Job relevance influencing quality output), showing a stronger relationship between intention to use and usage behaviour. This implied that the perception of the system's usefulness was directly affected by an individuals' cognitive importance given to job goals (perceived usefulness) impacting system use and output quality (Venkatesh & Davis, 2000). The TAM findings have been applied to many technologies over the years, e.g. email, management information systems, hospital information systems, and word processors in various settings, proving its robustness (Lee et al., 2003). The influence of information processing theories for the technology acceptance model and, consequently, virtual learning environments can be seen using dimensions, e.g., Perceived Usability, Perceived Quality, and Perceived Value (Table 2.), in evaluating the effectiveness factors.

DeLone and McLean's (2002) information system success model is widely used to evaluate information systems' implementation. The factors comprising the model are system quality, information quality and service quality, impacting intention to use and user satisfaction, consequently providing net benefits. The system quality in e-learning studies has the scope of help functions and end-user facilitation such as availability, usability and reliability. Information quality facilitates the end-user performance improvement resulting from system information, ease of understanding, personalisation and relevance. Service quality has scope for providing quality support to end-users to enable system usage (Bhuasiri et al., 2012). Information System success models were used in many e-learning studies and found that system quality and information quality have a significant relationship with learner satisfaction, as indicated in section 2.4.1 for e-learning effectiveness trends over the years.

2.2.4 Constructivism

Fox (2001, p. 24) studied various formats of Constructivist theories and summarised claims of Constructivist theories as below:

(1) "Learning is an active process."
(2) "Knowledge is constructed, rather than innate, or passively absorbed."
(3) "Knowledge is invented not discovered."
(4a) "All knowledge is personal and idiosyncratic."
(4b) "All knowledge is socially constructed."
(5) "Learning is essentially a process of making sense of the world."
(6) "Effective learning requires meaningful, open-ended, challenging problems for the learner to solve."

The constructivism review presented in the study suggested that the constructivist theories, if taken in their simplified interpretation, may lead to misleading assumptions and practices; for example, if learning is entirely taken as an active process, then the reactive or behavioural nature of learning could potentially be ignored which would result in flawed learning processes. Similarly, suppose the construction of knowledge is seen from personal or social perspectives that are mutually exclusive from each other. In that case, it will miss out on the fact that both phenomena co-exist and augment the construction of knowledge simultaneously.

2.2.4.1 Dewey

Dewey was seen as a progressive and pragmatic educator (Feng, 1989). He has influenced many education reforms, such as project-based learning, and he was considered the propagator of a learning approach based on cognitivism (Gonon, 2000). Although mostly misunderstood, Dewey was somewhere in-between the traditional (structured/passive learning) and the progressive methodology (hand-on experience/participation of learners/learning freely). He made a case for students to be guided and monitored by the Teacher or Guide as well as the Teacher/Guide should engage students actively in problem-solving and learning freely. For Dewey, the Individual Experience takes the central role in education, leading to positive growth and contribution to society. Dewey combined sociological and psychological aspects of learning, *"... Dewey insisted that the curriculum should embody what he called the sociological and the psychological principles. The sociological principles demanded that the pupil be initiated into the customs, habits, values, and knowledge which constitute the culture of a community. The psychological principles demanded that this should be done regard to the pupil's individual needs, interests, and problems."* (Feng, 1989, p. 9). Dewey's work promoted education for democratic citizenship, highlighting the link between education and the impact it has on a diverse and tolerant society (Detlefsen, 1998).

2.2.5 Social Constructivism

2.2.5.1 Vygotsky

Vygotsky related the major theoretical learning positions by suggesting all have common innate responses (Vygotsky, 1978). Vygotsky introduces the approach of 'Zone of Proximal Development', defined as *"... the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers."* (Vygotsky, 1978, p. 33). Vygotsky argued that the approach of Zone of Proximal Development could be used to increase the possibility of what is already being achieved and developed and is in the process of maturing. This approach suggested that the social environment helps the child learn, leading to social constructivism. Vygotsky's work contributed towards using education and upbringing to develop the personalities of students and linked the development of the personalities to unlocking the creative potential of students. In this process

teacher act as a guide and facilitator for the individual activity of the students in a socio-cultural environment (Davydov & Kerr, 1995).

2.2.5.2 Bruner

Bruner argued for the stronger relationship of culture's symbolic systems in understanding the growth of the mind and its significance to support human knowledge and skill (Bruner, 1991). In his study, Bruner described the narrative principles and the way these are used in organising the structure of human experience. Bruner described the narrative as *"... As I have argued extensively elsewhere, we organize our experience and our memory of human happenings mainly in the form of narrative-stories, excuses, myths, reasons for doing and not doing, and so on. Narrative is a conventional form, transmitted culturally and constrained by each individual's level of mastery and by his conglomerate of prosthetic devices, colleagues, and mentors. Unlike the constructions generated by logical and scientific procedures that can be weeded out by falsification, narrative constructions can only achieve "verisimilitude.""* (Bruner, 1991, p. 4). Bruno was strongly influenced by Vygotsky and believed in the central role adults play as the sociocultural mediator in developing a children's learning. The adult supports the students in acquiring new skills and knowledge, and they increasingly become independent. The support is envisaged as scaffolding for the learning and requires the appropriate structure provided in organising the instructions. In this process, language plays an important role in developing skills in comprehending abstract concepts (Contemporary Psychology, 2019).

2.2.5.3 Gagné

Gagné suggested five main categories (Gagné, 1974) of learning:

1. Verbal Information (knowledge)
2. Intellectual skills
3. Cognitive strategies
4. Attitudes
5. Motor skills

Gagné (1974, p. 3) elaborated Verbal Information or Knowledge as "…kind of capability is learned when the individual can state in propositional form the names, facts, and generalizations he has acquired". Intellectual skills *"... are the capabilities the student acquires that enable him to deal with his environment symbolically"*. The cognitive skills were described as the learners thinking skills to manage the learning process and acquired capabilities over a period of time, enabling the learner to increasingly become a more independent learner and thinker. Attitudes were described as *"... as learned dispositions, they modify the behaviour of the individual towards classes of things, persons, or events, In doing so, they affect the choices he makes of his own personal actions toward these objects."* (Gagné, 1974, p. 4). Motor skills were highlighted as the main category due to the importance of many disciples, e.g., sports, sciences, engineering and languages.

2.2.6 Experiential Learning

Kolb (1984) first used the term experiential learning and defined it as *"Learning is the process whereby knowledge is created through the transformation of experience"*. The concept of experiential learning has its roots in the works of Dewey, Lewin and Piaget. In his study, Kolb (1984, p. 22) identified that the feedback process was the common instrument in Dewey and Lewinian approaches and used to transform experience into *"higher-order purposeful action"*. The experiential learning approach tried to integrate behavioural and cognitive learning approaches. Experiential Learning theory puts the experience at the centre stage of the learning process. The rationalist and cognitivists put emphasis on the gathering, manipulating and recalling of abstract symbols. One of the tenets of experiential learning is that the knowledge is continually derived from the experience and tested for its usefulness and assimilation to new experiences. This implies the need for continual refinement and modification of ideas emerging from learners' continuum of experience as they progress and advance. Kolb presented an experiential learning cycle dialectical in nature and based on action/reflection and experience/abstraction at opposite pole positions. The model has the mode of 'grasping experience, which as characteristics of acquiring knowledge and information; essentially, it is a process of taking in information. The 'grasping experience' mode is related to Concrete Experience (CE) and abstract Conceptualisation (AC) at dialectical opposition positions. Essentially CE is related to experience, and AC is related to thinking. The other mode is transforming experience which is related to Reflective Observation (RO) and Active Experimentation (AE). Essentially RO is pertaining to the process of reflection, and AE is related to acting. The dialectical tension between four learning modes results in learning in a recursive process that is sensitive to learning situations and evaluating what is being learned. The immediate and concrete experiences (CE) provide the bases for the observations and reflections (RO). The reflections (RO) are refined, filtered and assimilated into abstract concepts (AC). The conceptualisation and abstraction lead to new implications for actions (AE), which are eventually tested and evaluated to form new experiences feeding back to the start of the cycle for the bases of immediate and concrete experience (Kolb, 2015). The Experiential model is widely adopted in educational programs, and the challenge is how the benefits of the experiential learning process could be assimilated when using the E-learning mode and how the practitioners and learners could be informed of the implications.

2.2.7 Andragogy

Andragogy has played a major role in the development of learning theories from didactic/transmittal-of-knowledge/stimuli based on modern approaches. The traditional teaching and learning methods didn't work for adult learners *"... teachers found them to be resistant frequently to the strategies that pedagogy prescribed, including fact-laden lectures, assigned readings, drill, quizzes, role memorizing, and examinations. Adults appeared to want something more than this, and drop-out rates were high"* (Knowles, 1980, p. 40). Knowles (1980) considered learners as an independent and self-directing and

teacher act as a facilitator in the learning process. Knowles argued the need for a different paradigm for adult learners and later added contextual requirements in learning. The study also pointed out that the rate of change in culture, economics, politics and technology increased rapidly in the 20th century -an average person sees these changes many times during his/her life span compared to limited or no change before this period. The implication of these rapid changes is that the knowledge gained at any point will increasingly lose its productive value within a matter of years – the learning thus should be considered *"lifelong process of continuing inquiry"* (Knowles, 1980, p. 41).

Merriam (2001) discussed that adults learn as good as young learners when the time constraints and pressures are removed. The study also presented the argument that adult learner needs are different as compared to the education needs of children. The study argued for the centrality of the learner in Andragogy: *"education is fundamentally the same wherever and whenever it occurs. It deals with such basic concerns as the nature of the learner, the goals sought, the social and physical milieu in which instruction occurs, and the techniques of learning or teaching used. These and other components may be combined in infinite ways. ...Andragogy remains as the most learner-centered of all patterns of adult educational programming." What is significant, Houle writes, is that andragogy has alerted educators to the fact that they "should involve learners in as many aspects of their education as possible and in the creation of a climate in which they can most fruitfully learn"* (Houle, 1996, as cited in Merriam, 2001, pp. 29-30).

2.3 Instructional Design and Learning Design

Shambough & Magliaro (2011, p. 83) define instructional design (ID) as: *"... a conceptual model for developing instruction and typically includes analysis, design, development, implementation, and evaluation (i.e. ADDIE model)."* This particular ID has its foundation in system design: analysis is used for goal setting and identification of learner needs; a set of specifications are designed for the learning environment; development of learning and management material; and results of the development are evaluated – Formatively and Summatively. Shambough and Magiaro emphasised the importance of understanding the instruction setup process and learning decisions. This model has a limitation in capturing the changing nature of teaching over time and consequently changes in the processes. However, the model was useful for insights into instructional design thinking at the time.

Merrill, Drake, Lacy and Pratt (Merrill, Merrill, Drake, Lacy, & Pratt, 1996) argued the need for instructional design to be established on scientific grounds rather than on relativism. This concept was elaborated in the article as, *"Like other sciences, instruction is verified by discovery and instructional design is extended by invention. Instructional science, the foundation for the technology of instructional design, is the discovery of instructional strategies. Instructional science involves identifying the variables to consider (descriptive theory), identifying potential relationships between these variables (prescriptive theory), and then empirically testing these relationships in the laboratory and the*

field."(Merrill et al., 1996, p.1). The rationale for Instructional Design was given as follows (Merrill et al., 1996, p. 2):

- "Instructional design is a technology for the development of learning experiences and environments which promote the acquisition of specific knowledge and skill by students.
- Instructional design is a technology which incorporates known and verified learning strategies into instructional experiences which make the acquisition of knowledge and skill more efficient effective, and appealing.
- While instruction takes place in a larger organizational context, the technology of instructional design is concerned only with the development of learning experiences and environments, not with the broader concerns of systemic change, organizational behavior, performance support, and other human resource problems.
- Instruction involves directing students to appropriate learning activities; guiding students to appropriate knowledge; helping students rehearse, encode, and process information; monitoring student performance; and providing feedback as to the appropriateness of the student's learning activities and practice performance. Instructional design is the technology of creating learning experiences and learning environments which promote these instructional activities."

The Elaboration theory presented by Reigeluth (“Elaboration theory,” 2022) emphasises the process of narrowing down the topic, starting from the general level – enabling the context in view all the time. The instructions provide clear information; thoughtful practise; informative feedback; strong intrinsic and extrinsic motivation. Instructions have three stages: sequencing, synthesising and summarising. Sequencing refers to decisions about the order for the concepts and principles to be taught. Synthesising refers to showing the interrelationship between the topics and summarising refers to previewing and reviewing the topics. Epitome is the core construct for the Elaboration Theory and defined as an advanced organiser which epitomises the subject-matter content. Elaboration is related to the portion of instructions, providing more details on the part of the content and increasingly complex knowledge to be taught. The Elaboration model depicts an iterative process starting with the epitome's specification. The next stage is five primary-level elaborations on the epitome leading to four secondary level elaborations on one of the primary-level elaborations. The Epitome starts with familiarising what to be learnt and analogies are used to draw the students' attention to what they already know and the concept to be taught. The instruction refers to primary-level elaboration for each aspect of the epitome. The primary level elaboration acts as summariser and provides expanded epitome on that elaboration, and the same process is repeated for each primary level elaboration. The primary level elaborations lead to secondary-level elaborations with the same function of summariser and expanded epitome of that elaboration. The whole process ends with Terminal Summariser and Terminal Epitome. A Terminal Epitome function to synthesise the entire domain (Reigeluth, Merrill, Wilson, & Spiller, 1980).

The Wildman and Burton, (1981) highlighted the importance of Input, Process and Output variables as: *"appropriate instructional interventions must be available at the appropriate time to ensure optimum learning."* The development of students' cognitive structure was perceived as an iterative process. The cognition processing and transformation of memory structure result in learners displaying correct outcomes; the output stage feedback results to the input stage for further fine-tuning. The study recommends that planners and instructional designers understand the system's dual requirements and theoretical orientations that explain how learners learn. Wildman and Burton argue that without capturing requirements appropriately, it will be difficult to plan or design effective instruction to meet the client's and stakeholder's individual needs.

Schiffman (1986, pp. 16-17) presented the linear process for the instructional design. The model shows: *"...instructional systems design to be a synthesis of theory and research related to (a) how humans perceive and give meaning to the stimuli in their environments, (b) the nature of information and how it is composed and transmitted, (c) the concept of systems and the interrelationships among factors promoting or deterring efficient and effective accomplishment of the desired outcomes (Torkelson, 1977), and (d) the consulting and managerial skills necessary to meld points a through c in-to a coherent whole."* The instructional design process was perceived as the culmination of educational theory, system analysis; diffusion; consulting and project management techniques.

The Conversational framework presented by Laurillard, (1999) shows the learning process for the individual learner, the interdependence of the learning process and content, and the internal relation between the learner and the world. The framework suggests two levels for academic learning: practice and discussion. The levels are connected through adaptation and reflection. The framework shows the cycle of goal, action, and feedback - a reflection on action is the framework's key process. A parallel conversation goes on for the learner, e.g., externally between individuals and internally within individuals. The internal structure enables the learner to reflect at the conceptual level or reflect on interaction with the environment leading to derive meaning from experience and generalise it. The generalisation process empowers the learner to *enhance further action* and utilise learning in a different context. The conversation of concepts between the teacher and the learner is made via inquiry-based learning. It is a mechanism to teach learners teacher’s conception and result in a change in learners’ conception and translated into the learner's action in the learning environment. The same process exists between learners and peers and change in conception through peer interaction triggers changes in learner practice and conception. The conversational framework provides a systematic approach to analysing the engagement between teacher and learner and their relationships with the learning environment. The learning environment can be physical or digital, and for this reason, the current research could be used to develop a further understanding of the application and adoption of the conversational framework.

Alonso, López, Genoveva, Manrique and Daniel (2005) discussed that there is interdependence in learning theories from behaviourism, cognitivism, constructivism and social constructivism. The content structure relates to behaviourism and cognitivism; cognitive processes relate to cognitivism and constructivism; collaborative activities related to constructivism and social constructivism, as indicated in Figure 3. The author argued that learners best learn when a blended learning approach is used, i.e., mixing various event-based activities, self-paced learning, live e-learning, and face-to-face classrooms. This led to an instructional learning model. Alonso et al. (2005) had seven phases: analysis, design, development, implementation, execution, evaluation, and review. The model uses a series of psycho-pedagogical prescriptions (structure content, promote effective cognitive processes and further effective collaboration activities) at the design phase (learning approach, structure information, define standards, execution criteria, required achievement) and the development phase (practical learning process: strategies, events sequence, learning tools, resources to be used) that further the learning process.

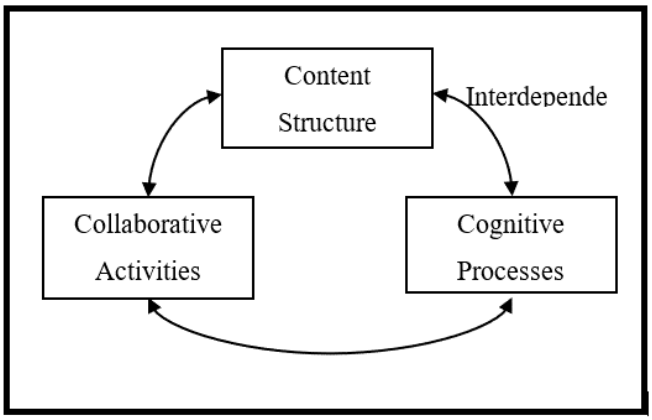

Figure 3

Shows interdependence in learning theories from Behaviourism, Cognitivism, Constructivism, and Social Constructivism

2.3.1 Blended Learning

Blended learning enables the teachers to work with technology as a starting point in their practice (Motteram, 2013, as cited in Breen, 2018). Blended learning offers diverse spaces and mediums for students to access and engage with learning materials and perform learning activities, enabling them to balance education, work and family life. The key issue in blended learning is to find the balance between online and face-to-face components of the provision. Merely re-packaging old content with a new medium would not be sufficient. A thoughtful learning and teaching style should be incorporated, and each module and course should be looked at individually when designing for blended learning (Glogowska, Young, Lockyer, & Moule, 2011). The study was conducted by Moskal, Dziuban and Hartman. (2013) emphasises the organisational support for blended learning at all levels: organisational infrastructure, course and faculty development and learner support. Putting all the components in place

will require careful planning and adequate investment for resources and capability generation. This study will provide the constructs and focal areas beneficial for this purpose.

2.3.2 Peer Instruction

Eric Mazur first introduced this instructional method in the 90s. The objective was to achieve better student participation and focus attention on more profound concepts and not just on what is presented through slides, lecture notes and books (Crouch, Watkins, Fagen, & Mazur, 2007). The main method could be summarised as, *"...lectures consist of a number of short presentations on key points, each followed by a ConcepTest – short conceptual questions, typically posed in a multiple-choice format, on the subject being discussed. (Figure 1) Therefore, each key point in a lecture takes roughly 15 minutes to cover: 7-10 minutes of lecturing, 5-8 minutes for a ConcepTest"* (Crouch et al., 2007, p. 6). The main idea behind this pedagogy is to allow students to construct their own comprehension of the concept and then discuss and challenge their own understanding of the concept with a peer and refine their understanding accordingly – the teacher also moves around and listens to their discussions and where necessary support and guide the discussions through questioning. The closure of a particular topic is achieved as, *"... the instructor calls an end to the discussion, polls students for their answers again (which may have changed based on the discussion), explains the answer, and moves on to the next topic."* (Crouch et al., 2007, p. 7). Suppose the poll test and final discussions show a considerable gap in the understanding of the students, the teacher slows down and elaborates in more detail the same concept. In that case, - the whole process could be repeated again with a different set of scenarios and evaluation method, e.g., ConceptTest.

2.3.3 Flip Instruction

The Flip Instruction model is developed and practised in response to efforts for improving student engagement and making them in charge of their own learning. The learner comes to the class with knowledge and comprehension of the topic attained (up to a certain level) before the actual class time. The main characteristic of successful Flip Instruction is active learning; analysis and critical thinking; more space for discussions; application of concepts and reduction in content overload during directed teaching time (Bristol, 2014).

The flip classroom model enabled teachers to give individual learners personalised attention for their specific needs – monitoring and support is data-driven as with Khan Academy System (Thompson, 2011).

2.4. ELES Effectiveness

Instructional design models have their grounding in learning theories – ELES implementation is related both to instructional design and learning theories and the evolution of E-learning effectiveness models is discussed in this section.

2.4.1 E-Learning Effectiveness Models/Factors

Early e-learning effectiveness models were developed with a focus to understand better technology adoption in the educational sector (Chu & Chen, 2016). Piccoli et al. (2001) based their analysis of the effectiveness factors on the Technology Acceptance Model: human and design dimensions were perceived to impact the effectiveness of ELES. A longitudinal experiment based on this model revealed the issues students faced. For example, in terms of communication in ELES, higher dropout rates were detected compared with the general population despite students showing the same computer self-efficacy and satisfaction (Levy, 2007), highlighting the need for further investigation.

The high dropout rates problem is persistent and manifests acutely for the MOOCs platforms, where dropout rates could be more than 90% despite MOOCs being available for a decade (Feng, Tang, & Liu, 2019).

Liaw (2007) proposed a conceptual model where the system, multimedia quality and environmental characteristics were related to perceived learners' satisfaction and usefulness. In contrast to previous studies, which focused on the benefits of e-learning, Liaw focused on understanding the causes of dissatisfaction of the learners. Liaw's suggested four core factors for an effective e-learning development: Environmental characteristics; Environmental satisfaction; Learning activities, and Learners' characteristics. Environmental characteristics such as the ability for asynchronous communication, multimedia instructions and asynchronous interaction have the potential to create a high-level communicative environment, benefitting learners to share and retrieve useful information with ease. Fosnot and Perry (2005) correlated this with a behavioural intention of e-learning usage, revealing that although learners consider E-learning a helpful tool in assisting their learning, they are concerned with the system quality and communication features available. Their study identified perceived self-efficacy as the strongest indicator of learners' perceived satisfaction, along with multimedia instructions in the perceived usefulness of the E-learning system.

Subsequent research in e-learning effectiveness moved towards personalisation and e-learning environmental factors, where learners' behaviour and internal conditions emerged as an important factor in e-learning effectiveness with the perceived e-learner satisfaction model by Sun, Tsai, Finger, Chen and Yeh (2008), identifying the importance of environmental dimension and users' behaviour and attitude for effective e-learning. The study identified six factors having a 'critical relationship' with "Perceived e-Learner satisfaction". The findings revealed that when learners' computer anxiety is low, then the barrier to E-learning is low – training and education of learners towards gaining computing knowledge and application of technology are important (Sun et al., 2008). Moreover, just an experience of an instructor in teaching is not enough to significantly impact learners' satisfaction within E-learning settings – enthusiasm and level of engagement towards E-learning are key factors for any E-learning

instructor (Elango, Gudep, & Selvam, 2008). Factors related to course quality, assessment and technological design are important for learners' perceived usefulness and ease of use of a course, impacting learners' satisfaction directly – pedagogy driven E-learning solutions could potentially play a significant role in improving learners' satisfaction concerning these factors (Brenton, 2014).

Lim et al. (2007) showed the importance of personalisation to enhance the effectiveness of e-learning using intelligent agents in virtual learning environments. Emphasis on personalisation dimension (especially in the constructivist approach to learning) is in line with the findings of earlier work by Wang (2003). Lim investigation found the relationship between trainees' motivation and work performance; computer self-efficacy and learning effectiveness; and provision of work practices related to training content and improved online training effectiveness.

Although the e-learning effectiveness studies were presenting ever more factors influencing the performance of the learners, there was a gap in capturing more nuanced influences, e.g., innovations and technology on changing learner behaviour and perceptions towards learning when they experience new modes of studies. Innovations in technology are emerging, and there is a need for more dynamic solutions to e-learning models. Effective communication of the e-learning strategy is a continuing challenge (Singh & Hardaker, 2014). Kirschner (2004) argued for a 'fitting pedagogy', and collaborative and coordinative media utilisation in e-learning environments in a review of prevalent trends that was carried out. Kirschner's study was useful in providing the direction; however, it lacked details on how this could be achieved effectively. Table 1. below shows the major e-learning environment and services effectiveness models/factors evaluated and corresponding influences over the years and the resulting findings and results presented.

Table 2

E-Learning Environment and Services Effectiveness Models/Factors

Reference	Effectiveness Factors Evaluated	Focus/Findings	Influenced By
(Piccoli et al., 2001)	Human dimension [Students (Maturity, Motivation, Technology comfort, Technology attitudes, Previous experience, Computer anxiety, Epistemic beliefs), Instructors (Technology control, Technology attitudes, Teaching style, Self-	VLE effectiveness model presented for performance, self-efficacy, and learner satisfaction. Learners using VLE showed higher computer self-efficacy against traditional learners but lower satisfaction with the learning experience.	Information processing; Technology Acceptance Model

	efficacy, Availability)]; Design dimension [Design (Learning Model, Technology, Learner Control, Content, Interaction)]		
(Arbaugh & Duray, 2002)	Course Flexibility, Program Flexibility	Large class sizes were negatively associated with learning and course satisfaction; Perceived flexibility of the delivery medium found to be significantly associated with perceived learning satisfaction.	Cognitivist;
(Wang, 2003)	E-learner satisfaction was tested for relation with Learner Interface, Learning Community, Content and Personalization	A model for measuring E-learner satisfaction was presented. Shifted focus from organisational information or classroom education.	Behaviourist; Information processing
(Chiu et al., 2005)	Perceived Usability, Perceived Quality, Perceived Value, and Usability Disconfirmation	E-learning continuance intention model. Linked E-learning satisfaction with the continuance intention. Based on Expectancy Disconfirmation Theory.	Behaviourist
(Shee & Wang, 2006)	Learner Interface, Learning Community, System Content; Personalization	Presented hierarchy structure for evaluating web-based E-learning systems based on multi-criteria decision-making theory.	Information processing; Psychology of decision making; Human Computer Interaction
(Lim et al., 2007)	Learning motivation, learners' self-efficacy, the content of the training program, face-to-face interaction, support from supervisor, ease of use of the digital environment, organization environment; innovation; the reward for trainees' self-development	Established factors: trainees' motivation, face-to-face meetings and training contents directly affect leaning performance.	Behaviourist; Information processing; Technology Acceptance Model

(Liaw, 2007)	Learner Characteristics (Self-Efficacy), Environmental Factors (Multimedia Instructions; System Quality)	A conceptual model of user's satisfaction, behavioural intention, and effectiveness toward e-learning was presented. Perceived satisfaction, perceived usefulness and E-learning effectiveness contributed to the behavioral intention of using E-learning.	Behaviourist; Constructivist
(Sun et al., 2008)	Learner; Instructor; Course; Technology; Design; Environment	The study found that the Learner computer anxiety, instructor attitude towards e-learning, e-learning course flexibility, e-learning course quality, perceived usefulness, perceived ease of use, and diversity in assessments were significant factors for learners' perceived satisfaction.	Behaviourist; Information processing; Technology Acceptance Model
(Urbach et al., 2010)	System Quality; Information Quality; Process Quality; Collaboration Quality	The structural analysis results showed a significant relationship between mentioned factors and user satisfaction, impacting individual performance enhancement leading to organisational level performance enhancement. The control variable management support found to has a substantial impact on use and user satisfaction.	Behaviourist; Information processing; Technology Acceptance Model
(Chen, 2011)	Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions	Technological expectancy and educational compatibility found to be essential determinants. behaviour intention had a salient effect on e-learning acceptance.	Constructivist; Instructional design
(Wang & Chiu, 2011)	Information Quality, System Quality, Service quality	Communication quality has a significant relationship with user satisfaction leading to loyal users of e-learning systems.	Behaviourist; Information processing; Instructional design
(Bhuasiri et al., 2012)	Learners' characteristics; Instructors' characteristics; Institution and service quality; Infrastructure	Learners' characteristics were the most important dimension for ICT experts; Infrastructure and System quality were the most important	Cognitivist; Behaviourist; Information Processing;

	and system quality; Course and information quality; Extrinsic motivation (Perceived usefulness, Clear direction)	dimensions from the faculty perspective.	Technology Acceptance Model
(Xu, Huang, Wang, & Heales, 2014)	Human dimension; Design dimension	The study found both Human and Design dimension have a significant impact on perceived learning performance. Only the Design dimension had a significant effect on online learners' satisfaction. Actual learning performance found to be significantly affected by perceived learning performance.	Constructivist; Instructional design
(Chu & Chen, 2016)			Behaviourist; Information Processing; Technology Acceptance Model
(Cidral et al., 2018)	Collaboration Quality; Information Quality; System Quality; User Perceived Satisfaction Instructor Attitude; Diversity in Assessment; Learner perceived Interaction with others;	Collaboration Quality positively influences the use of the e-learning system. Instructor attitude, diversity in assessment, and learner perceived interaction with others positively impact e-learning satisfaction. Information quality has a positive impact on use and user satisfaction.	Behaviourist; Information processing
(Pham, Limbu, Bui, Nguyen, & Pham, 2019)	E-learning System Quality; E-learning Instructor; Course Material Quality; E-learning Administrative and Support Service Quality	The significance of all the presented factors was established for E-learning student satisfaction. The study focused on Vietnamese higher education and factors extracted aligned with previous studies	Behaviourist; Information processing
(Ameen et al., 2019)	Perceived Usefulness; Perceived Ease of Use, Subjective Norms, Information Quality, System quality,	This study shows that the presented factors have significant effects on behavioural intention. Consequently, it was also established that the behaviour intention and technical support significantly affect the actual use	Behaviourist; Information processing; Technology Acceptance Model

	Technical Support and Self-efficacy	of E-learning systems. This study focused on Iraqi higher education, and the factors explored aligned with previous studies.	
(Al-Fraihat et al., 2020)	System Quality; Service Quality; Information Quality	The study found that system quality and information quality positively influence the perceived satisfaction with the e-learning system; System quality did not significantly affect the use of the e-learning system; Information quality found to be determinant of perceived satisfaction and perceived usefulness. Perceived satisfaction, usefulness and the use of e-learning systems positively influences students' benefits.	Behaviourist; Information Processing; Technology Acceptance Model

Existing models of E-learning effectiveness lack a holistic perspective and agility when dealing with varying settings and do not capture adequately the evolving nature of the learning landscape as new technologies are introduced and practices of people and society change. For instance, the earlier models were based predominantly on system design, system quality and technology parameters with an emphasis on user efficacy, as presented by Piccoli et al. (2001), Arbaugh and Duray (2002), and Wang (2003). There was a distinct shift of focus towards personalisation and environmental interactions as effectiveness parameters, as noted in studies by Chiu et al. (2005), Shee and Wang (2006), and Lim (2007). The collaboration and social component were added to the E-learning's success parameters shown in studies by Urbach (2010) and Chen (2011). Various new parameters have been added to the new models presented, such as Instructor quality and diversity in the assessment. It was noted that despite a rich source of theoretical models, the problems of low engagement and high drop rates persist in e-learning settings. It was highlighted that there is a need to understand the relationship between E-learning Effectiveness factors, learning theories and instructional designs for better adoption of these models in a meaningful way, instead of just adding new factors for e-learning effectiveness. The challenge was to study parameters and dimensions contributing to an adaptable model for e-learning effectiveness and intuitive to use in a practical sense.

2.5 Conclusion

This chapter contributed a critical analysis of the prevalent e-learning effectiveness theories and models. The discussions highlighted the evolutionary trends of these models. In this vein, this chapter examined the theoretical underpinnings of these e-learning effectiveness models with critical insights. The discussion of e-learning effectiveness models was informed by learning theories and instructional design and various educational drives were highlighted since the 50s, critically examining models presented by researchers and experts like Bloom, Piaget, Kolb, Laurillard. The literature review highlighted the importance of developmental work for the e-learning domain and its related impact on the education sector and society. The literature review also provides the basis for the comparative evaluation of the findings of this research study in Chapter4, 5 and 6.

Chapter 3: Research Methodology

Overview

Research philosophies play an important part in developing an understanding of the broadest sense of the research process. Research philosophies such as Positivist, Interpretivist, and Realism are discussed in this chapter. A comparative evaluation of research design and methods is conducted to facilitate the choice of research method for this study. The discussion leads to the comparison of qualitative and quantitative research approaches and the justification for the choice of mixed methodology for this study and of the Interpetivist approach, in particular, for its first part. The rationale and details for the Grounded Theory Method (GTM) are presented, including discussions on the data collection approach. The Grounded Theory Method's reliability and validity are discussed with implications for triangulation of the findings.

3.1 Selecting an Appropriate Research Approach

Understanding the whole research process and how various stages of the research are connected and inform each other is important to make the correct decision for the research study. This understanding helps align the activities to the goals and objectives, enabling them to make rational choices based on the nature and constraints of the research investigation for the defined problem and research question.

3.1.1 Underlying Philosophical Assumptions

Understanding the role of the philosophical assumptions is essential to facilitate selecting the appropriate approach for the research (e.g., qualitative or quantitative) for an investigation or exploration for a study (e.g., investigating factors influencing adoption of Elearning Systems and Services in various settings, e.g., higher education, lifelong learning).

Several research philosophies (Figure 4) are available as indicated by Saunders, Lewis and Thornhill (2019), for example, Positivist and Pragmatism. The research philosophy relates to understanding the process of developing knowledge, underpinned, and governed by the nature of knowledge and experience.

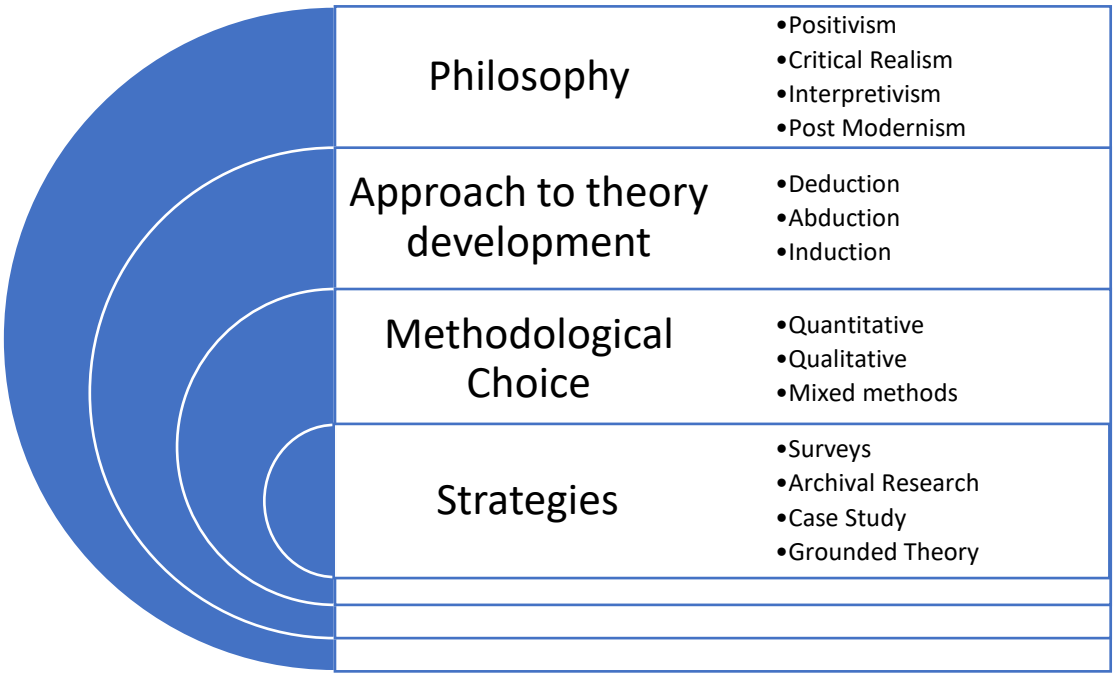

Figure 4

Research Onion adopted from Saunders et al., (Saunders et al., 2019)

The researchers make assumptions (consciously or unconsciously) at every stage of the research, potentially including assumptions related to human knowledge (epistemological), assumptions related to encountered realities (ontological), influences on the research process, triggered by values and ethics of the researcher (axiological assumptions). These assumptions influence the research design process and how findings are interpreted and presented (Crotty, 1998 as cited in Saunders et al., 2015, p. 124). As indicated in the adaptations of the research 'onion' figure above, the research philosophies influence the choices all the way to data collection and analysis, so it is worthwhile to elaborate on research philosophies and their implications for this research study.

Positivism relates to the philosophical stance of the natural scientist, leading to working with observable realities, producing law-like generalisations. In the domain of business management and social sciences, this would mean the researcher focus on observable and measurable facts and regularities, hence influencing the choice of data. The researcher will look for causal relations in the data, enabling to create law-like generalization to predict behaviours and trends and occurrences. The causal prediction and explanation are the strength of this approach which is relatively independent and value-free from the researchers' axiological alignments. Typically, quantitative methods of analysis are used with this approach, believing that objective facts present the best scientific evidence. However, this may lead to a simplistic view of reality, such as ignoring multifaceted, dynamically intricate relations within

organisational structures and differing contexts in which people operate within the business organisation (Quinlan & Zikmund, 2015, pp. 55–72).

Guba and Lincoln (1994, pp. 105–117) proposed four paradigms (worldview or basic belief system, guiding the researcher) for quantitative and qualitative research:

(a) Positivism
(b) Critical Theory
(c) Post-positivism
(d) Constructivism.

The Post-positivism approaches relied on a priori hypotheses, not just verifying the assumptions as in Positivism, but also exploring mathematical formulas to express the propositions and functional relations. The ontology in this context is based on critical realism, which assumes reality exists but will only be possible to apprehend imperfectly, never perfect. With the methodological emphasis on the falsification of hypotheses (against verifying), the inquiry is made preferably in natural settings, fed by situational information, with discovery and determining meaning people ascribe to their actions, e.g., in business and social settings. Qualitative methods are increasingly utilized in this context, such as Grounded Theory Method (Guba & Lincoln, 1994, Chapter 6).

The Critical Theory paradigm (Guba & Lincoln, 1994, Chapter 6) differs by focusing on structures 'formed' in the context of societal, political, cultural, economic, ethnic and gender factors, epistemologically, based on dialogue between the investigator and the subjects of the inquiry, driven by dialectical engagement in terms of analysis. The methodologies related to the critical theory paradigm are 'dialogical' and 'dialectical' in nature, facilitating comprehending how the structures are formed and changed and the actions or factors needed to effect change. In essence, the knowledge constructed or derived is subjective; hence, value-dependent (values of researcher influence comprehension and derivation of findings).

Ontologically, Constructivism is based on relativism, where multiple, sometimes conflicting, social realities are considered based on human intellect. The constructs of these realities may change as the constructors become more informed and sophisticated. Epistemologically, it is based on transactional/subjectivism, where the investigator and object of investigation are interactively linked, leading to the construction of findings. The purpose is to present a more consensus construction, more sophisticated and informed than the predecessors, formed by hermeneutical and dialectical exchanges between and among investigators and respondents as specified by Guba and Lincoln.

Realism is a philosophical position, believing that objects have an existence independent of humans' cognitive and investigative activities. There are two types of Realism. Direct Realism simply means that reality exists as is and what is perceived by the senses is an accurate depiction of reality. The second type is Critical Realism, which states that there are two steps to experiencing the world: first, the object itself and the sensations it generates or conveys and the processing in the mind that interpret the sensations. In essence, Critical Realism states that the researcher's understanding could be affected by the interpretation of senses depicting the reality of an object or phenomena, whereas Direct Realism will consider the reality or phenomena of reality independent of any cognitive processing. Direct Realism could be limited in the social and business management context. The complexity of multilayered interactions between individuals, groups, and organisations may not be captured adequately, accounting for a simplistic worldview (Saunders et al., 2019).

An alternative to Positivism, Critical Theory and Post-Positivist approaches is Interpretivism. Social scientists long argued that social research must include the understanding, explanation and interpretation of a social phenomenon, not necessarily directly observable by the senses, lending to the epistemological position of Interpretivism (Matthews & Ross, 2014, pp. 17–41). The Interpretivist approach to social research will typically involve qualitative data, rich in detail and description, researchers discovering and working with subjective meanings, and considering specific contexts when interpreting the data. The interpretivist researcher claims to overcome the Positivist approach's perceived shortcoming, where rich insight could be lost when reducing complexity to the law like generalisations in the case of the Positivist approach. The Interpretivism has its roots in the study of phenomenology and symbolic interactionism, enabling it to discover deeper insights within a complex environment and social interactions. Phenomenology deals with the direct investigation and description of phenomena by humans to make sense of the world around them. In comparison, Symbolic Interactionism refers to the meaning humans give to the social world around us. Consequently, meanings are continually being modified and reflected upon symbolically, leading to adjustments in our meaning and beliefs (Saunders et al., 2019).

3.1.2 Selecting an Interpretive Research Approach – First Stage of the Research Study

The research approaches, paradigms and methodical choices present challenges in selecting an appropriate research approach. The researcher argued for the mixed method research for this investigation. Mixed methods research (MMR) is an established area with a history of 50 years as a methodological approach in social, management and behavioural sciences and is increasingly used in critical areas such as health sciences (Regnault, Willgoss, & Barbic, 2018). Tashakkori and Creswell (as cited in Regnault et al., 2018) defined MMR as, "Mixed Methods Research is a research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or program of inquiry". The mixed-

methods approach enables the researchers to complement the strengths of one approach with the limitations of another. For example, using qualitative and quantitative data from different sample sets and interpreting results enhances the rigour of the findings. This is particularly beneficial where multiple insights are required to support the investigation of complex research questions or conditions. The mixed-methods approach presents challenges in terms of increased time and cost required to conduct the research, as well as researchers, should be aware of interpreting conflicting results.

The mixed methods research benefits far outweigh the challenges. Considering this study's complex nature, the researcher has opted for mixed methods research. For this purpose, the research is divided into two stages; qualitative research for theory building as detailed in Chapter 4 and quantitative research for validation as detailed in Chapter 5.

The background knowledge and theories, literature review, and comparative evaluations presented in Chapters 1 and 2 indicate continuously evolving relationships and an interplay between pedagogies, learning design and practices in E-learning environments and services (ELES). Determining the contemporary, relevant success factors for the ELES will be a complex undertaking. Thus, choosing an appropriate methodology is crucial for the first part of the research study, which is exploratory, longitudinal, and interpretivist.

In the context of research philosophical stances, the next sections describe the qualitative research approach's nature, leading to the specific methodology chosen to justify its relevance to this research study.

3.2 Justifying the Use of Qualitative Research Method

Qualitative research generally involves descriptive words and interpreting non-numerical data, seeking to explore phenomena within the natural setting (“What is qualitative research?,” 2019). The study of social systems involves many uncontrolled and unidentifiable variables, making it difficult for closed system methods to be applicable in natural settings. More so, the simplification and abstraction needed for the experimental design could remove many features from the study's subject, resulting in apparent findings and results (Kaplan & Duchon, 1988).

The literature indicates that qualitative research is flexible and iterative in nature in terms of instruments utilized to elicit responses and categorization in response to questions posed. The analytical process typically derives from the iterative process; that is, data collection and research questions are typically adjusted based on what is being learnt and fed back in improving understanding of a phenomenon. Qualitative research focuses on process and meaning, and typically data is collected through in-depth interviews, focus group notes, and participants' observations, inherently containing descriptive details

to unearth meaning and understand links and relationships (Sale, Lohfeld, & Brazil, 2002). It is important to gain a clear understanding of qualitative research, comparing it with the quantitative research perspective. The comparison summarized in Table 3 will facilitate highlighting the differentiation between the two approaches, considering the strength and weaknesses of each.

Table 3

Differences in Qualitative and Quantitative Approach

Research Approach	References	Research Approach	References
Positivist • Reality is perceived as fixed laws of causation. • Addresses cause and effect. • Complexity is handled by reductionism. • Focus on objectivity. • Based on measurement and repeatability.	(Ittner, 2014)	**Interpretivist** • No universal social reality. • Subjective • Focus on the explanation of meaning and understanding	(Goldkhul, 2012)
Quantitative • Use of statistical and mathematical techniques to identify patterns, factual assumptions, and causal relationships. • The data is structured and numerical in nature.	(Matthews & Ross, 2014)	**Qualitative** • Use of stories, accounts, narratives, and observations, determining what things exist, including subjective understandings, feelings, opinions, and emotions. • Data typically is unstructured, involving descriptive accounts, words, expressions and typically conducted in the natural setting and participatory in nature.	(Bell, Bryman, & Harley, 2018)
Confirmatory • Deals with hypothesis testing and model/theory verification and confirmation. • Inclined to follow positivist approach. • Apply quantitative methodology. • Pre-specified theoretical constructs could be tested for significance.	(Jaeger & Halliday, 1998)	**Exploratory** • Based on asking the open question of what is happening and gaining insights into the domain of interest. • Enable to understand and discover patterns for the issue, problem, or phenomenon. The nature of subjects, settings, objects of interest and related issues may not be readily clear. • Flexible and adaptable to change and could be used to provide the descriptive foundation, leading to the generation of hypothesis.	(Saunders, Lewis, & Thornhill, 2019)

Deduction • Using general/specific assumptions, theory, results, or logical explanations to ascribe properties to specific instances. • Associated with theory verification and hypothesis testing.	(Remler & Ryzin, 2015)	**Induction** • Conducting systematic observations of the world and then develop a logical explanation, using specific instances to arrive at overall generalisations. • Plays an important role in theory conceptualisation.	(Remler & Ryzin, 2015)
Laboratory • Accurate measurement and of variables and ability to control environment and settings. • Artificial Settings • Difficult to map naturalistic situations. • Capturing real-world variation may not be achievable, leading to limited applicability.	(Leavy, 2017, pp. 87–123)	**Field** • Takes place in natural settings. • Control of variables, environmental setting, and behaviour. Measurement cannot be achieved precisely. • Participatory or Non-Participatory from the researchers' involvement point of view. • Typically occurs over a long period of time.	(Leavy, 2017, pp. 124–163)

The qualitative research approach recommends researchers to observe social behaviour and action as occurred in mundane everyday life (Schutz, 1967). The qualitative research approach is selected for the first part of the investigation in this thesis, as the main assumption of a qualitative approach is that the researchers investigate phenomena in the natural settings, attempting to understand the meanings, utilizing instruments such as self-reflexivity, analyzing subjectivity and context systematically through thick descriptions people bring to them (Tracy, 2013).

Qualitative research methods present a better option in the area of science where humans and organisational idiosyncrasies are involved. Examples of qualitative research are ethnography, action research, grounded theory, case study research and should be used to capture the complexities of human behaviour, emotions, communication choices and issues (Dybå, Prikladnicki, Rönkkö, Seaman, & Sillito, 2011). The ethnographic studies focusing on cultural aspects are qualitative in nature to capture the depth and details of the environment in which subjects operate and interact, enabling the researcher to be part of the experience. This points to the fact that no two situations are identical. As a result, quantitative research methods may be inappropriate where the researcher's subjective experience is needed to understand the context, culture, environment, and context in a complicated situation (M. Byrne, 2001).

This suggests that the selected research methods should take account of parameters such as complexity, scale, settings, environment, and human behaviour and acknowledge that learner behaviour and choices made for management decisions are idiosyncratic and guided by circumstances related to the context, time, and culture of the organisations.

There are limitations associated with the qualitative research approaches and these limitations are well documented. Developing an understanding of the limitations of qualitative research approaches will enable to make the right choice when choosing a particular qualitative method. This will enable to take steps towards ensuring reliability and validity for the chosen method.

A lack of control is typically attributed to qualitative research, especially if the researcher is new. It is important to understand the qualitative research rules in weighting, downgrading, and excluding according to the quality of the evidence and nature of the samples. The qualitative data is usually descriptive and rich in textual content and context. This richness can be potentially lost when aggregation or summarisation occurs, stripping out the context in order to derive themes and key concepts. Extra care needs to be taken to preserve the contextual richness, and certain methods, such as the Grounded Theory method, have a mechanism called Memoing to preserve the context and meaning of the phenomena (Cohen, Manion, & Morrinson, 2011). The disadvantages of qualitative analysis could be related to the lack of controllability, deductibility, repeatability and generalisability.

Triangulation

The findings of the qualitative research are questioned because of the nature of analysis employed in qualitative based research. The quantitative approach uses statistical analysis based on mathematical rules and constructs to explain the patterns, causations, and reality. Whereas qualitative research is a creative process at heart, it still requires rigour and validity, reliability and triangulation for the collected data and analysis. Triangulation is used in many ways, e.g., to combine data for analysis of the findings, where the findings of one method corroborate the findings of another method, or multiple researchers work on the set of the same data and compare the findings for validity. Triangulation can be very expensive in terms of time, budget, and training, although reliability, repeatability and validity could be enhanced many times. There are several types of triangulations: (1) methods triangulation, where consistency of the findings is checked using different data sources; (2) triangulation of sources, where consistency of different data sources is examined within the same method; (3) analyst triangulation, where multiple analysts review the findings; (4) theory/perspective triangulation, where multiple perspective and theories are used to interpret the data (Patton, 1999). The purpose of the triangulation is to check the consistency and not the same results from different sources, providing opportunities for deeper insights into the emerging relationships between the method of inquiry and the phenomena investigated. This study is mixed-method research, and method triangulation is applicable by default. It should also be noted that the chosen methodology for the qualitative study has built-in triangulation mechanisms, as detailed in section 3.4.3.

The initial stage of this study adopted a qualitative approach, enabling to discover paradoxes, contradictions, and a new perspective. Essentially this phase of the research is exploratory in nature, as discussed in section 3.4.

3.3 Selecting an Appropriate Research Design and Method

A research design is a term used to depict a research framework to collect and analyse data, guiding the execution of the research method. In simple terms, the research method is a technique to collect data. Examples of research design are Experiment, Archival and Documentary Research, Case Study, Ethnography, Action Research and Narrative Inquiry. For instance, Case Study method explores and investigates specific cases, relating to the individual, organisation, or specific phenomenon. However, just specifying the case is not enough; an instrument is needed to collect data to investigate the case. This instrument is determined by the research method, such as doing observations, conducting interviews, running group discussions, or administering questionnaires (Bell et al., 2018, Chapter 3). The next section provides further details on the research specific research strategies.

3.3.1 Experiment

The experimental approach has roots in laboratory-based research of the natural sciences. The experiments are generally conducted in a strict control environment, studying the probability of change in independent variable/s, causing a change in dependent variable/s. The variable types are defined in Table 4 below:

Table 4

Types of Variables (Saunders et al., 2019)

Variable	*Meaning*
Independent (IV)	"Variable that is being manipulated or changed to measure its impact on a dependent variable"
Dependent (DV)	"Variable that may change in response to changes in other variables; observed outcome or result from manipulation of another variable"
Mediating (MV)	"A variable located between the independent and dependent variables, which explains the relationship between them (IV → MV → DV)"

Moderator	"A new variable that is introduced which will affect the nature of the relationship between the IV and DV"
Control	"Additional observable and measurable variables that need to be kept constant to avoid them influencing the effect of the IV on the DV"
Confounding	"Extraneous but difficult to observe or measure variables that can potentially undermine the inferences drawn between the IV and DV, need to be considered when discussing results, to avoid spurious conclusions"

The experiments can be conducted in the field, that is, in real-life settings such as the workplace or specific social settings. The field-based experiments are more common in business research where certain conditions or specific scenario is employed for the experimental condition.

3.3.2 Survey

The Survey strategy is prevalent in the business and management domains. It is grounded on a deductive approach, focusing on answering questions like 'Why,' 'Where,' 'How,' 'Who,' which are exploratory in nature. Survey strategies using a questionnaire allow a standardized format to collect data, contributing towards reliability and are perceived to be economical against other strategies such as an experiment. In many cases, the results of surveys are easy to communicate, explain and comprehend by various interested parties.

The Survey strategy can be used to describe relationships between various variables, enabling to present relational models. Surveys' collected data is generally quantitative in nature, enabling results to be presented using descriptive and inferential statistical techniques. Although the survey-based methods give more control over the research process and control over sampling to collect data, care should be taken to ensure the sample is representative of the population data. To this effect, it is crucial to design and pilot the survey instruments such as questionnaires with due diligence and, where possible, use reliable and tested scales. Another disadvantage of the survey is the potential bad design of the survey instruments. For example, a questionnaire that is long in terms of time consumption from the participants' perspective and couples using confusing language from the participants' perspective will lead to erroneous results. Therefore, it is essential to pilot and test the survey questionnaires before the survey's full launch to a larger population. In Chapter 5, the aspects of questionnaire design are fully discussed, including the reliability and validity measures.

3.3.3 Archival and documentary (secondary) research

In recent decades, the digitization of the data related to all aspects of our lives, such as social or business exchanges in the form of emails, government and organisational reports, business processes, customer reviews, media documents, digitization of library records across the globe and other media, presented tremendous opportunity to access such resources across the globe, in many cases traditionally hard to reach points to collect such records and data. The digitized data comes in many formats, such as:

- Social exchange documents such as emails, blogs, social media postings and responses, SMS, and online forums.
- Individual data and records, for example, individual diaries, calendar entries, notes and observations captured using multimedia.
- Governmental sources such as parliament and committee proceedings, national statistics, government departmental reports.
- Organisational records such as annual reports, contracts and agreements, policy and strategy documents, news releases, meeting logs, administrative records.
- Machine generated data such as server logs, sensor-based data, algorithmic trading data.
- Media records such as tv and radio broadcast media, newspapers, articles, and social media channels.
- Ecommerce and peer trading records

Although Archival and documentary records provide an opportunity to capture rich data in reference to issues faced by people, happening in terms of trends, accounts of an event with different perspectives, enriching context, the role played by a different actor in a given situation and identifying economic pressures and constraints faced by governments and organizations; care should be taken when using such records as these documents are secondary in nature, meaning not explicitly designed to answers the researcher's research question and may present incomplete and inconsistent data. The researcher should acknowledge the limitations and address the potential issues when using Archival methods. For example, a longitudinal approach with a particular research method could be used to address the issue of incomplete and inconsistent data, such as Grounded Theory Method (GTM), where constant comparison and evaluation of the data are used to ensure reliability and consistency of the findings.

3.3.4 Case Study

Case Study research is a common approach in the social sciences and management sciences. In which the subject/s are commonly studied in natural settings, such as organisational and social settings, with certain political, legal, behavioural or economic contexts (Adolphus, n.d.). Yin (2018, p. 13) defines case study as "… an empirical method that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident". The definition emphasises the coverage of contextual conditions to clarify and understand the phenomenon under investigation. The case study approaches best suits when the nature of the inquiry is explanatory and addresses descriptive questions, e.g., how or why subjects behave in a certain way, what happened and what reactions were caused. The case study could be single

or multiple case studies. Traditionally, the case is about a person, for example, a nurse or teacher within an organisational setting dealing with specific situations and data collected in this reference. A case could also relate to an event or entity such as a group of families. It is important to differentiate between the research case study and the non-research case study, typically used to teach and consolidate a topic. The research case study follows a research procedure: defining scope through setting the propositions, practical considerations for the choice of the case to address the research question, unit of analysis, instruments of data collection, case reporting and analysis and validity and reliability considerations (Baxter & Jack, 2008). The common objection to the case study approach is the lack of rigour. So, it is vital to understand and apply instruments for validity and reliability. Empirical social science research commonly uses four tests to evaluate the quality of research design, providing a framework for establishing the research method's rigour. The four tests are: construct validity, internal validity, external validity, and reliability. The construct validity focuses on the use of correct operational measures for the study, such as using the number of sources and sufficiently defining the operational set of measures, for example, specifying criteria of acceptance for an identified trend to link to the outcome of an event within the case study setup. Having a chain of events documented improves construct validity. The second test, internal validity, is relevant to causal and explanatory studies as compared to exploratory and descriptive studies. Internal validity focuses on pattern matching and explanation building and checks interactions such as mediation and moderation effects. The third test deals with the generalizability issues in the case study research, evaluating and using theory in single-case studies and using replication logic in multiple-case studies. The fourth test is reliability, dealing with 'documenting the research procedure' so the later investigators are able to conduct the same study and reach the same findings and conclusions. It is advisable to construct a case study database and case study protocol (Yin, 2018). A case study is not a quick option and requires considerable skill on the part of the researcher to design, conduct the case study and validate the findings.

3.3.5 Action Research

Action research is reflective in nature and focuses on one's practice in a particular way to check whether it is as one feels it should be and allows for discussions and inquiry as components of the research. Typically, it is participatory and collaborative in nature to develop solutions to real organisational problems (Saunders et al., 2019). For example, in school settings actions research will entail collaborative activity among colleagues to identify and propose and work out solutions to everyday issues and real problems faced and experienced in school. Instead of heavily relying on theory, action research allows practitioners to focus on matters and activities that are more relevant and closer to them. They will be able to influence resolving these (Ferrance, 2000). The Action Research process is iterative and comprises several stages: a process of specifying or constructing issues; planning action; taking action; and evaluating action. The specifying issue involves fact-finding and analysis, enabling planning for action and decision making for the actions to be taken. The outcome of this will be used for the

evaluation of the action, and the whole cycle would repeat itself. The process goes on through multiple stages to explore and assess the solutions for organisational issues. Action Research is a collaborative and social process targeting specific issues within the organisational settings, conducted in real-time. The purpose of Action Research is to facilitate change. Action Research is dependent on the quality and ownership of participation. The generalization of the findings may not be possible readily, and other investigation modes may be required (Coughlan & Coghlan, 2002). Well planned Action Research has the potential to offer an enriching and worthwhile experience for those involved.

3.3.6 Ethnography

Ethnography is the study of culture and group/s of people interacting within their social world. Ethnographic studies had their roots in studying primitive societies and started in the colonial period, founded by researchers like Malinowski, who lived among south pacific islanders during the early 1900s. Prior to the 1900s, early ethnographic information was collected by 'amateurs' like missionaries, colonial administrators and travellers, whose focus was collecting artefacts, categorizing and classifying the collections and describing the exotic and 'supposedly' backward people (O'Reilly, 2011). In the early twentieth century, ethnographic studies started to be used to understand urban cultural and social issues, led by the Chicago Booth School research (Saunders et al., 2019). The researchers conducting Ethnographic research spend a significantly long period of time in the field with the research subject, capturing detailed observations and experiences, leading to developing deep insights into routines, interactions, language, symbols, rituals, shared meanings, hierarchies, frustrations, loyalties, feelings, relationships, explicit and implicit social contracts and risks (Myers, 1999). One of the major drawbacks of Ethnographic studies is a long time needed to conduct the study and analyze and compile the findings. Typically, Ethnographies spend a long time with one group in a specific cultural and social setting, leading to a lack of breadth. Although, as more Ethnographic studies are conducted for specific societal setting and cultural context, the latter criticism will be less applicable. Hence, care should be taken when generalizing the findings of the Ethnographic studies at the early stage of a phenomena occurring, specifying the limitations of the research clearly would increase the validity of the research.

3.3.7 Grounded Theory Method (GTM) - Justifying the Use of GTM as a Research Strategy

Grounded Theory emphasises the 'Why' question as well as 'What' and 'How' questions. The grounded theory comprises the coupling of the research product and the analytic method of producing it (Charmaz, 2008a). The two American social scientists, Barney G. Glaser and Anselm L. Strauss introduced the Grounded Theory Method (GTM) in 1967. They stressed the importance of developing theory from social research grounded in data compared to theories logically derived from priori assumptions. Hence GTM is inductive in nature, based on the discovery of underlying theory emerging from the systematic analysis of the data (Kenny & Fourie, 2014). The Grounded theory has proved to be an effective approach when human interaction needs to be captured in varied and complex situations. The GTM has

provided the base for an interactive, emergent and fluid research process and repositioned to capture multiple perspectives, uncertainties, acknowledge partial knowledge and variations in empirical experiences and theoretical conceptualization (Bryant, Charmaz, & Urquhart, 2012). In the thesis, the nature of the investigation is complex and exploratory. Hence, with inherent uncertainties, the GTM is further explored in the section below for this research study's investigation method.

Figure 4 shows the GTM process used - illustrating the relationships and themes derived from the empirical data using the constant comparative method with three main stages open coding, theoretical sampling and selective coding, where the analysis and data collection continually inform one another.

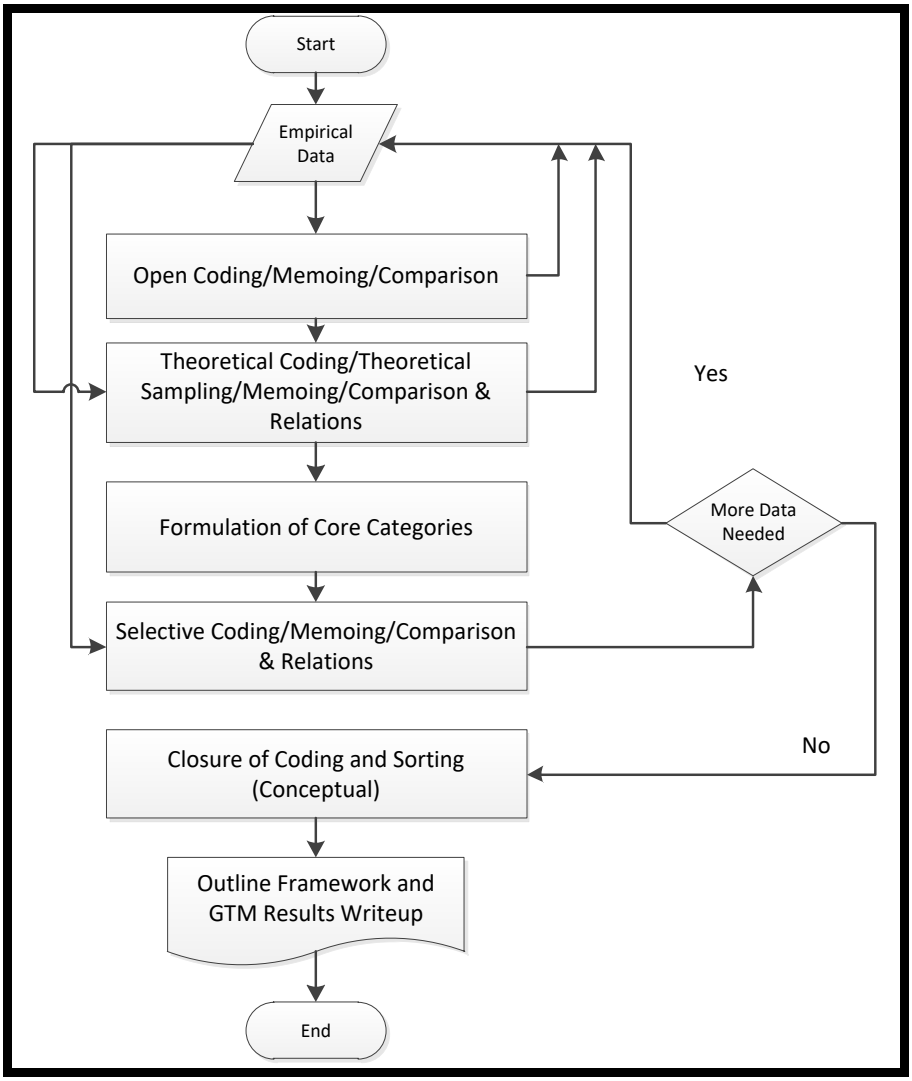

Figure 5

The flowchart depicting GTM process.

3.3.7.1 Data Management and Analysis

Relationships and themes were derived from the data using the constant comparative method with three main stages open coding, theoretical sampling and selective coding ((Glaser & Holton, 2004); see also (Niekerk & Roode, 2009); (Razavi & Iverson, 2006, p. 462)). In this process, the analysis and data collection continually inform one another.

3.3.7.2 Open Coding

This is the first stage of the process. Open coding involves analysing and codifying data line by line and assigning the extracts to concepts or categories (Glaser, Strauss, & Elizabeth, 1968). Comparing similarities and differences and exploring patterns in data will assimilate the extracts around categories to highlight key emerging concepts. This assimilation process generates core categories. The researcher works directly with the data dissecting it through open coding, leading to the emergence of initial categories and clumping of related concepts, providing the basis for the theoretical sampling and selective coding to consolidate and saturate core categories and associated concepts (Holton, 2010).

3.3.7.3 Theoretical Coding

Theoretical coding is the conceptualisation of the data through coding. The data present incidents or points of interest, which are analysed and coded. This provides initially substantive categories which, at a later stage, relate to the theoretical categories through constant comparative analysis (Glaser, 2005). Categories are depicted by core variables, each accounting for the most variation in the data. The constant comparative method is an essential component of the grounded theory, pertaining that every aspect of data, i.e. emerging codes, initial categories, core categories, properties, dimensions, relations, are constantly compared with all other parts of the data to explore the full extent of variations, patterns, similarities and differences in the data (Hallberg, 2006). The theoretical coding results in increasingly explicit relationships between the categories associated with the core category (Glaser, 1978, as cited in Wiesche, 2017). Theoretical coding is different from a mere summary of data, enabling to build theory through the conceptualisation of the data through coding, elevating data to an abstract level (Simmons, 2010).

3.3.7.4 Memoing

The memoing is the process of recording notes on the matters that emerged and analytical thoughts through GTM processes, e.g., open coding, selective coding etc. This led to shedding light on findings, conceptual relationships between categories, directions of further investigations & probing, emergent theoretical points, and this goes on in parallel with data analysis. Writing memos is not about descriptive narrations of the accounts and observations; it is about the concepts and relationships between them, especially the connection to the core categories (Simmons, 2010).

3.3.7.5 Theoretical Sampling

Theoretical sampling is a mechanism to collect the next set of data and simultaneously analyse and code the collected data. This process ensures the collection of relevant sets of data to develop the emergent theory (Adolph, Hall, & Kruchten, 2008). The theoretical sensitivity is an important aspect of the process, enabling researchers' to use personal and professional experiences, guided by systematic methodological knowledge and explore data in new ways, increasingly applying abstraction about the data to develop a theory (Glaser & Strauss, 1967, as cited in Hallberg, 2006).

3.3.7.6 Selective Coding

Open coding leads the way for selective coding to explore the concepts, themes and properties related to emergent core categories. The core categories become the focus of the study and require selective data collection and coding. The selective coding process enabled further coding to focus on the concepts and relationships around core categories, enabling a focused and comprehensive theoretical framework to emerge (Razavi & Iverson, 2006). In essence, this process entails identifying categories and focal concepts related to the core category or core variables, enabling reporting examples and elaborating the reasons for abstraction (Wiesche, 2017).

3.3.7.7 Closure of Coding

Theoretical saturation indicates the stage where new data addition does not add to further exploration and further understanding of the concepts or themes (Loonam, 2014). The data collection is carried out until the theoretical saturation is reached, meaning adding new data will not add to the structure of the theoretical framework and relationships established (Hallberg, 2006).

3.3.7.8 Sorting and Write up

Sorting is the process through which data and ideas are theoretically ordered (Glaser & Holton, 2004). The sorting of conceptual indicators related to core categories is done through memos. The conceptually sorted memos provide the outline of a theoretical framework. This led to the Grounded Theory's write up result in a set of hypotheses linked through a theoretical framework (Glaser, 2009). The Grounded Theory provides a systematic qualitative methodology where the abstraction process is systematically conducted. The conceptualisation of empirical data through constant comparison and relational binding constitutes the theory-generating process, enabling to discover and articulate relations in the data (Hallberg, 2006).

3.4 Research Design (discussion on a longitudinal study, data collection, reliability, and validation)

The majority of studies evaluated a particular ELES's design features using a survey methodology (Mueller & Strohmeier, 2011) and are generally limited in scope to provide deep insights into evolving users' perceptions of ELES effectiveness. Choudhary and Patnaik (2020) conducted a critical review of

138 articles published in tiered journals from 2000 to 2018 and emphasised the importance of developing further deep insights, especially considering different stakeholders need to observe the changing dynamics of the
learning environment and they are able to adapt for better diffusion of e-learning tools. This research investigation uses Glaserian Grounded Theory-GT approach (constant comparative analysis). The Glaserian GT approach is a general iterative and systematic method to develop theory and incorporate qualitative and quantitative data (Glaser & Holton, 2004). It is well-established and commonly used where meaning and relationships are not directly evident. Therefore, it is suitable to avoid injecting any preconceived theoretical constructs derived from existing models and literature for exploring effectiveness factors.

Literature indicates Grounded Theory is an emergent and systematic research strategy, comprising concurrent collection and analysis of data, development of codes from the data, constant comparison, memos, and theoretical sampling. Different analytical techniques have been in use for the Grounded Theory Method (GTM), showing the influences of different schools of thought in the evolution of GTM. For instance, Strauss and Corbin (1998, as cited in Saunders et al., 2019, p. 668) emphasise structure when establishing relationships between categories, depicted as axial coding. The process starts with an initial sampling of the data based on a general theme of interest, and open coding is conducted at this stage, which is essentially disaggregation of data in units, named open codes. The more flexible approach by Charmaz (2014, as cited Saunders et al., 2019), comprised of two main phases of coding, initial and focused coding and theoretical coding approach developed by Glaser (1978, as cited in Saunders et al., 2019). Although Charmaz (2008) gave a social constructivist dimension to grounded theory, Strauss and Corbin's methodical procedures gave grounded theory objectivist grounding. The objectivist assumes the data speaks for itself and is self-evident; uncertainties, partial possibilities and multiple views/layers are unseen. In contrast, the constructionist approach assumes the reality of being multiple and constructed and manifest under particular conditions and considers the researcher's positionality, enabling the researcher and researched to co-construct the data – data become the product of the research process, not simply observed objects of it.

The benefit of the longitudinal nature of the study and constant comparison to compensate for the incomplete and inconsistent nature of the data, e.g., when using Archival or Documentary data. The Glaserian grounded theory is termed as classical grounded theory and more close to the objectivist paradigm, where the researcher is guided by the realities discovered through systematic analysis of the data

3.4.1 Data Collection for GTM Methodology

The studies based on empirical inquiry are subjective in nature and are based on irregular data. In this context, it is important to understand and follow GTM protocol rigorously as a scientific path of the research, allowing other researchers to follow the same path for data collection and analysis, and ultimately, conclusions derived.

3.4.2 Data Collection

Over the last decade, there has been big traction in using Web-based materials as s secondary data source generated by online users and communities for research purposes. The data stored in web pages, especially for social communication channels such as discussion forums, blogs, and pages set up on social networking sites, provides rich data sources with perspectives, providing researchers to utilise this research project source. However, several considerations should be taken into account in using this type of data, including authenticity, locating it, and evaluating utility concerning the research investigation and objectives (Saunders, et al., 2019). The ethical considerations should be taken into account, which will be discussed later in this chapter.

Survey-based secondary data is another type in this genre. This type of data is originally collected for some other purpose, using data collection methods such as questionnaires, usually relating to organisational settings, people, or households. There are further three types of survey-based secondary data: censuses, continuous/regular surveys, and ad hoc surveys. Censuses are distinct in a way as conducted by the governmental body, and participation is obligatory. The published tabulation and results are generally available via government official websites, such as Office for National Statistics in the UK. The raw data may cover decades or hundreds of years, depending on when systematic surveys were started in a particular country or region. Such data is high quality and accessible in a compiled format, widely utilized by interested organisations and individual researchers.

The Continuous surveys are conducted over time, and data collection could be carried out throughout the year/s. Governmental, non-profit and professional research organisations, e.g., Rand corporation (Rand corporation, 2001), research bodies, research groups and individual researchers. These surveys could include general-purpose market research surveys, economic conditions surveys, impact of governmental policies, behavioural or social trends. These surveys could be costly and generally conducted by a commercial organisation and may have sensitive information, so it is often challenging to have access to this type of survey data, especially in the raw format. Ad hoc surveys are one-off surveys and are very specific in the purpose and subject matter. Generally, these involve data from questionnaires and interviews conducted by individual researchers and governmental bodies and business and non-profit organisations. Because of the data's ad hoc nature, it is difficult to find out relevant surveys. Access to raw data from an ad hoc survey is often obtained from a data archive of a particular organisation or research body/institution.

The multiple source secondary data is put together entirely from the document or survey or both, combining different data sets. For example, regional or national newspapers can be accessed through online databases such as Nexis, offered by many university libraries, providing company information stored in databases, enabling researchers to access comparable data of 18 million public and private European companies. This type of data compilation enables researchers to have access to longitudinal data. Table 6 below provides an overview of secondary data sources and comparisons in terms of strengths and weaknesses. The next section will give more discussion on the use of documentation and secondary data for this research study's first part.

Table 5

Secondary Data: Strengths and Weaknesses and Sources

Sources of Evidence	Strengths	Weaknesses	Potential Sources
Documentation (White & McBurney, 2012)	• Availability can be convenient and possible to review repeatedly. • Not restricted based on specific data collection design. • Access to relevant records: exact names, attributes, references, and details of the events. • Longer span of time could be incorporated for the investigation, including more events and settings as per investigation requirements. • Saving in resources (time and money) – raw data format readily compatible	• Collected for a different purpose – may not be appropriate for the intended research question. • Difficult to track data collection bias. • Difficult to report bias-effects, e.g., the bias of an author. • Only partial access may be available or blocked under certain conditions. • In some cases, it may be difficult to retrieve the data again with the same conditions. • Access to data may be costly, e.g., commercially produced market research reports	[Text] • Reports to Shareholders • White Papers. • Reference material from the relevant case organisation • Organisations communication records, e.g., Emails, Memos, • Reference material form organisational websites. • Newspapers • Magazine articles. • Tweets • Blogs • Diaries • Interview Transcripts • Reports and Minutes of Committees [Non-Text]

	with analytical software. • Facilitating Triangulation of findings • Offer permanence of data – ability to be checked by others easily		• Television and Radio recordings • Photographs • Web Images • Media Recordings of News Reporting • Voice Recordings • Video and Films, including available on Social Media Platforms

Archival Records (White & McBurney, 2012)	• Same points applicable as above for documentation • Precise • Meta-data may readily be available • Potentially cost-effective	• Same points applicable as above for documentation • The data format may not suit the research study. • Sometimes access to the data source is available only for a limited time.	• Previous Projects Records • Case Records • Company Reports • Patient Records • Government Unclassified Records
Surveys (Lawrence, 2014)	• Supports Positivist approach. • Good Survey design will yield accurate, reliable, and valid data. • The majority of professionals and people from the public are familiar with the surveys. • Able to perform statistical analysis on the data gathered. • Appropriate to evaluate self-reported beliefs or behaviours. • Can administer multiple instruments for variables. • Hypothesis testing is possible using obtained data. • Can be used for exploratory and descriptive or explanatory research.	• Can yield misleading results. • Poorly designed surveys can induce biases. • Due diligence needed to establish a causal effect. • Preparing and analysing data is time-consuming.	[Censuses] • Government's Censuses • Census of Population • Census of Employment [Continuous and Regular Survey] Labour Market Trends Survey Employee attitude surveys Patient quality of service surveys Internet opinion polls [Ad hoc Survey] Government's survey Educational Surveys

Multiple Source (Holmbeck, Li, Schurman, Friedman, & Coakley, 2002)	• Offer multiple perspectives. • Able to compare and evaluate data across multiple sources. • Useful for longitudinal studies.	• Additional source may be used unnecessarily, existing source. • Resource Intensive • Authorization for use may be needed for each source. • Analytical Process may have additional complexity when combining data from multiple sources.	Longitudinal EU Publications Big Data Sets Journals Surveys Documentation

3.4.3 Justification for the Data Sources Used and Data Triangulation

The secondary data sources should be considered with the same vigour and caution as the primary data is collected. It is important to evaluate the secondary data sources' suitability for the research against the research question and objectives. A set of data that may look suitable but on closer examination may not be appropriate. Rejecting unsuitable data earlier in the research may save valuable time and resources. One of the advantages of secondary data is that the researchers are in a position to evaluate the data prior to its use. The possibility can save valuable time, and unsuitable data could be rejected early in the data collection process, consequently avoiding waste of effort (Saunders et al., 2015, pp. 335-344). The secondary data used should be suitable in terms of coverage to ensure the data cover the population for the intended investigation and for the time period it is needed and include the data variables or entities of data to answer the research question. The process entails the elimination of unwanted data, and the remaining data is sufficient for valid analysis and able to achieve data saturation as required in many qualitative methods (Hakim, 2000 as cited in Saunders et al., 2015, p. 336).

The social media space is increasingly attracting people of all ages to join the ranks and participate in media production, discussions, reviews and critiques (Kaplan & Duchon, 1988). Social media has a significant impact on how many people, organisations, communities, and governments communicate and interact. Social media's backbone is user-generated content, created and disseminated by sharing applications, impacting people and communities ability to reach, connect, and influence on a global scale.

Blogs are an important part of the social media landscape. They could be considered as space for a personal diary, a website and space for online collaboration around particular topics and building

communities classified as *'high'* in reference to *'Self-presentations/Self-disclosure'* and *'low'* in reference to *'Social presence/Media richness Medium'* (Kaplan & Haenlein, 2010, p. 62). Self-disclosure is defined as *"... the conscious or unconscious revelation of personal information (e.g., thoughts, feelings, likes, dislikes) that is consistent with the image one would like to give."* (Kaplan & Haenlein, 2010, p. 62). This classification is significant as it points out that the Blogs media potentially shed more light on the author's internal thought processes and feelings about a particular subject – blogs also provide opportunities for interaction with others via the addition of comments in the blog resulting in potential insights on the subject area. The blogs chosen had at least one comment associated (to capture the dialogue) with them as the choice of data for this exploratory study for the following reasons:

1. Adar et al. (2004) highlighted the value of communication generated through listings and commenting in blogs as "… intended to relay the latest interesting, humorous, or thought-provoking information the user has run across."
2. For this study, the blogs provided varied, high volume and high dimensional data sets with a 360-degree view to start exploring users' perceptions, success factors and issues related to ELES.
3. The study is longitudinal, and the analytical process spanned more than four years, capturing the trends and depth – some of the technologies didn't even exist at the start of the study, e.g., MOOCs. The collection of online data was a suitable option to capture the more varied experience and reflections of the users globally, compared to the questionnaires or interviews as the method of data collection for a specific system.

This is appropriate as social media blogs with associated comments were chosen for the investigation to obtain a view of discussions leading to a deeper understanding of the concerned field of study. Blogs used were taken from 2005 onwards to capture the trends and relationships over a significant period (approximately ten years), capturing diverse and complex data spread globally. The GTM process creates a conceptual, theoretical framework in the concerned field. The research starts with the general area of interest, and the key concepts emerge from the collection and analysis of the data.

Theoretical sampling process in GTM enables researchers to gather data in a systematic manner, without unnecessary constraints. This also opens up various different collection techniques and data types; for example, interviews, observations, surveys, historical records, media records and social media-based data. Theoretical sampling provides a tool for the researchers to follow emergent storylines and sample to tap into the richness offered by the data, guiding on analytical grounds for where to sample from next, avoiding superficial analysis (Urquhart & Fernández, 2016). The social media-based data particularly offer a rich data source, enabling researchers to explore unexplored perspectives. In many cases, social media accounts offer opinions and accounts of experiences and perspectives that are not constrained by the policy lines of the organisations and pressures, hence, offering freedom and richness in the data source. Theoretical sampling is an especially useful tool to leverage this type of data and enable researchers to pursue a particular phenomenon in-depth and for a longer period of time. Social media-based interactions and accounts present long term and persistent accounts, showing the evolution of

arguments, ideas or experiences. The property of the data is extremely valuable for longitudinal studies, aspiring to capture the full extent of dimensions pertaining to the matter of investigation.

The blogs and comments used were written by academic practitioners, ELES administrators, education community members, and ELES learners/users. The keywords, relevance of discussions carried out via the Blogs, the context of the information, the writing styles and elaboration on experiences were taken into account when the blogs' data was collected for its authenticity. The data's sample size is significant and from varied sources to eliminate any bias in the data collected. Overall, 187 blogs were collected iteratively for this study in total with more than 800,000 words, including associated comments, which helped establish the authenticity of the blogs used. The summary and the meta-data for the Blogs data are given in the section and Table 6 below.

Table 6

Meta-Data for Blogs; B denotes Blogs; C denotes Comments

	Role	**Gender**	**Year**	**Blogs**
Instructor/Practitioner	81B; 296C			187
Learner/Student	41B, 359C			
VLE/Technical Expert	47B; 74C			
Unknown/Other	18B; 131C			
Male		110B; 354C		
Female		44B; 266C		
Unknown		33B; 240C		
2006			3B; 7C	
2007			17B; 53C	
2008			6B; 12C	
2009			16B; 107C	
2010			35B, 172C	
2011			13B; 65C	
2012			18B, 90C	
2013			27B, 68C	
2014			29B, 99C	
2015			15B, 148C	
2016			8B, 39C	

Various attributes of the data were identified with the following criterion.

Gender verification: name, profile, profile picture, dialogue via comments, self-identity language constructs.

Learner/Student: role description, language constructs, self-identification

ELES Instructor/Practitioner: role description; language constructs, self-identification

Example Extract: *"I think that the VLE will only succeed if the initiative comes from the top down…my head said putting info/lesson plans on etc, is an admin task and most teachers said it as just another layer added to their already buddy schedule.*

I'm trying to use it for forums for the children to comment on work but, even though I'm head of ICT, I don't really see many benefits at this time."

ELES/VLE/Technical Expert: role description; language constructs, self-identification

Example Extract: *"Educational technologist at Cardiff Uni, photographer, Wordpress & Doctor Who fanatic, Pembrokeshirephile"*

Unknown/Other: role description; language constructs, self-identification

Example Extract: *"VLE's are a solution looking for a problem. My daughter just came home from school after being lambasted by her teacher for handing her homework in on paper, as opposed to online.*

It just seems like a lot of extra work, and less say for parents"

Blog's Year Identification: Blog and comments time stamp

"…03/01/2010 at 22:03 | Reply"

The use of the Blogs as the secondary data and codification process Grounded Theory Method process is discussed in detail in section 4.1 of Chapter 4, leading to the discussion on the findings and formation of the proposed ELES Effectiveness model.

3.5 Research Process Overview

This research investigates the effectiveness factors of E-learning Environment and Services in contemporary and varied settings. For this purpose, a two-stage approach was used for E-learning effectiveness model development and validation. The first stage was a longitudinal investigation using the Grounded Theory method to develop the E-learning effectiveness model from the unstructured secondary data, as depicted in Chapter 4. The second stage was the application of CL-MIM for the E-learning effectiveness model and validation of the proposed model. For this purpose, the measurement model and structural model were validated using the PLS-SEM approach using primary data, as depicted in Chapter 5, and findings were presented in a systematic way.

The overview of the research framework and the overall process for the research investigation is depicted below in Figure 6. The details of each process stage are provided in the relevant chapters, as noted above. The research process diagram below helps to have an overall picture of the research activities.

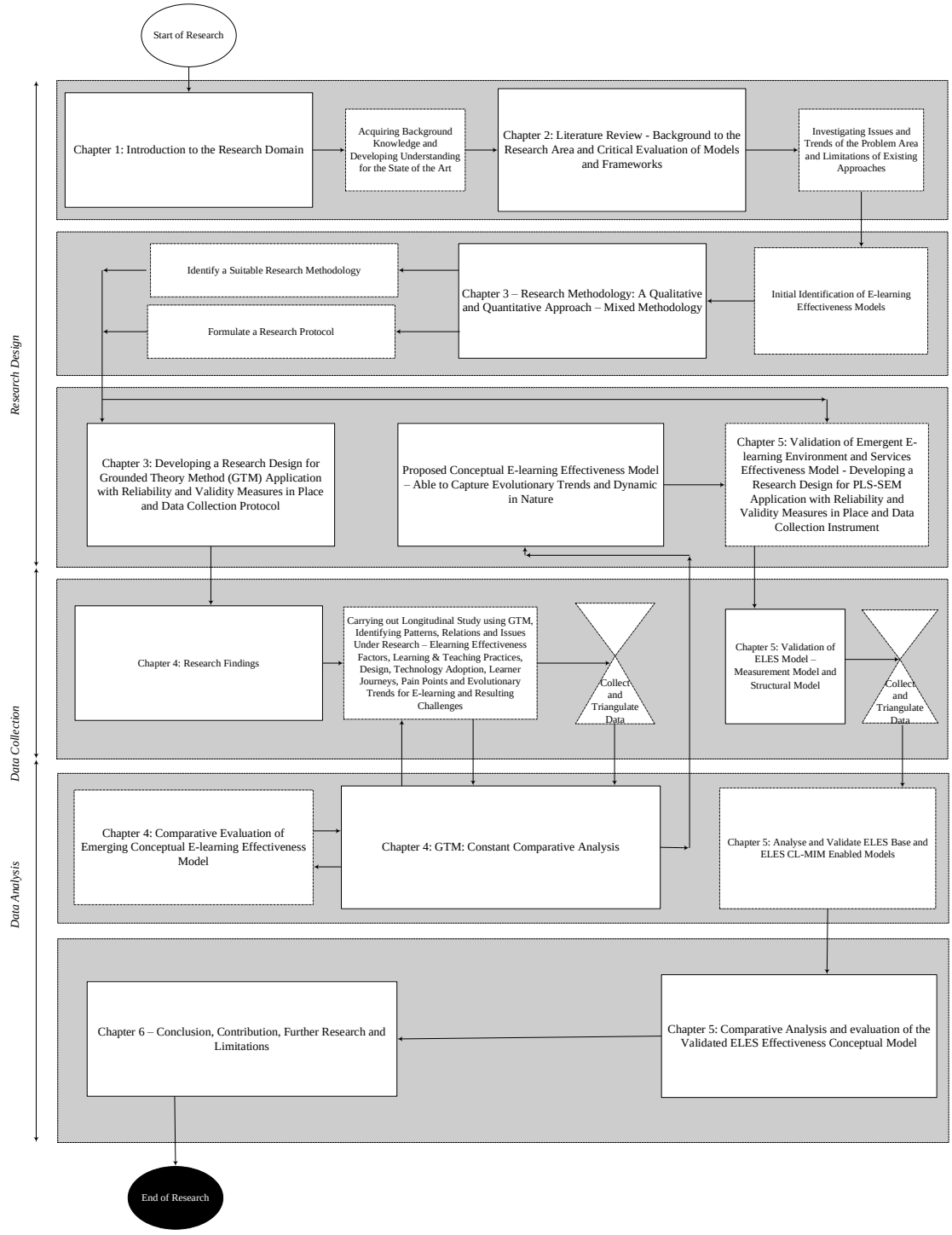

Figure 6

Overview of Research Process

3.7 Ethical Issues and Compliance

Ethical considerations are a critical aspect of any research investigation. The etymology of the word ethics points to the Greek word *ethos*, meaning *character*. Ethics deals with integrity, morality, fairness, truthfulness, and integrity. Knowing what is right and wrong is the subject of morality and acting on this knowledge is subject to integrity. The research investigation from an organisation such as HE

institutions always goes through Ethical approval procedures. Ethical considerations are essential whether the research is based on primary data sources or secondary data sources. The ethical concerns are greatest when the research involves human participants, and it doesn't depend on whether the contact was in person or done remotely or via other means (Leavy, 2017, pp. 23–53).

This research investigation put in place a number of safeguards for ethical considerations. The data obtained from the questionnaire was kept secure on the password-protected computer. Where the data was placed on portable storage devices, it was protected with encryption and password protection. The physical copies were kept secured in a locked cabinet. The data were anonymized for any published material, so the persons' identities are hidden, including anonymity of any personal details. As per Birkbeck College's Research Ethics requirements (Birkbeck College, 2021), the 'Proposal' form for Ethical review was submitted to the Research Ethics officer and approval was obtained (appendix f) for this research investigation before the distribution of the questionnaire for the data collection purpose. The data protection, privacy and GDPR considerations were taken into account and safeguards were set appropriately. Participation for the primary data collection was voluntary, and a consent form was used with an explicit declaration that the participant of the survey could refuse to take part in the study without giving any justification. The top questionnaire section also briefed the participants on purpose and gave a brief overview of the research investigation. It was ensured that the secondary data used had no copyright or access restrictions associated, and the data was openly and publicly available. Any identification and personal data were anonymized in the publication of the journal paper and this thesis report. Whilst performing the research to the highest standards of professionalism, independent thought and application of ethical principles were observed as specified by the Birkbeck College Ethical guidelines.

3.8 Conclusion

This chapter presented a rationale for the use of appropriate research philosophy, leading to choosing and research methodology for this thesis. The choice for the research methodology was justified and compared against a range of research methodologies. A systematic analysis is presented for the research process with a well-developed framework and provides an understanding of the broadest possible terms. A discussion of the epistemological stances and their suitability was initially provided. The researcher has justified using an interpretivism stance for the first part of the research for a longitudinal exploratory study in the specified field. The rationale for the chosen method of Grounded Theory Method presented with comparative evaluation. The data collection procedures and measures to ensure the validity and reliability of the data and research methodology are presented. The reader is also pointed to the fifth chapter, where 2nd part of the research is conducted, including the justification and application of PLS-SEM method for the validation purpose. Ethical considerations of the research study are reported as well.

Chapter 4: Research Findings and Emergent Elearning Environment and Services Effectiveness Conceptual Model

Overview

In the previous chapter, the researcher justified and analysed the research methodology employed in this thesis. This chapter applies the research methodology to develop test the proposed conceptual framework for ELES. Using GTM seven distinct concepts/dimensions emerged. These are discussed in detail below with sample representative data items. The elaboration, theoretical constructs and applications for the model's core dimension are also presented in this chapter. Discussions on each finding's relationships and attributes are also carried out, including the model's cohesive nature.

4.1 Grounded Theory Method

4.1.1 Data Analysis and Process

As depicted in Figure 5, initially, blogs related to e-learning and ELES topics were collected and used for open coding - started by 'close reading' and 'integration' of data (Charmaz, 2008b). At this stage (open coding), the blogs' data was studied, and incidents were identified in the data.

This first stage of the process analysed and coded the data line by line, assigning the extracts to concepts or categories.

Theoretical coding is the conceptualisation of the data through coding. After initial analysis to establish core categories, further blog data, specifically related to the emerged topics, were gathered and used to understand and probe the issues and relations in greater depth. This provides initially substantive categories which, at a later stage, relate to the theoretical categories through constant comparative analysis (Glaser & Holton, 2004). Concept and theoretical coding facilitated the collection, analysis and coding of the next set of data. This process ensures the collection of relevant sets of data to develop the emergent theory (Adolph et al., 2008). Once the theoretical framework was matured, comparisons and validations against the existing body of knowledge were conducted to identify the newly emerging concepts based on the findings of the study.

Sorting is how data and ideas are theoretically ordered; sorting of conceptual indicators related to core categories is done through memos (Wiesche, 2017).

Memoing (Memo Writing) process was used for recording notes on the matters emerging, analytical thoughts throughout GTM processes capturing 'ideas in process and progress', providing traceability for the researcher and the tool for building and writing up the theoretical framework cohesively as suggested by Charmaz (2008b). This revealed findings, conceptual relationships between categories, directions of further investigations & probing emergent theoretical points, and parallel data analysis. An Example of Memo reference related to data reference is given here, including the Code example.

Memo & Key Point: ELES CA Data 08 Ref 1 M, "The discussion points to the need for appropriate pedagogical implementation in online courses. The problem identified is the prevalent use of online courses to disseminate factual information - not focused on the learning process – lack of ELES specific instructional design and assessment approaches (needs further probing for the extent of the problem during next iteration of data collection)"

Code: "lack of application of pedagogical instruments."

The emerging themes and relationships were identified using the computer-assisted qualitative data analysis software (CAQDAS), NIVIVO (QSR, 2021), increasing transparency and methodical rigour (Figure 7). The coding and constant comparison facilitate in sorting and synthesising a large amount of data, facilitating the empirical phenomenon and comprehending explicit and latent emerging perceptions, e.g. "effective pedagogical driven training", "importance of informed learner choices" - including diminishing of the strands not relevant to the scope of the emergent themes, leading to the category generation (Charmaz, 2008b). Figure 7 shows an example of a category generation based on this process. It is important to note that core categories were consolidated with theoretical sampling and selective coding as outlined in sections 3.3.7.5 and 3.3.7.6. This process enabled the researcher to increasingly apply abstraction about the data and facilitate theory generation.

Category: "ELES and Pedagogy"

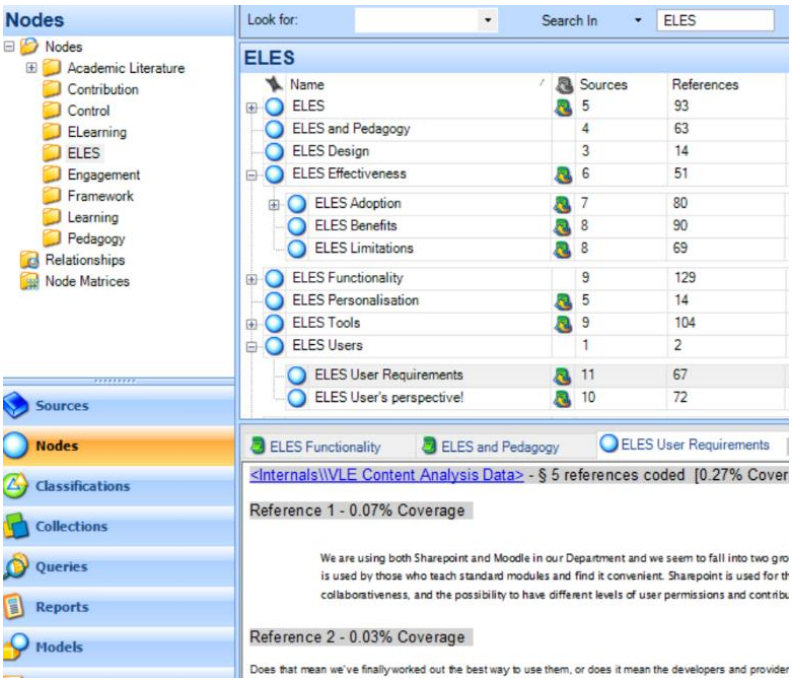

Figure 7

Showing the use of NVIVO CAQDAS for the research study

This analytical process is longitudinal in nature, spanning 2011 to 2016 and went through hundreds of iterations until theoretical saturation was reached. This process is shown in Figure 5 and carried out using NVIVO software, as shown in Figure 7. The data collection was stopped at the theoretical saturation point, i.e. when new categories/concepts stopped emerging despite the inclusion of new data (Aldiabat & Le Navenec, 2018).

The conceptually sorted memos provided the outline of the theoretical framework. The next section presents the study's findings, identifying the individual components of the model and the framework as a whole is demonstrated by the theoretical write up below (as outlined in section 3.3.7.8).

4.1.2 Results

Using GTM seven distinct core concepts/dimensions emerged. The core dimensions have emerged using the process explained in the section above (4.1.1) and by going through the iterative process as depicted in Figure 5 and using the Social Media Blogs' data over a span of 5 years. The conceptual write up is shown below, backed up with the original data as shown in sections 4.2, 4.3, 4.4, 4.5, 4.6, 4.7 and 4.8.1, discussing the theoretical dimensions of the conceptual model. The outcome of the Grounded Theory is the conceptual model (Glaser & Strauss, 2019) and is the result of sorting and theoretical write up as outlined in section 3.3.7.8, and the theoretical write up below follows the GTM guideline (Glaser, 2009)

and style followed by other researchers in the field (Fletcher & Sarkar, 2012; Vinckx, Bossuyt, & Dierckx de Casterlé, 2018; Wright & Graduate, 2021).

4.2 ELES Transformation, Scope and Scale

ELES is used for distance learning or to supplement face-to-face classroom-based teaching as indicated in Social Media Blog (SMB) data (sample) below together with the year it was published.

The primary focus of the ELES is to facilitate teaching and learning, course creation and provide assessment tools and feedback to the users. SMB data shows that ELES provide mechanisms to obtain information from users, e.g., using a questionnaire and providing tracking tools. This is in line with the traditional ELES closed context, as defined in Section 1.1.

> *"The system (VLE) can often track the learners' progress, which can be monitored by both teachers and learners. While often thought of as primarily tools for distance education, they are most often used to supplement the face-to-face Classroom."* – 2007

The SMB data shows that one of the characteristics users want out of ELES (closed) is simplicity; balancing simplicity and functionality would enhance the learning space's potential. This could be the key for the practitioners and learners in adopting ELES incrementally, exploring increasingly new features and methods in the learning process.

> *I would also say that if we are going down the increased choice track (as we should) then we probably do not need the expensive, bloated and overly complex institutional VLEs that we currently have. There is a reason that Edmodo is so popular with teachers and that is its simplicity. Do we need anything more complex as a first step for beginner learners and educators using the web? Interestingly a quick look at our usage stats show that very few of our educators use the VLE for anything more than admin announcements and posting Word and PowerPoint docs. – 2009*

The users' perceptions of ELES have been evolving with the advent of Web 2.0/3.0, cloud-based tools and social media availability and their wide-scale adoption. The SMB data has indicated, the ELES scope and objectives relate to functionality considerations, including communication tools to transfer and enhance ideas and knowledge; providing facilities to administer groups and social media in the context of teaching and learning; offering different options and choices to facilitate the learners and teachers which best suit them. The focus on supporting learning communities and the need for an innovative environment to enable users to personalise their own learning structures and build their network and knowledge are perceived to be essential factors for ELES effectiveness.

"Maybe a good model for a VLE is a social networking site such as Facebook. It is user friendly and an excellent tool for communication. Communication of ideas and knowledge is at the core of a school's role, use of technology in creating a VLE should surely mirror that. VLEs should above all become learning communities." -2009

Wang (2003) included *'Learning Community'* as the key factor in his ELES effectiveness model. This dimension emerges as important in many categories in this study, and users are also reflecting the desire for more meaningful interaction within the learning community. The findings suggest that the changes in the scope and scale of ELES are directly influencing the perception of ELES effectiveness and adoption by users and organisations. It is therefore important to understand the relationship of ELES scope, scale and transformation for users, practitioners, and organisations with the other factors for ELES effectiveness.

MOOCs provide a chance for institutions to reach out to a wider audience, potentially a group who may never have the chance to link with it in any other form. Disadvantaged groups, or those located half-way around the world are offered a chance, even if thinly veiled, to connect with otherwise unavailable institutions. - 2014

The ELES (blended) is valuable in users' perception and bore potential for innovative ways to complement/enhance education – reflected by a sample comment from the Social Media blogs data (SMB) below. The ELES is also perceived to support users in technology adoption in education and learning. The ELES could potentially be used as the platform for wider participation and a merging tool between formal and informal learning. Sun et al. (2008) environment dimension incorporates user interaction with others and with the environment – affecting the perceived usefulness of the ELES. This dimension could be extended to the informal setting and could potentially give users functional control to integrate services with other environments. The ELES has value in the users' eye and bears the potential for innovative ways to complement/enhance education.

"Think about lectures, which are considered structured and formal, with YouTube, other video services, lecture capture, can now be accessed when and where the learner wants them, so blurring the formal and the informal. Discussion forums on the VLE allow seminar style activities to happen without the constraints of geography or time." – 2012

"I very much agree that the VLE is not dead. Here in hampshire we will have 420 schools using our VLE by January 2010. Yes some are doing better things than others, but we are able to collaborate across infant and juniors, or whole groups of schools. They are doing things that they hadn't done before and this is all because of the VLE. Yes there are other fab tools out there (google docs, wallwisher, etc) but the VLE is definitely the starting point for many." – 2009

"MOOCs would seem to be natural venues for crowdsourcing, given the cognitive diversity and intrinsic motivations of participants. I mentioned above the wiki that [redacted] set up for his course, in which students contributed a variety of resources and how-tos. As [redacted] designed her nutrition course, she was aware that her expertise lay in nutrition in the US context but her students would come from around the world." - 2013

The traditional ELES (closed) is not perceived (shown in the sample comment below) at the forefront of the edu-tech revolution because it is used and adopted without thorough consideration of design/engineering and pedagogical principles: in most cases, new features were added on top of old technology; users and experts were not fully incorporated in the vision for implementing ELES based solutions. Readily available ELES solutions were imposed at levels where these were not designed for, e.g., university/distance learning specifically designed systems onto school level education. The ELES (open) is perceived to be still in the process of developing a suitable pedagogy that could incorporate and accommodate the scope and scale of such systems – one of the main issues with ELES (open) is related to the assessment as indicated by the sample data below.

"We found that the exploitation of VLEs at curriculum level resembled more of a cottage industry than a national technological revolution.

...used as a dumping ground or storage place for rarely used files." – 2009

"The informal learning of the past was constrained, often to an individual activity, today informal learning can be, thanks to technology, an asynchronous or synchronous, collaborative, group experience. Many learning activities that would have been considered formal before, can now, through technology, be part of the informal learning that happens. Think about lectures, which are considered structured and formal, with YouTube, other video services, lecture capture, can now be accessed when and where the learner wants them, so blurring the formal and the informal. Discussion forums on the VLE allow seminar style activities to happen without the constraints of geography or time." - 2012

"In true Internet fashion, these peer reviews were totally anonymous. I couldn't discuss with my reviewer why he or she thought my essay was lousy, and I couldn't defend my link to Fox News. I felt uncomfortable and powerless. Stupid. This is not an environment that encourages productive learning." – 2014

"Of course it's probably necessary given the "M" in "MOOC", but having experienced peer review in moocs, I get the sense of the blind leading the blind." - 2014

The above reflection highlighting the issue is in line with Kirschners' model (2004), where 'fitting pedagogy' was presented as a core dimension of the ELES effectiveness, putting emphasis on the

importance of understanding this dimension in relation to learning attributes, e.g. reflective learners, active learners, problem-based learning etc.

New ELES models (blended) are providing opportunities for learners to gain professional/industry-specific skills. Platforms such as Udemy (2021) provide corporate training opportunities at much-reduced prices compared to traditional training sources. Interestingly the merger of ELES (blended) with traditional corporate/professional training setups indicates a new shift in the companies' attitude towards the use of ELES to achieve their business aims and objectives.

> *Over 30% of those surveyed had experienced tangible career improvement as a result of their coursework, with 26% reporting that they had gotten a new job as a result of studying by MOOC. -2016*
>
> *"Inexpensive training isn't the only lure. Brightpearl, an online business software management developer, started to use Udemy last fall to help train a new team of salespeople. It found that the new team produced 32 percent more in revenue compared with a previous group of new hires, who had been taught in a traditional instructor-led class." - 2014*
>
> *One exceptional learner, [redacted], took over 140 MOOCs over a two-year period, while simultaneously studying as a full-time master's student. [redacted] formally studied Educational Science and Technology as well as Information and Library Science (he holds a master's degree in each) and used MOOCs to supplement his education with topics like business strategy and R coding. After finishing his studies, [redacted] landed a job in a small design unit within Capgemini, a large IT/consulting firm in the Netherlands. He describes the work in his unit as "like running a startup inside a big organization." As in any startup, versatility is required. "I can do strategy in the morning, chase down project managers at lunch, and code in R to automate sales reporting in the afternoon. A lot of what I learned through MOOCs, I apply here," he says. -2016*

ELES (open) is providing opportunities for people who were not able to acquire the level of education and training they wished - opening up new prospects and professional-level opportunities (reflected in the sample data below) and linking to the cultural change in society in the context of attitudes towards learning and development. The change is enabling learners to develop not only technical skills but also soft-skills necessary to succeed in an ever-increasing competitive world. In many ways, ELES (open) provides opportunities for wider participation and has the power to make a real difference, particularly for the less developed segments of the population at a global scale.

> *"I want to share that MOOCs are providing those who are under-employed or under-educated an opportunity to improve their lives through education and new skill acquisition. Meeting in cohorts, having a coach and providing support facilities all matter - but more needs to be done*

to really assure we are spreading this amazing opportunity among those who have not successfully acquired a college education."– 2014

The experience of taking courses on Coursera also changed me. I found myself regaining my own confidence, and gaining new insights as I interacted with learners in my courses from different cultures and backgrounds. I became more self-aware, adept at evaluating my own actions and seizing creative ideas that I hadn't previously seen. I started participating in new community activities related to mental health - 2016

Some of the ways ELES is transforming learners, practitioners and organisations as societal entities is summarised as: emphasising the importance of sharing ideas and building learning communities; building self-Efficacy in technological use; supporting teaching and learning; Enabling tracking progress; the importance of effective use of assessment tools in complex settings; Increasing confidence in skills use (including soft skills) in the learning journey and for future career and jobs; enhancing wider participation and reach.

4.3 ELES Users Characteristics, Perspectives & Requirements

The ELES User Perspective concept reveals 'What the users think of ELES?' whilst the concept ELES Requirements identifies reflections in response to the question 'What the users want out of ELES?' This section discusses the relationship between the concepts, e.g., ELES User Perspective, Requirements and ELES Functionality.

System functionality and use should be related to the perceived usefulness. The users may not successfully adopt even a cutting-edge system if they perceive that it will not affect their learning or academic results. This suggests learners' engagement is related to their perception of the system. An ELES system should provide the mechanisms and tools to improve users' perception, such as a user-friendly environment and a variety of tools and opportunities for the exchange of ideas and knowledge.

"I think the key here is not so much whether students like online ed or not, but rather how it is delivered. Online courses are often so clunky and poorly managed that they try to do too much and in doing so, accomplish too little. Online ed cannot wholly replace an in classroom experience, but it can augment it. Blogs that professors run for their class are a great example of how an online component can be successful. Just assigning dozens of readings in 'learning modules' is a lazy, archaic approach that students (myself included) despise." -2012

"More than only for an unknown distant future, these are skills which learners today need to be comfortable and confident in. It is when they are at school/college that they can practice them in a safe, peer-level environment. From learning how to conduct efficient and effective online

searches, being able to sift through the never-ending data available, to learning how to blog and use Twitter as a collaborative learning platform, educators have the responsibility to teach these skills, not only to motivate and engage learners, but to help prepare them for their futures." - 2012

Improving learners' efficacy is an important step in any learning journey; equipping learners with an appropriate skillset and frame of mind could be the difference between sustained progression and development. Moreover, the modern hyper-connectivity (ELES is a contributing factor in this) could potentially cause an imbalance in work-life balance. It seemed important (as noted below) to train the learners and practitioners for soft/life skills – smart and fresh thinking is needed on how to achieve this customisable to training needs for different groups, ages etc.

"We know that the so called Google generation and digital natives don't exist. Some learners are very familiar with Web 2.0 and technology, but many others are not. How do we provide an enhanced and enriched online learning environment to learners that are not confident about entering that environment. The VLE can be that first step, the first port of call for these learners." – 2009

Networking is one area most students struggle to excel in. However, becoming part of a MOOC community can be a way to establish links with all sorts of people looking to work in the same industry as you, on a global scale – providing a ready-made international network. - 2013

"The only downside of all this mobility and accessibility is that I am no longer able to switch off. The implication, since you asked, is that I am forever learning and growing, never standing still and never (I hope) getting complacent or bored with myself. That saying, I wish I could switch my brain off from time to time so I can properly enjoy time with my kids and family without thinking about learning objectives, workshops, conference paper submissions, presentations, emails, VLE, blogs, Twitter, etc, etc!" - 2012

The sample data below indicates that cultural background should also be considered when designing the ELES, and users should be able to tailor their ELES environment to their tastes, mood and feelings.

"He used a student population in China as the first people to try the system. It didn't have the uptake that he expected. They soon realised that this was because the students had come to the conclusion that use or non-use of the system did not directly affect their grades. The students also lacked an understanding of the (Western?) concept of a Personal Learning Environment." – 2010

But the international exposure MOOCs offer means people of different cultures, ages and backgrounds with unique outlooks on life are willing to give you feedback. - 2013

Liaw (2007) and Sun, et al. (2008) suggested the perceived usefulness as a key contributing factor for ELES effectiveness in their models – conforming with the reflections from the empirical data and emerging concepts in this study and should be incorporated in the e-learning design, delivery and ELES functionality. An interesting theme is emerging from the SMB data on how the users' expectations and behaviour are changing the nature of their experience with technology changes, e.g. centralised and traditional ELESs might pose a mismatch to users' experience as users are increasingly using flexible and collaborative tools in their personal life (McKnight et al., 2016).

Intelligent interaction with the content is required in ELES to improve learners' engagement during the learning process and in varied settings, e.g. content in group settings (Beetham & Sharpe, 2019). Directing learners through particular learning pathways by restricting their navigation in the ELES does not necessarily imply that effective learning has happened – this implies the need for thoughtful pedagogical-based design and instruments for learning to happen effectively; this design feature should be a key characteristic of modern ELES.

Users should be able to choose a different type of ELES system functionality based on their requirements, such as flexibility, the level of access and permissions, content relevance and level of contribution according to personal learning goals etc., suggesting users require tools and mechanisms to improve communication and collaboration. Moreover, engaging learners with the learning process requires giving users control to enhance personalisation and enable the integration of external services. There seems to be a need for a standards-based service that would enable exchanging data between ELESs and cloud-based services, enabling smooth interaction between the distributed systems (Fensel, Hendler, Lieberman, Wolfgang, & Berners-Lee, 2005).

> *"I have been thinking about compliance and other regulated training, and while logic dictates that robust assessment should be enough, when is it ever logical?! In such cases, forced navigation and SCORM interactions may remain to cover the company's backside. Whether or not the learning is effective, well that's a different issue."* – 2010
>
> *"If we are going to get 'buy in' from pupils of all ages, particularly those of Secondary age, first and foremost we need to place them in an environment which appeals to them. It has to be THE place to be, hang out and be with others. It has to be instantly customisable, a place that each student can make their own. It's well known that one of the first things young people want to do with anything is customise it. Take their own pencil cases and books - immediately they doodle on them, attach stickers, anything to make it a little bit unique and special. The same is true with online spaces." - 2008*

The cohesion of well-planned resources and tools; pedagogy; collaboration & interactions; personalised support seems to be a combination of success in e-learning environments. The question is: Do we have a well-established framework for the cohesion of all these varying components necessary for the learning experience the learners wish for? This study plays an important role in devising such a framework.

> *"To my surprise, the first thing I did in the MOOC was not watch a lecture or do a reading, but instead participate in a discussion. The first course activity was posting about prior experiences with opera and engaging with other students' responses in the discussion thread. To emphasize the importance of discussion in the course, the tab immediately to the right of "Syllabus" in the course navigation is "Discussion." - 2015*

The main thematic dimensions could be summarised for the users' perception and requirements as community enablers, enabling them to become effective users of conversational channels, ELES facilitating Self-direction and Self-efficacy, Ease of use, facilitating resolving common problems, enabling to obtain effective feedback, facilitating awareness of organisation rules, facilitating accessibility, facilitating flexibility for progression in learning and cultural awareness.

4.4 ELES Effectiveness

The ELES perceived benefits directly affect the functionality and adoption of the system. This concept is quite inclusive, covering the provision of online courses, the exchange of information between peers and teachers, online submission of assessment elements, searching facilities, marking and grading tools, tools for collaboration, linking resources, and providing a secure and trusted environment for students shown below. ELES could be a powerful tool for learner engagement if proper due diligence is done to plan, design, and apply tools.

> *"I was the one who posted the entries for the kids to respond to. I was the one creating the wikis that the kids would add to. With the MOODLE we all create together. It is OUR space."* – 2012
>
> *"And what of formative assessment? Unless I missed it you do not appear to mention the benefits of working in a closed and e-secure environment in which teachers and students can work in a trusted formative dialogue."* – 2009
>
> *"The use of storytelling and case study based approach makes the course compelling. Instead of lengthy monologues, the course is the combination of tiny vignettes of videos, articles and stories. For instance, we had an extensive case study of the National Trust and it was very fascinating." – 2014*

The existence of a positive relationship between perceived benefits and e-learning effectiveness is consistent with the findings of Liaw (2007) and Sun et al.(2008). The reinforcement of content provision

and its availability, especially when direct contact learning opportunities were missed due to other commitments or illness, are considered added benefits, as illustrated below. Access to educational content and related resources from a common point and presentation of the information in a personalised format are rated high.

> *"I believe there is value in offering students a VLE to support their learning. Not to act as a substitute for attending face-to-face classes but as an additional form of reinforcing content and a "safety net" to help students who have missed work due to sports exchanges, illness or those who are disorganised and have lost their class material. I also believe parents value the easy access to relevant and up-to-date class material as a means of supporting their son/daughters' learning at home."* – 2009
>
> *"But two weeks later … I couldn't remember how sample size affects significance, why statistical significance did not imply clinical significance, and how confidence intervals are related to p-values. I had to watch the videos one more time, then everything was clear again.*
>
> *But a month later … You know where this is going.*
>
> *Now, consider this: I have a PhD in Aeronautics from Caltech—I've proved that I am a "good student." Yet, without manipulating the new concepts through writing things down, making summaries, diagrams, working through examples and so on … I just forgot."* - *2015*

ELES facilitate course management, reducing the burden on support staff by making relevant information available to concerned parties or stakeholders. Findings also revealed that the ELES could provide the opportunity for learners to become accustomed to virtual learning even if they have little prior experience.

> *"The Exams secretary put timetables on there (and this meant teachers, pupils and parents could access the information whenever they wanted and this reduced their phone calls to the school office and exam secretary. Our SEN students contributed (often but not exclusively by making suitable animations); gifted and talented contributed and eventually had their own sections tapping into their own interests; parents had a section – and the parents of SEN students particularly liked the additional information and form of contact."* - 2009

The ELES are generally centrally controlled and tightly coupled, meaning the functionality provided is not easy to change or extend. Thus, some institutional ELES can appear limited in scope for larger contributions or collaborations.

> *"VLEs are already out of date – the way forward is loosely-coupled, not central-and-monolithic…"* – 2008
>
> *"I'm not challenging the concept of online learning, nor the existence of a coherent online environment for children to access learning. What I am challenging is the term VLE and what it*

has come to represent. It represents a time gone by, where knowledge was locked away deep in a silo. It does not embrace the freedom and beauty of the social web. It represents a prison in the sky." - 2012

Another perceived limitation is the lack of ELES tools for supporting users who want to continue using and building their own resources after they leave the institution. Innovative functionalities, for example, creating thematic learning networks around which learning communities could be developed, is considered to be limited in some ELES as well as providing learners with broader functionalities, such as job searches. Additionally, the integration of tools, services, and networks to the institution's ELES is perceived to be a security concern.

"Now one of the issues you may find with your VLE is that the security settings restrict you using embedding code on pages or discussions forums on your VLE; this is certainly the case with Moodle." - 2010

ELES (open) enables learners to build the portfolio and gain a competitive advantage in the jobs market. The experience and exposure of engaging with ELES (open) prove to give the users tangible results, as evident from the SMB data. The engagement with ELES (open) helps many professionals shift to another area, gaining confidence to apply their existing skillset in new domains and developing expertise in the new domain.

"The recruiters I've spoken with are most positive about the resume-boosting benefits of skill-based courses. Learn to do data analysis in Hadoop, learn excel, or study supply chain logistics. Earn a certificate and build a portfolio of work to highlight on your resume, and this strategy just might make the difference between you and another candidate." - 2016

A sense of belonging is important when engaging in learning through ELES. The peer interaction could be especially useful in this sense, e.g., for ELES (open) smaller peer networks could be created within the large set, and algorithmically, peer interaction could be facilitated, and if a smaller peer network shows a drop in interaction and significant deviance from the patterns then further targeted assistance could be provided to learners. The ELES (open) could be enhanced manifolds if the learners achieve a sense of belonging and feel valued.

"I've pretty much dropped out of my MOOC because i've been ill for three weeks. I was a diligent student, always posting work on time. But no-one has noticed I've gone…." - 2013

"I agree with you, the course is very good because we can learn not only from teachers but also from our peers. We have one more week … so studying!" - 2012

The use and adoption of ELES require thorough planning and backing of all institution stakeholders, including a careful examination of the users' requirements. This is perceived to be the key to the successful use of ELES and mapping ELES functionality, and provision of services in ELES with related security and privacy needs. The ELES effectiveness is related to complimenting learning enabling comprehensive options, providing easy access to resources, and learning material, facilitating organization, facilitating course management, limiting forces reducing (e.g., security requirements) collaborative potential, and encouraging the growth of learning communities and sense of belonging.

4.5 ELES Design, Tools & Services

The ELES design, tools and services should evolve along with the systems and delivery mechanisms contributing to the learning experience. New innovations of tools could open up new ways for collaboration, new pedagogical dimensions and system design possibilities.

> *"There are numerous other research opportunities with MOOCs, including adaptive pathways during the course, personalized learning, self-regulated learning, alternative credentialing approaches, automated assessment, evaluating the impact of socially created artefacts on learning, alternative approaches to lectures and content presentation, and so on. Those are topics for future exploration."* – 2014

ELES tools should offer provision to create courses and provide services and configuration tools to ensure the ELES could meet the organisations' requirements. ELES tools include assessment tools, e.g., automatic marking, communication, uploading content, providing feedback, peer assessment, administrating student groups, collecting and organising student grades, questionnaires and surveys, and tracking tools, e.g., content usage and access statistics, wikis, blogs, and RSS. Rahimi et al. (2015) linked the provision of tools and technologies (web 2.0) with the learners' control dimension (control over the self-learning process and interaction and dialogue with the instructor). But the study didn't explicitly specify the mapping mechanism between tools/technologies and learners' control in terms of ELES functionality (Boyce & Pahl, 2007). The modern ELES should provide tools to enable learners to plug in their networks and applications' personal toolsets. There seems to be a need for a set of tools that enable the users and content developers to organise and structure the content that caters to creativity and personalisation and maintain the focus for learning.

> *"The new image editor allows you to easily resize and customise images that you insert. Gone are the days of massive images appearing in forums, if students have not resized them before uploading."* - *2011*
>
> *"When it comes to teaching and learning, everyone has their own style and approach to gathering, presenting and consuming information. Having the ability to personalize the environment in which you are working to fit your own needs and style can help simplify the*

experience and allow you to find what you are looking for and complete your task much faster" - 2010

"All the practitioners then choose at least one feature that they will use with their learners on one of their courses. Features could include voting, feedback, discussion forum, photo gallery." – 2011

Learners, practitioners, and institutions require the tools necessary to exercise their choice of transferring content and communications for the ELES and the e-learning environment acting as a container and space where knowledge, sharing, creation and light bulb moments happen. Online resources and the integration of external services in ELESs have blurred the lines between informal and formal training. Forums and social networking services, and social media have opened new avenues and design dimensions in learning. ELES design will increasingly play a key part in the evolution of such systems, and this study contributes to capturing and understanding this transition with its proposed conceptual model.

"As a member of that community this makes it very hard to identify which people in the community are worth listening too and who to ignore: all of a sudden I'm surrounded by 16000 people all talking at once. When things ramp up more slowly, I can build out my social network more easily. Coursera doesn't have any notion of study groups." – 2013

"For years I have experimented with blogs, wikis, pod casts, websites, etc. In fact this blog space has been refurbished, if you will, from a site where I used to get the kids to share. However, the MOODLE is now a space for all of this to occur together, in a real and authentic way. In the past I haven't been happy because I have had to control the learning. I was the one who posted the entries for the kids to respond to. I was the one creating the wikis that the kids would add to. With the MOODLE we all create together. It is OUR space." – 2012

The system design should incorporate constant dialogue capability to assist the users, reducing the anxiety of unknown and technical failure when interacting with technology. For example, system failure should be handled effectively with clearly defined routines and communication channels established to guide the user in resolving the issue. From the design perspective, it is crucial to have correct foundations laid based on sound design principles, ensuring robustness and reliability. Otherwise, the problems will compound and frustrate the users of the poorly designed systems.

"It got worse when I would have tests online on blackboard. Imagine your test just disappearing because blackboard froze. Now imagine explaining this to your professor who may not encounter the daily or rare roadblocks blackboard sometimes provides students with. Unless your teacher sees this frequently among other students, you may be in luck, because they'll understand enough to let you remake it, or you could be screwed." – 2010

"I have used [redacted] system for my classes for four years and in my day I have had and seen some "doozies." There are a whole slew of problems that [redacted] has overlooked for years now with the site. They have tried and tried to correct these problems but you're always playing catch up when you don't do it right the first time." - 2010

Well-thought-out pedagogy, structure and correct use of learning tools engage and motivate learners, including enhancing teaching practises through a better understanding of the pros and cons of specific approaches and their relationship with particular environments. ELES should not be restricted to institutional tools and services but incorporate tools to inform change of practices and potentially lead to improvements in the learning experience. When all the pieces are aligned, e.g., appropriate design, pedagogy, and effective use of tools, the learning experience could enrich all involved.

"MOOC learners are not undergraduates who expect a diet of lectures delivered synchronously over a semester. They are not at college and do not want to conform to institutional structures and timetables. It is unfortunate that many MOOC designers treat MOOC learners as if they were physically (and psychologically) at a University – they are not." – 2016

"Videos can be one device for building a MOOC or a small online or blended course, but not generally the most important one. We need to acknowledge the limitations of video and place emphasis on authentic learning and not just "engagement" (time watching, # of clicks)." - 2015

Understanding the evolution of design, tools, and services is important with changing design paradigms, trends, and broader changes. Effective use of tools and services could trigger new patterns of working and pedagogies. ELES design contributes to meeting organisational requirements, facilitating social interactions for knowledge creation, and sharing, facilitating the integration of wider tools, enhancing the learning environment and motivation of learners, and enabling them to work effectively.

4.6 ELES Networking & Collaboration

Users consider an ELES as space where all can learn together utilising the tools and services of this space. It is perceived that networking technologies have the potential to engage learners in meaningful learning processes, as indicated by the sample comment below.

"When I describe a MOODLE to the un-initiated, I often resort to the somewhat snide: It is like a website on steroids! My MOODLE is so much more than that. It is my classroom. It isn't an extension, or a place for the kids to play - it is a space where we all learn together." - 2012

ELES provides networking opportunities around learning concepts, inadvertently enhancing learning and engagement. Community learning around topic/course using ELES (open) as a tool reveals new opportunities, particularly for students without traditional college/university background, and could be

used to teach learners to develop networking skills and achieve common goals while working with others.

"To those of us who have had the opportunity to go to college; we may be disappointed in what the MOOC's offer but to others who do not have the opportunity and can use the information to build their knowledge base; it's opened a whole new world. I know of several groups of people (non college grads) who self-organize in enrolling and discussing the course that they are in. That is where I have found the course content is truly being used to "learn;" through the information given and being discussed." - 2013

Shee and Wang (2006) recognised the importance of learning communities, communications, and social space in the e-learning effectiveness models. ELES designers and practitioners must incorporate social learning dimension in their design and delivery. Today's users expect the availability of the content across multiple platforms, enabling them to make exchanges with peers and tutors seamlessly and immediately. However, ELES (open) presents its own challenges where a single instructor might teach thousands of students. In this scenario, networking and communication skills to work collaboratively become even more critical.

"The issue though is as much one of pedagogy as it is of experience. It is difficult to apply a constructivist, developmental approach to a course with thousands of students and effectively one instructor." - 2013

ELES compliments traditional learning when used with thoughtful pedagogical considerations, providing opportunities, advances in technology for collaboration and adding new perspectives to the discussions (Coman, 2002). ELES has the potential to teach learners how to develop networking and communication skills and work towards common goals whilst working with others.

"More than only for an unknown distant future, these are skills which learners today need to be comfortable and confident in. It is when they are at school/college that they can practice them in a safe, peer-level environment. From learning how to conduct efficient and effective online searches, being able to sift through the never-ending data available, to learning how to blog and use Twitter as a collaborative learning platform, educators have the responsibility to teach these skills, not only to motivate and engage learners, but to help prepare them for their futures." - 2011

"ELES lower the barrier for learners to take part in the conversations, even for those who feel shy in the traditional classroom setup." - 2010

"I very much enjoyed doing this online course. I liked it because with doing the assignments you could see other student's responses and most importantly their opinions. During a class you don't always get to see this. Some people are too shy to participate during a class discussion…" - 2014

The provision of networking and collaboration poses certain challenges, and this study highlights that conforming with organisational policies and privacy perception is a major one. The ELES integration with mobile systems also presents new privacy issues - how these are managed will be an interesting area to observe. The major issue will be guidelines, legal aspects and monitoring of compliance with the standard operating procedures.

> *"... I'd love to hear your thoughts on web vs. native app - and on tracking what learners do on their mobile devices (e.g. the crazy desire of so many big companies to have SCORM-conformant courses so they can track completion. As learning becomes (hopefully) more informal, do we seriously want to track everything people do on their mobile devices"* – 2011
>
> *"I don't see the VLE as a place for conversation, I see it as somewhere the students 'should' be interacting with for the purpose of their studies. Yes, use Facebook and other websites to chat about housing, drinking, sport, etc but for your course studies they will benefit from using the VLE as we, the educators and facilitators, are present and able to join in when they ask us. If the students take everything outside of the space we provide then we can't be expected to join them, or even know where they are. Can they?" - 2011*

Another challenge of adopting ELES (open, blended) is an increased availability of the content and consequently increased interaction with tutors, potentially disturbing work-life balance as indicated below. They require careful management, which must be taken into account when designing the online courses' parameters.

> *"I have seen my students exchanging much as they are learning to engage each other and then me as we expand the teaching and learning virtual learning environment. If you are serious about teaching on-line courses then be prepared to spend much time both preparing your courses and in responding to students who are multi-tasking using a diverse assortment of technologies based instruments such as Nooks, IPad and their IPhone to stay on task. I have been holding dialogues with students while on the Santa Fe plaza on a bench using my IPhone and interactive video."* - 2011

An interesting phenomenon is the increasing importance of ELES (open) for companies interested in recruiting global talent. Some companies are already paying ELES (open) providers, e.g. Coursera (2021), for this service. ELES (open) is also increasingly being used as a tool to market and project-specific services and products by the companies, e.g. Salesforce using Udacity (2021) platform. It seems this trend will increase as the adoption of ELES (open) increases.

"One MOOC provider, Udacity, also offers a program where recruiters can access student resumes. According to Bersin, Over 350 firms, including Amazon, Facebook, Google, and Twitter have paid Udacity and Coursera to match them with high-performing students." – 2014

The ELES Networking and Communication entail enabling interaction with more people, enabling effective dialogue with the instructor, facilitating collaborative learning, facilitating interactions beyond one's own class, enabling addressing privacy concerns, facilitating diversity, and facilitating ease of access.

4.7 Pedagogy

The users' perception showed that the ELES were prevalently used to disseminate factual information – not enabling learning as an active process, echoed by Rienties et al. (2015), who identifies that a positive learning experience in online settings requires thoughtful design and pedagogically-based considerations.

Simply applying traditional classroom-based teaching and learning pedagogies may not work in electronic-based environments illustrated below. The SMB data points to the need for appropriate pedagogical implementation in online courses. The problem identified is prevalent in online courses where the emphasis is to disseminate information and not appropriately focusing on the learning process and outcomes. The sample SMB data indicate the potential problem of using traditional instructional design in MOOCS setting - pointing toward the need for instructional design and pedagogy specific to MOOCS to avoid limiting wider participation.

"Nevertheless, it will be interesting to see how the design of MOOCs emerges as institutions and people with more experience of credit-based online learning start grappling with the issue. Will they add value, or will 'instructional design' kill the inherent nature of a MOOC, which is its wide (initial) appeal?" - 2013

"Sadly, many online classes are Web-based correspondence courses where students complete worksheets and take tests. The offerings and content mirror traditional curriculums. Despite the Web's abundance of primary source materials and distributed expertise, too many online courses stick to a "just the facts m'am" approach. Kids reluctant to ask for help don't receive it and the computer's ability to time and mark simple tasks is abused." – 2011

The pedagogy of ELES and utilisation of tools for achieving specific learning goals and the experience should be considered carefully at the design stage of the course. Thoughtful pedagogy is required for an effective learning experience to happen- just the provision of a tool will not make the learning happen.

"It is necessary to correct the misconception that computer teach; computers are nothing more than an appliance unless the faculty and student use it as conduit for active teaching and learning." – 2011

"The reason is that books, online classes, group discussions, telephone conferences, video, one-face to one-face and lecture classes are all just different methods to communicate. They are just tools, not inherently good or bad. They can all be effective an ineffective depending on how they are used and the situation they are used in.

So the question for society isn't, "Are online classes good for learning?", but rather, "What are effective methods and situations for using online classes?"" – 2011

Despite more people engaging in e-learning, it seems there is a gap in the provision of training on how to use them effectively. Development of more informed users about the choices available to them and the implications of these choices in terms of their own learning experience, e.g., how the choices made will lead to a particular learning style, e.g. constructivists etc., is required.

"It is necessary to correct the misconception that computer teach; computers are nothing more than an appliance unless the faculty and student use it as conduit for active teaching and learning. I am preparing a doctoral level course in logistics and operations in higher education institutions and I am involved in a discovery process to identify and apply many resources from both the public and private sectors to inform the students." – 2011

The pedagogy employed in ELES (open) could guide learners to form study groups, build skills required to form/join learning communities, and inform and educate them to find relevant people/resources/support for the tasks. Support structures should be provided for the learner in the ELES (open) environment and should be carefully planned within the pedagogy.

"As a member of that community this makes it very hard to identify which people in the community are worth listening too and who to ignore: all of a sudden I'm surrounded by 16000 people all talking at once. When things ramp up more slowly, I can build out my social network more easily. Coursera doesn't have any notion of study groups." - 2013

Picolli et al. (2001) showed the importance of the Human dimension (Students & Instructors attributes) and the need for careful planning utilising specific learning models, arguing that just giving more control in e-learning environments may not result in more user satisfaction and could impact negatively on the learning experience. Kirschner (2004) identified the need for innovation in pedagogies as the key factor for an improved learning experience. The findings by Singh et al. (2014) showed an interesting contradiction: the result for the pedagogies' effectiveness for e-learning showed negative reading, signifying the lack of influence of pedagogies for e-learning effectiveness. The work of Sridharan et al. (2010) does not generally conform with the previous studies conducted on e-learning effectiveness. Still,

our study validated this finding: just designing and implementing pedagogies would not be enough to engage users and enhance their learning experience. There seems to be a need to better understand the relationship between tools, pedagogies, and learning environment through the glue of well thought of pedagogical constructs.

> *"Watching videos is not better (or worse) than sitting through lectures*
> *Videos are nice, they can get you exposed to a new concept for the first time in an agreeable way, but they do not produce learning, on their own. Students need to engage with the concepts in various ways, interact with ideas and problems, work through a process of "digestion" of the learning material."* – 2015

Application of pedagogies must be complemented with innovative and fresh thinking designed explicitly for the e-learning environments, educating and informing users about particular pedagogies and the implications of the choices they will make in e-learning environments. The ELES (open) provides opportunities for the learners to explore new dimensions that even instructors may not have perceived and may come out of discussions and interactions among learners. The question is what kind of pedagogical instruments and ELES tools could be utilised in such situations to encourage innovation and creative ideas or even make learners realize that they are exploring/creating something new. The pedagogical considerations should not stifle opportunities for new experiences and innovative thought.

> *"The format of a well-designed online course allows for discussion and interaction among students that allows everyone to learn from one another. Students who grasp the material better or more quickly can clear up confusion by posting comments or connecting through other social media channels. The larger the course, the more people who can help. Since everyone comes from an entirely different background and brings their own experiences and skill sets, there is so much to offer and so much to learn beyond what the instructor provides."* – 2013

Our study's findings corroborate Picolli et al. (2001) for the need to educate and inform users on how to use more control and flexibility available to them in e-learning environments. The need to better understand the relationship between tools, pedagogies and learning environment emerged, with ELES technology regarded as a tool rather than a solution fit for all circumstances - thoughtful pedagogy and meaningful utilisation of tools are required for an effective learning experience. Throwing tools, technologies and approaches at learners is all good, but the question is how learners are informed of different options available to them during the process and how they measure the significance and relevance of these approaches.

> *"As with previous MOOCs that I've taught, the intent is to provide learners with a range of tools, technologies, and approaches and provide learners with the opportunity to sensemake and*

wayfind through complex information spaces. All the fun (and deep learning) happens in that process." – 2014

The use of technology and ELES should have a meaningful purpose to make the subject alive; even innovation in pedagogy could be utilised, opening up new dimensions in thinking and delivery - enriching learners' experience.

"…working collaboratively on the global Monster Project, sharing photos with Taiwan, Skyping with kids in England and Washington state, watching eagle webcams, and making maps on computers to be used to go hiking in the woods. All very constructivist - all very much as [redacted] *stated. We don't do the mundane with technology, we do the exciting, we enjoy childhood."* – 2011

The provision of context, considering specific themes and building the concept like a story are useful components of teaching methods, irrespective of environment settings, e.g., online, or offline.

As I went through the four sections in the first week of the course, I was presented with activities I had not anticipated: online searches for examples to share in a discussion, contributing to a word cloud, sharing tips for listening strategies, and writing a short analytical essay on the opera. – 2015

It is perceived that the success rates for ELES (open) are low because people start the course full of energy and enthusiasm, but after the initial momentum diminishes, they end up not engaging continuously with the course - causing large numbers to drop out and not finishing off the course. This is a typical scenario for ELES (open). Personalised coaching and motivational tools may help in these situations, but personalised coaching/support may have an additional cost associated with it, making it hard to implement where cost is an issue.

"I should not take online courses. … But I do know myself better than anyone else, and I know that I have trouble finishing projects. When I get an idea in my head, when I'm inspired, I start in full force, with passion and drive and every intention of seeing this thing through to the end. Then I start to get a little bored. Without someone pushing me along, my intrinsic motivation starts to taper off and I lose steam. I'm not a "slow burn" type of person." – 2013

A University of Pennsylvania survey released late last year found that few students made it past the first online lecture. That's been a constant criticism of MOOCs from educators: There's a lack of proof that they work as well as traditional classroom methods. San Jose State University suspended a program it had initiated with MOOC provider Udacity after poor early results. - 2014

Learners are expecting the pedagogically driven experience to gain substantial knowledge and expertise in the concerned field of study. Offerings that are not accommodating these learners' expectations lose out on reputation and revenue. ELES (blended, open) is increasingly used to complement traditional classroom setup; in many cases, flip classroom pedagogy is employed to give more personalised attention to learners during class time.

> *"With my class, I was disappointed to find that there was one initial lecture, which I didn't feel offered enough information (especially not 15 dollars' worth), and one wrap-up lecture. The lesson didn't expand enough on what the syllabus promised. One video was too sparse for a week-long course, and I wanted to be taught more. I wanted to know how to create those images, and I felt like I was led on. Instead, the instructor linked to other photography blogs and articles, all of which I could have found for free. (Keep in mind that MOOCs offered by prestigious universities such as Harvard and MIT are obviously more in-depth than my one-week Skillshare class.)"* – 2013
>
> *"With an online platform only the very first stage is successfully reproduced. Yes, better to have the professor's lecture online to view any time any place. But this is no more than viewing a Ted Talk. The student doesn't even have to take notes in real time (a really useful mental activity of active listening and synthesis) because the transcript is there." – 2015*

The application of appropriate pedagogy helps in understanding the nature of choices available is useful in ELES for learning - facilitates in creating constructs for being part of the learning community, developing an understanding that the context is important for the learning process, enabling personalised support for continuous engagement and utilising motivational tools for engagement and retention.

4.8 ELES Cognitive Lenses Multidimensional Interaction Model CL-MIM.

According to the definition of cognition, it is related to the thought process, understanding states and processes of knowing. These states and processes, in their completeness, include perception and judgement. The cognition processes include perceiving, recognising, conceiving and reasoning to accumulate knowledge and develop a better understanding ("Cognition," 2022). In this research, a new dimension has emerged and is named 'cognitive lenses multidimensional interaction'. This dimension can act as a standalone tool and binds an object, design, concept, or an artefact with not only what it does but also with what relationship it has with other objects, concepts in a given context and what is the meaning of these relations. Hence given, the name cognitive lenses is given to highlight the purpose of this tool. The details for this new dimension are given below.

4.8.1 The New Dimension

Instead of looking at the dimensions of e-learning effectiveness models discretely, the notion of 'Cognitive lenses' enables us to look at these dimensions cohesively and contextually. For example, it helps us to identify what relationships exist between pedagogies, networking, users' characteristics, personalisation, services, and technologies used in ELES. Moreover, it enables the practitioners to determine what ELES functions correspond to particular learning styles or understand how choices made at the design stage will allow achieving specific learning goals. The system functionality is generally defined as the result of requirement analysis resulting in a clear understanding of system functions. Functionality is central to clarity, what the users want out of an ELES and what it can deliver and how this impacts the user's perception regarding the ELES. Tools, services, and pedagogies offered must adapt to changing needs of the users and wider community.

The ELES is used to create courses and make related services available to the users. ELES functionality involves submitting assignments electronically, and this solves the problem associated with space and time in many situations. The ELES provide access to content online, assessment and feedback, communication features, grading facility, administration of groups, tracking and statistical tools, collaborative features, e.g., wikis or blogs, acquisition of targeted material for learning purposes, e.g., RSS feeds. Effective communication is core to ELES functionality, and the exchange of information can be done in an innovative way, such as blogs, forums, or discussion groups, allowing participants to gradually construct their knowledge of a particular topic. Other users may also benefit from this community knowledge. In addition to content creation, content management, delivery and availability of assessment features, ELES could be integrated into other institutional systems to offer seamless transition and flow of information, as indicated by SMB data sample below.

> *"A virtual learning environment (VLE) is a software system designed to support teaching and learning in an educational setting, as distinct from a Managed Learning Environment (MLE) where the focus is on management. A VLE will normally work over the Internet and provide a collection of tools such as those for assessment (particularly of types that can be marked automatically, such as multiple choice), communication, uploading of content, return of students work, peer assessment, administration of student groups, collecting and organising student grades, questionnaires, tracking tools, and similar. New features in these systems include wikis, blogs and RSS."* - 2008

The provision of personalisation features in ELES is perceived to enhance the users' interaction, engagement and satisfaction. Where users are given more control over the functionality and personalisation features, they should also be educated on how to use them responsibly and effectively. This process could teach students wider social and civic attitudes, e.g., how to respect other people's privacy. Availability of control to place and rearrange tools and services in the ELES working

space/environment, known as 'functional control', tend to positively impact users' enthusiasm towards their ELES space. Functional control over layout, e.g., the ability of a user to turn on or off services/features within the environment perceived to make it more useful. It enables the users to simplify the environment from clutter and distractions and is the key factor determining the effectiveness of ELES, as remarked by a blogger from her perspective:

> *"And what of templates, skins, choice of fonts, avatars etc? If the e-Portfolio is supposed to be Lifelong AND life wide, it should be capable of changing templates or skins according to audience or the very mood the learner wants to communicate. What of the teenager who regularly changes the pop-group genre they follow or the football team that they support? The ability to change one's self-representation can be done in minutes, if not seconds, with a good e-Portfolio system."* - 2009

Applications and services tightly coupled with a particular ELES system tend to restrict users from exploring new modes of learning, as noted in the user's comment below. The complexity involved in services integration and reliability considerations pose obstacles (sometimes) to the integration of third-party services in ELES. If ELES are to contribute beyond course duration, these should provide the users' functionality to integrate services and change the environment according to users' learning needs.

> *"I was surprised to find that Sakai, much like many of the proprietary course-management systems, fell prey to building their own applications such as the wiki, the blog, chat, forums, etc. None of them seem particularly stellar, and in fact many of them are admittedly sub-standard– specifically the blog."* - 2007

Student engagement and productivity increase by providing control over the way the activities, assessment and collaboration tools are linked. Making users choose themselves or create learning paths and workflows may increase student engagement, satisfaction, and retention. It is likely that learners use these tools and skills beyond course-based situations, and this freedom and interaction could result in creativity and improved engagement for learners. As a learner notes:

> *"Because you can link to an infinite variety of web pages and you can embed media (images, videos, and Slideshare presentations) in a tile, as an instructor, you can make a webmix quite interactive. For example, you can create tiles that link to challenges, quiz questions, polls, discussion forums, chat pages, and other types of content and media that will facilitate more student involvement and creativity. You can provide a tile linking to a web page describing a number of exploratory activities a student will need to engage in, but make the path for accomplishing these activities (e.g., the numbers and types of tiles used) up to the student."* - 2010

This research suggests that functional control over the ownership of users' content and working space is a crucial factor that could enhance ELES system adoption and its effectiveness at a wider scale. This research found conflicting views on giving users control over ELES functionality, acknowledging that institutions often impose specific requirements or conditions when providing a formal ELES environment to their users. The traditional use of ELES suggests strict central security control and limited extensibility of ELES features and services to the wider community. The paradox between users' control and security often leads to a designer's dilemma and maintaining a balance between users and system/institution control over the ELES environment is the key to successful ELES adoption. The control of services that are based on cloud infrastructure could be shared by the users, academics and institutions. So, there is no single point of control for one party. The functional control over the exchange of data between the ELES and the cloud via a standards-based body or service could hugely benefit the continuation of the learning process beyond the institutional context, bridging the gap between formal and informal learning, e.g., integrating cloud-based learners' work (such as knowledge acquired in the workplace) in the institutional ELES. This will also offer users the choice of sharing this information/knowledge or keeping it private, or even specifying what information they would like to share in a particular learning context or system. ELES should provide mechanisms for the users to have ownership of their learning process and interactions just as they have it in social media. Ownership and ability to functional control are key factors in why users adopt social media for learning more than traditional ELES when it comes to collaboration and discussions.

> *"Students and staff both need to control their learning environment and access external learning networks and CoPs. At the same time institutions still need a platform of providing formal online learning/teaching for all students and staff. It's clear that there is a need for both formal and informal learning and learning networks."* – 2010

Becoming part of the learning communities for a particular ELES course increases learners' engagement and completion rates. Just providing activities through the medium of ELES without pedagogical grounding may confuse learners, e.g., learners might not know why an activity is being designed and presented in a particular way.

> *"In e-learning and Digital Cultures, the one thing we had in common was an interest in the topic, and the only reason we were compelled to complete the MOOC was sustained interest in the community."* - 2013

Learners want a meaningful learning experience; ELES functionality could be instrumental in providing a learning experience based on sound pedagogical principles. An interesting question arises here, e.g., if the tools and services are provided for the pedagogically driven learning experience, how to inform and guide practitioners and learners to use this functionality. ELES (Open) currently lacks equal

opportunity (compared with traditional methods) for assessment feedback to act as an instrument of dialogue and enable the learner to improve based on the provided grading process.

The solution to this problem cannot rely on just making certain technologies available to users; it needs deep innovative pedagogical thinking with clear relations to technologies and design possibilities.

> *"For starters, anonymous grading should not determine the students' success—at least not by itself. If I had the ability to defend myself and possibly change a grade, I might be more inclined to get actively involved. In college, I was always allowed, if not encouraged, to meet with the professor or teaching assistant who graded my work to challenge or ask questions if I didn't agree with the final grade. Even if I didn't change someone's mind, chatting with someone made feel more at ease."* - 2014

Getting content in ELES is easier but giving a meaningful context around the content and informing how best to exploit the resources is a more significant challenge. ELES should provide pedagogically informed functionality where users could put context around the resources conveniently and naturally.

> *"The MOOC platforms are mostly course delivery systems - I think these companies can think much broader about how they bring content, connections, and experiences together." – 2016*

4.8.2 The Model

The GTM process's findings indicate, 'CL-MIM' is a core dimension for the ELES effectiveness model – this reflects a need to emphasise this dimension from practice and decision-making perspectives. The concept diagram of Figure 8 shows the emergence of 'CL - MIM' in relation to ELES scope & scale, and users' perspectives and how these affect the type of functionality users desire or would be keen to use. In addition, the concepts ELES Effectiveness (e.g., perceived benefits and limitations), ELES Networking & Collaboration, ELES Design, Tools & Services, ELES Pedagogy and their relationships through ELES 'CL - MIM' also emerged. CL - MIM' tells us that entities or objects have deeper meaning and relationships, e.g., a tool in a particular functional area might have a deeper meaning in a given context, it could entail corporate policy, satisfy personalisation or privacy needs of the users, signify the need for better integration for the designers, pose a hindrance for a particular learning design or complement a particular learning design. 'CL - MIM' informs us: it is not enough to consider just a tool or a particular aspect or a function of the system for its utility, but the consideration should incorporate how the users and practitioners could be made aware of the degree of relevance, significance and relationship that this tool might have with the application of a particular concept, theory or the model.

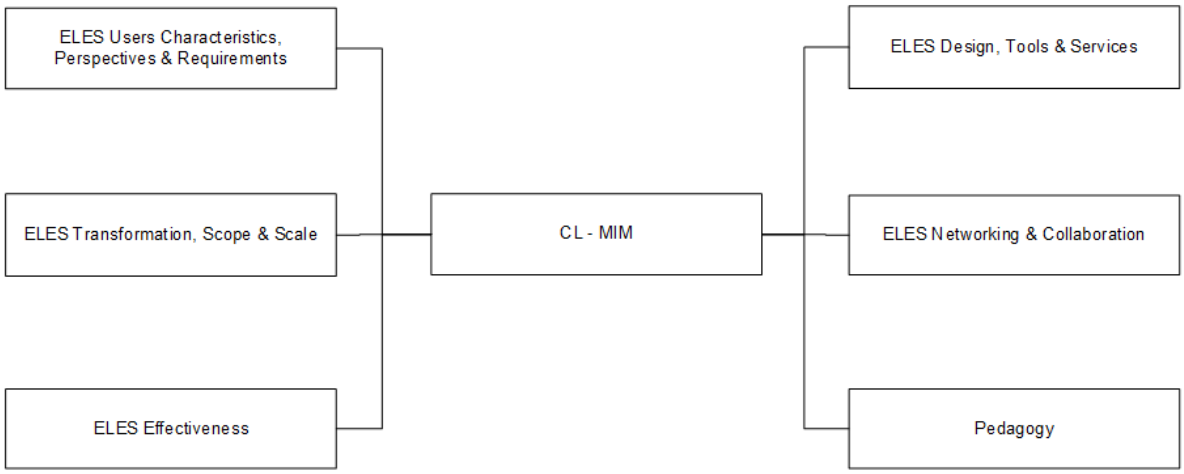

Figure 8.

The concept diagram is representing Cognitive Lenses Multidimensional Interaction Model with CL-MIM as the core dimension in relation to other ELES effectiveness dimensions.

4.8.3 Cognitive Lenses and CL-MIM Equation

Figure 9 present the structural essence of CL-MIM dimension. The lenses capture the interplay of the dynamic activity that existed between different dimensions, such as Pedagogy and the perspective of the learners. The concept is elaborated below through Persona diagrams with critical insights in relation to the Affordance concept. It is important to take note that the Cognitive Lenses model is dynamic, and the lenses could be added or reduced depending on the nature of the requirements and complexity of the phenomenon. The three dots in the model signify this characteristic.

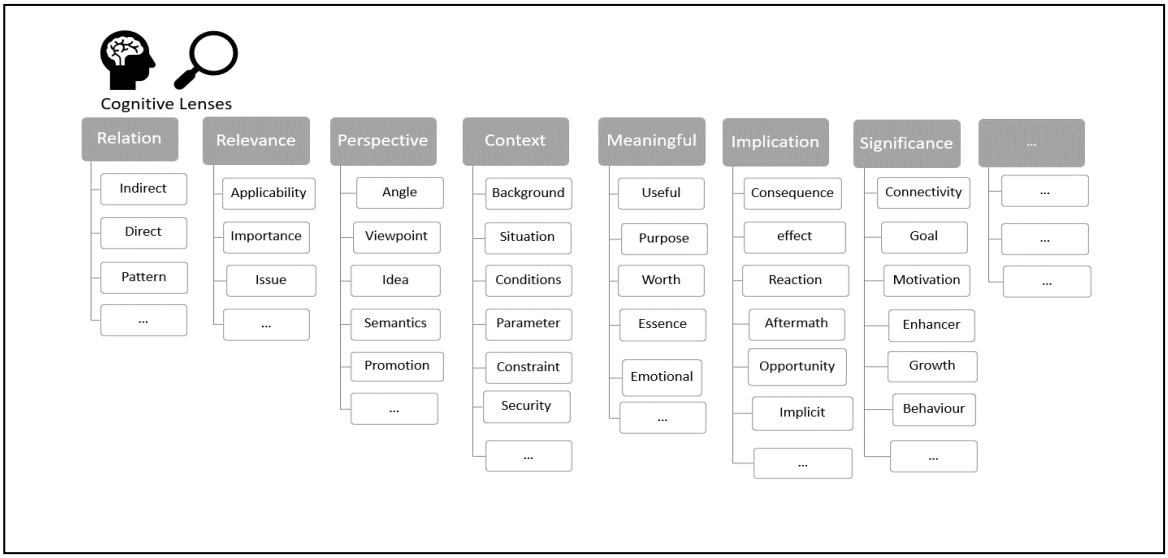

Figure 9

Core dimension structure in ELES - Cognitive Lenses Multidimensional Interaction Model CL-MIM.

An equation is presented below to elaborate on the concept of CL-MIM. The first part of the equation is related to the 'Lens'. As depicted in Figure 8 above, a lens could be a 'Relation' or 'Context', or 'Implication' as proposed in Figure 9 above and the symbol 'L' is used for the notation. The next part of the equation is the 'Dimension' related to a particular Lens. For example, an 'Indirect' dimension is related to 'Relation' Lens. The last part of the equation is 'statement/action-statement/qualifying statement' for the 'Dimension' used for a particular Lense. The equation and the examples are given below to elaborate on the concept.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Relation (Indirect) – between choices for design and learning goals;
This example depicts indirect relationships between the design choices available and chosen and the resultant efficacy of the environment to meet the learning goals. The design aspects may not be readily visible, and further chaining may be needed to dig deeper for this purpose.

The chaining process is where CL-MIM equations could be linked to provide context and ever-increasing clarity for the evident and latent dimensions. The chaining of CL-MIM equation is notated with a semi-colon (';'). Examples are given below.

Context (Adaptability Enhancement) - Personalization ability; Requirement (Constraint) - act responsibly; Context (Background) - Security; Relevance (Applicability) minimizing security risk; Enhancement (Behaviour) – better social and civic attitudes;

Meaningful (Useful) – making content available for learners; Implication (Organisation of content) – ease of access; Significance (Perception Improvement) – improved perception of ELES effectiveness; Implication (Transformation/Enhancement) – enhancing self-efficacy;
In the learning setup and design, making content available for learners via ELES will facilitate the organisation of the content, helping with ease of access for the content, enhancing self-efficacy of the users interacting with the system with the possibility of applying organisational skills by the learners in other domains where they operate. The perception of ELES for learners will improve with better motivation and a sustained learning process.

More examples for the chaining using CL-MIM are given below, and the concept will be used to develop an enhanced ELES Effectiveness model as depicted in section 5.15 of Chapter 5. In addition, the proposed model will be validated, as shown in section 5.15.11.

Context (System Enhancement) – ELES integration with wider organisation systems; Significance (Connectivity) – improved management of information; Relevance (Applicability) – better engagement across organisational divisions;

Context (System Enhancement) – ELES enabling functional control by the users; Implication (Consequence) – reduced clutter; Context (Behavioural Change) – developing sense of ownership; Significance (Motivation) – increased motivation and enthusiasm;

Context (Standards/Success) – ELES enabling learners to be part of learning community; Relation (Direct) – Right Pedagogical adoption; Meaningful (Purpose) – learner feels part of natural learning environment without feeling forced; Meaningful (Purpose) – sense of belonging; Significance (Connectivity) – Improved collaboration and networking opportunities; Context (Marketing) – Improvement in organisation Brand Image; Implication (Effect) – Securing business continuity;

In the next section, we discuss how these findings can complement or enhance existing ELES effectiveness models and could be used by practitioners.

4.9 Cognitive Lenses and Affordance

The CL-MIM dimension has implications for the research field. This dimension should be perceived as the cognition-based dimension, which facilitates and make the phenomenon explicit for a situation or field of observation. This aspect is elaborated below with proposed practical uses.

The cognitive Lenses model is not presented to replace existing instruments such as Affordance, but it complements the existing models and enhances specific notions. For example, a huge body of literature exists on the subject of Affordance, which was first coined by Gibson in 1966 (Jones, 2003). The Affordance concept mainly probes the specific relations between the properties of an object (its substance and surface) in relation to the animal interacting with it and perceptions utilised within the environment. There are various schools of thoughts in the field of Affordances, such as Physical Affordance, Functional Affordance and Learned Affordance (Osiurak, Rossetti, & Badets, 2017). However, the Affordance concept mainly deals with the physical aspects of the object, and relations unravel through the interactions or inherently present within the object. This poses certain limitations

for the application of Affordance where multi-dimensional relations need to be explored; for example, how the cultural semantics and language used within the E-learning system would affect an international student who is very capable but not finding the right channels to express her ideas and viewpoints.

Meaningful (Learning experience) – able to understand the language used; Meaningful (Learning experience) – able to understand cultural semantics used; Significance (Collaboration) – improved social interaction opportunities; Significance (Motivation) – increased motivation and enthusiasm; Implication (Transformation/Enhancement) – enhancing cultural integration;

This scenario is elaborated through the Persona given in Figure 10. The Concept Lenses provide the lens of perspective that the practitioners can use to link the issue with the solution and other parameters such as networking and collaboration. The use of a lens will assist the practitioner in understanding the impact of the provisions made available in the design of the learning activity to address the international student's challenge given a specific context and language barriers faced.

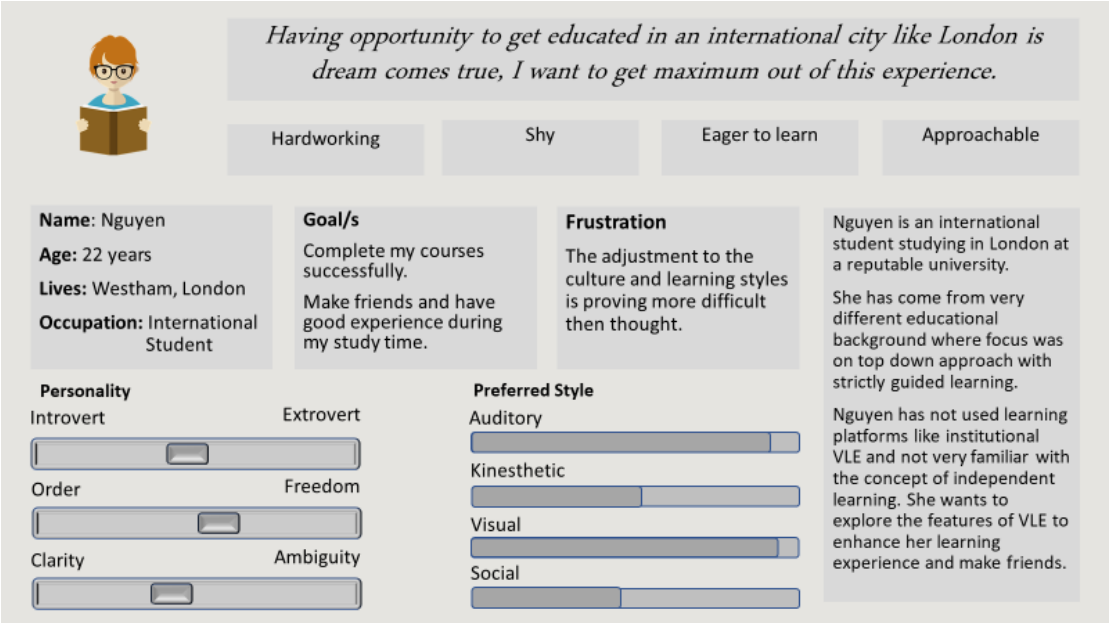

Figure 10

Persona of an International Student Studying in London.

The decisions made by the practitioner (Figure 9) in this scenario could be further facilitated by the application of the Relation lens for the pedagogical constructs as a direct relation, and an appropriate weightage could be given to the design, features, and styles to facilitate better learner experience given the context. For example, the instructor could place seeding of cultural cues wrapped around the ideas/topics in the Forum-based dialogues to facilitate the construction of ideas for a given subject. Inadvertently, the practitioner is using the Constructivist approach, whether aware of it or not. The

Constructivist approach (Ültanır, 2012) shifts the focus from the knowledge being given to the knowledge being constructed as part of an active process. The value could be added in the design process to make the learner and instructor made aware of the pedagogical view of Constructivism, so the activity could be done with a deeper realisation of the benefit to own and other participants' learning perspectives. Similarly, other Personas can be utilised to understand the motivations and remove impediments for the practitioners and learners. The CL-MIM can be used in other different perspectives; for example, it could facilitate to present a holistic view capturing the dynamic nature of the interactions between different forces such as institutional policy constraints on privacy or unearth the pressure points to design an effective solution for a given objective and didactic pressure between offering an engaging solution for the learners and tutors reluctance to use social media tools for learning purpose, as noted from the scenario depicted in Figure 10. Similar or more complex scenarios could be deeply understood using CL-MIM, hence facilitating better solutions and awareness of options available to the practitioners.

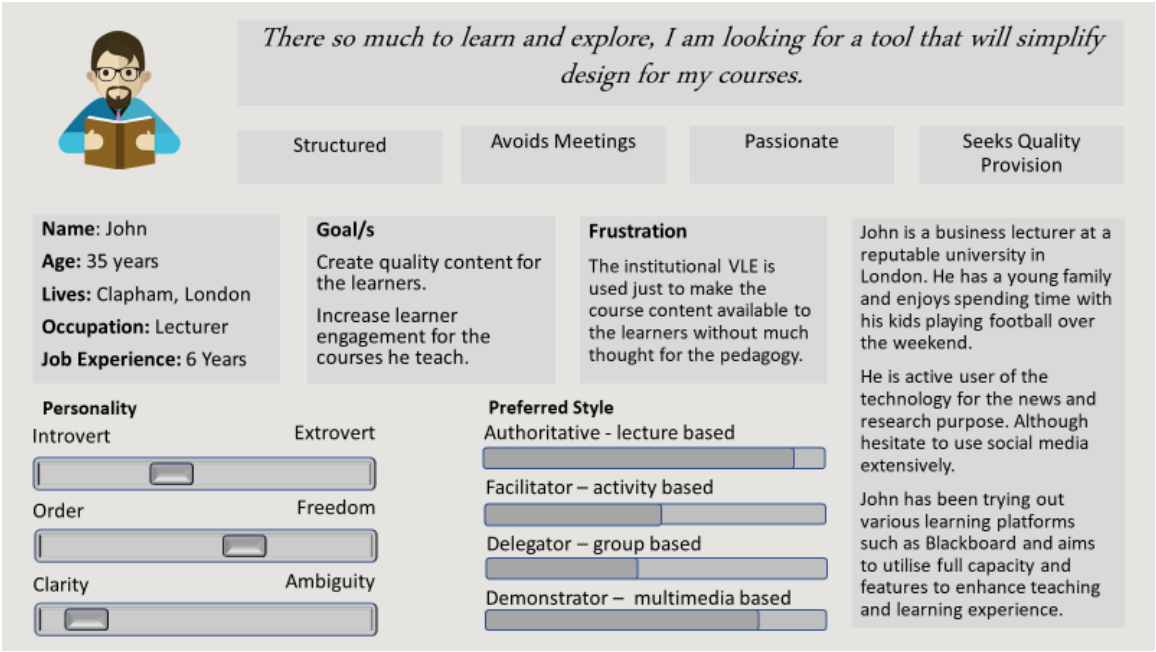

Figure 11

Persona of a Lecturer – Design Choices

The Cognitive Lenses dimension is used in the proposed ELES Effectiveness model and facilitates the development of a deeper understanding of the success factors for E-learning systems. For example, it is evident from the findings that just because a tool or a service is available - simply providing it is not enough in modern ELES systems.

This study highlights designers' need to think about how a 'tool or service' could be meaningful for practitioners by giving a context and how practitioners could be informed through design in achieving a better learner experience.

Our research conforms with many studies reporting technology as an important dimension (Bhuasiri et al., 2012; Liaw, 2007; Piccoli et al., 2001; Sun et al., 2008; H. C. Wang & Chiu, 2011). However, we found users' focus is perceived to be shifting in utilising the relationships that exist between technology and other dimensions such as pedagogy, networking and collaboration.

The practitioners might implement a certain pedagogy but it has to be relevant and meaningful for learners and they should be able to understand a particular approach to engage fully – this way our research findings conformed with (Kirschner, 2004, p. 43) e-learning effectiveness factor when he defined it as, 'a fitting pedagogy'. The conceptual model presented in our study has Networking and Collaboration as a key dimension in the e-learning effectiveness model, conforming to previous research studies (Kirschner, 2004; Shee & Wang, 2006; Y. S. Wang, 2003) in this field.

Instead of looking at the dimensions of e-learning effectiveness models discretely, Cognitive Lenses notion enables us to look at these dimensions cohesively. For example, it helps us to identify what relationships exist between pedagogies, networking, users' characteristics, personalisation, services, and technologies used in ELES. Moreover, it enables identifying what functions of ELES correspond to particular learning styles or helps to understand how choices made at the design stage will allow us to achieve specific learning goals with consideration of latent forces.

4.10 Conclusion

The results of the Grounded Theory Method are presented in a systematic manner. The components of the ELES effectiveness model, such as Design, Networking and Communication, are discussed with evidence from the data, and theoretical bindings are evaluated. The dimension of Cognitive Lenses for multiple interactions with multi-layered relational bindings is shown in action, including implications for wider scenarios. Examples of CL-MIM applications are shown. It was also noted that CL-MIM would be used to develop an enhanced ELES Effectiveness model, which will be validated in chapter 5.

Chapter 5: Validation of Emergent E-learning Services Effectiveness Model

Chapter Overview

This chapter starts with the theoretical background on the importance of model validation, and various genres are discussed in reference to structural equation modelling for this purpose. The details of the Partial Least Square structural equation modelling (PLS-SEM) are provided with the necessary justifications for the use of the analytical method of choice to validate the ELES effectiveness model following Chapter 4. PLS-SEM's procedural details are provided, including the measurement model and structural model stages for the PLS-SEM application. Data collection methods and the development of instruments for the questionnaire to capture relevant data for the evaluation of the CL-MIM ELES Effectiveness model are presented. Findings are presented and evaluated for the base and CL-MIM ELES Effectiveness models. A comparative evaluation is presented for the findings. The chapter is concluded, and contributions are highlighted to lead the discussion to the thesis's final chapter.

5.1 Validation

The model validation is a set of processes and actions that verify models in terms of reliability and verify the models' intended performance. Validation of the model involves testing key model assumptions. Empirical validation using multivariate statistics and structural equation modelling is discussed in this section, facilitating the decision to choose the appropriate validation method for this exploratory study.

Structural Equation Modelling (SEM) is a general term utilising various confirmatory statistical modelling techniques to evaluate the validity of theoretical constructs and frameworks (Lei & Wu, 2007). The structural equation modelling makes use of a pictorial representation (hypothesised set of relationships) of the structural relationships, depicted by a series of structural equations (i.e. regression equations), enabling a clearer understanding of the interplay between the theoretical constructs under study (Byrne, 2016).

Structural Equation Modelling (SEM) has the flexibility to model the relationships between multiple predictors and criteria variables, enabling to test out priori theoretical assumptions and hypotheses against empirical data. A system of linear equations could be used to test the hypothesised model, investigating the degree of variation in one variable to another variable/s based on the correlation

coefficient. SEM is more versatile compared to multivariate techniques as it enables to investigate simultaneous multiple dependent relationships among variables (Hoe, 2008). The multivariate analysis is different from univariate analysis. The univariate analysis could be conducted with statistics such as t-test and ANOVA where a single dependent variable is the subject of analysis, using t ratio or F ratio to test whether the group means are significantly different. In comparison, bivariate analysis involves two variables that are analysed together, generally using correlation techniques and the degree of correlation is measured using correlation coefficients such as Pearson correlation coefficient or Spearman correlation coefficient. The multivariate design contains more variables than univariate and bivariate analytical methods and involves aggregating the subset of variables to form variate, which is a composite variable and can be weighted or non-weighted. The multivariate analysis enables to create a composite of dependent variables and it can be conducted using various techniques, e.g. multivariate analysis of variance (MANOVA), and multiple regression (Guarino, 2016). In comparison, the simplest regression structures do not capture the possible interaction between the predictor variables. To overcome this problem, Structure Equation Modelling is widely used, which is based on Path Analysis and takes latent variables into account. A path model is a diagram connecting variables/constructs based on theory and logic to visually display the hypotheses to be tested. The Path Analysis enable the researchers to formulate the path model to depict their understanding of the interrelationship between predictor variables (Guarino, 2016).

The Structural Equation Modelling (SEM) is particularly useful for capturing the linkages' complexity and testing the inter-relationships among multiple predictors and criteria variables. SEM enable statistical testing for the existing theoretical assumptions against empirical data through Confirmatory Factor Analysis (Hoe, 2008), assessing how well the model fits the data. The SEM is a more sophisticated technique compared to other multivariate techniques because it allows exploring simultaneously the relationships among multiple dependent variables at various layers of dependency. The SEM is a set of methods, and the model represents many types of associations. For example, the non-directional relations could be evaluated by the Pearson correlation, the directional association is generally evaluated through multiple regression and ANOVA, and the indirect relationships between two or more variables are mediated, e.g., U1 affects U2 which in consequently affects U3, then the relationship between U1 and U3 is mediated by U2. The measurement model could consist of equations as follows:

$$x_1 = \lambda_1\xi_1 + \delta_1 \qquad y_1 = \lambda_4\eta_1 + \varepsilon_1 \qquad z_1 = \lambda_7\eta_2 + \mu_1$$
$$x_2 = \lambda_2\xi_1 + \delta_2 \qquad y_2 = \lambda_5\eta_1 + \varepsilon_2 \qquad z_2 = \lambda_8\eta_2 + \mu_2$$
$$x_3 = \lambda_3\xi_1 + \delta_3 \qquad y_3 = \lambda_6\eta_1 + \varepsilon_3 \qquad z_3 = \lambda_9\eta_2 + \mu_3$$

Figure 12.

Equations representing measurement model, adopted from Stein et al. (2012, p. 496)

The observed indicators for the latent variables are indicated by x's, y's, and z's, the ξ's and η's represent latent variables, the factor loading is represented by λ's and the ε's and δ's and μ's are measurement error representation. In the SEM notation (Figure 13), the boxes are used to describe observed variables, and the circles represent the latent variables. A causal relationship is represented by the single arrow between the two boxes. A double-headed arrow between the two boxes shows a non-causal relationship. An arrow not originating from a box represents residuals, and double-headed arrows between residuals represent covariance of residuals. An example of SEM diagram is shown in Figure 12 below, and these models are constructed and estimated using the variance-covariance matrix of the data.

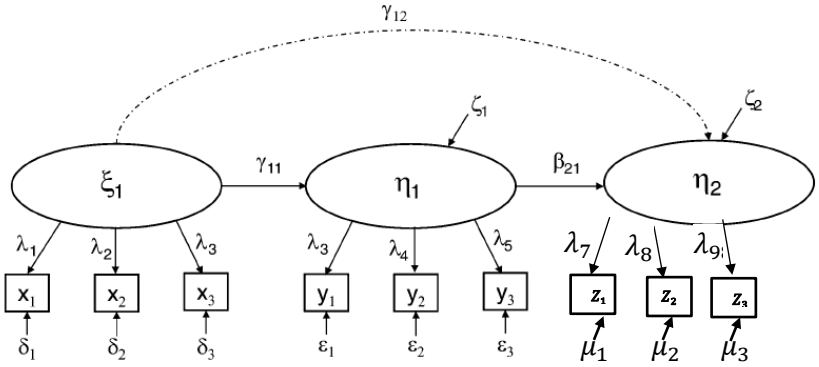

Figure 13

Illustrating SEM model, adopted from Stein et al. (2012, p. 498)

The CB-SEM (explained below in section 5.2 is based on the covariance matrix, defining model parameters by minimising the discrepancy between estimated and measured covariance matrices. The covariance matrix is formed by the set of relationships between Independent Variables (IV) and Dependent Variables (DV); both could be continuous or discrete. Both the Independent Variables and

Dependent Variable could be measured or manifest variables (directly observed) or latent variables (not directly observed). The measured variables could be derived from the items on a scale.

As mentioned above, the SEM has its roots in Path analysis, which essentially is an extension of multiple regression, allowing more than one dependent variable (DV) at a time, including the provision of the same variable to act as a dependent variable and independent variable in the chain of causality. However, path analysis can only handle observed variables. This limitation is overcome by SEM, which can measure the latent constructs, i.e. the variables that are not directly observable, affecting the influencing phenomenon in a given context, such as trust, anxiety, depression, and intelligence (Streiner, 2006).

5.2 Types of SEM

There are two main types of SEM approaches:

1. Covariance based SEM (CB-SEM)
    - The CB-SEM is based on the factor analysis, explaining the covariance between the set of observed variables through underlying latent variables. The relationships are constructed through regression or path analysis (Hox & Bechger, 1998).
    - CB-SEM aims to reproduce the theoretical covariance matrix that is minimising the difference between the observed and estimated covariance matrix (Astrachan, Patel, & Wanzenried, 2014).
    - The CB-SEM evaluation focuses on the goodness of fit (Sarstedt, Ringle, & Hair, 2014).
    - Usually used for testing and confirmation with the established theoretical basis for the models.
    - Dependent on large sample size assumes normality of data distribution and homoscedasticity.
    - Latent variable scores are indeterminate and not explicitly estimated (Sarstedt, Ringle, & Hair, 2014).
    - Small changes in model specification can affect the model fit substantially (Goodhue, Lewis, & Thompson, 2012).

2. Partial Least Squares SEM (PLS-SEM)
    - The PLS-SEM is a causal modelling approach, maximising the latent constructs' explained variance, combining the principal component analysis and path-based regression analysis (Ringle, Sarstedt, Mitchell, & Gudergan, 2018).
    - PLS-SEM aims to maximise the explained variance of the endogenous latent constructs (Sarstedt, Ringle, Smith, Reams, & Hair, 2014).
    - Theory development and prediction, develop theory and test theory for confirmation.

- Normality for data distribution is not assumed (Rigdon, Sarstedt, & Ringle, 2017).
- Fewer indicator variables (1 or 2) per construct can be used (Hair et al., 2014).
- Large number of indicator variables can be accommodated for the Proposed/Presented model (for CB-SEM, difficult with 50 plus items) (Sarstedt, Ringle, & Hair, 2014).

PLS-SEM and CB-SEM summary of comparison is presented in Table 7 below.

Table 7.

Comparison of PLS-SEM and CB-SEM ((Chin, 1998) **and** (Sarstedt, Ringle, & Hair, 2014)**)**

Item	**PLS-SEM**	**CB-SEM**
Method Objective	Prediction Focused	Parameter Focused
Method Approach	Variance dependent	Covariance dependent
Method Assumptions	Predictor specification - nonparametric based. Normality of distribution not assumed.	Assumes multivariate normal distribution - parametric based.
Parameter estimates	Consistent: as the indicators and sample size increases	Consistent
Latent variable scopes	Estimated explicitly	Indeterminate
Epistemic relationship: between latent variable and related measure	Supports formative or reflective mode	Supports reflective indicators typically
Implications	Optimised for prediction accuracy	Optimised for parameter accuracy
Ability to handle model complexity	Can handle large complexity, e.g., up to 100 constructs and 1000 indicators.	Can handle small to moderate complexity, e.g., less than 100 indicators.
Sample size Recommendation	Power analysis for the part of the model with the largest number of predictors. Typically, the minimum number of observations range from 30 to 100 cases.	Power analysis on specified model. Typically, a minimum number of observations range from 200 to 800.

PLS-SEM is particularly useful for exploratory research studies, enabling to handle problematic modelling issues, which frequently happen in social sciences and natural settings, such as data characteristics, e.g. non-normal data and complex relationship, including formative and reflective constructs (Hair et al., 2014). PLS-SEM is the preferred method to explore the multiple causal relationships for both the formative and reflective constructs, involving direct and indirect paths from a large set of indicators (Law & Fong, 2020).

5.3 PLS-SEM

The PLS-SEM comprises a multi-stage iterative process involving the specification of the inner and outer model, collecting and examining data, estimating the actual model, and evaluating the results (Joe F. Hair et al., 2014). The focus of PLS-SEM is to maximise the explained variance of Endogenous constructs. An Endogenous construct is something caused by an existing construct in the model, whereas any other construct does not cause an exogenous construct. A construct is an imaginary variable that researchers create to explain or understand a phenomenon and is used as the basis to test the hypotheses.

Endogenous Variable: Any variable/construct in the path analysis which can be explained based on one or more variables/constructs in that analysis.

Exogenous Variable: A variable/construct in the path analysis which cannot be accounted for by any other variable/construct in that analysis.

As mentioned already, PLS-SEM is a multistage process that includes:

1. Model Specification
2. Outer model evaluation
3. Inner model evaluation

The model specification refers to drawing the constructs and associated indicators to depict the variable relationships. The resulting diagram is called the path model and reflects logical associations and theoretical groundings and facilitates understanding and illustrations of hypotheses to be (Hair, Hult, Ringle, & Sarstedt, 2016, Chapter 2).

The Inner Model, referred to as the Structural model, displays the relationships (paths) between the latent constructs to be evaluated. The PLS-SEM requires no causal loops; hence structural paths can point in a single direction. The endogenous and exogenous constructs are distinguished for the structural model. The exogenous constructs have no relation paths pointing at the constructs, whereas the opposite holds for the endogenous constructs, which means other latent constructs define the endogenous constructs. The Outer Model, referred to as a measurement model, is used to evaluate the relationship

between the unidirectional indicator variables and the corresponding latent construct (Hair, Ringle, & Sarstedt, 2011).

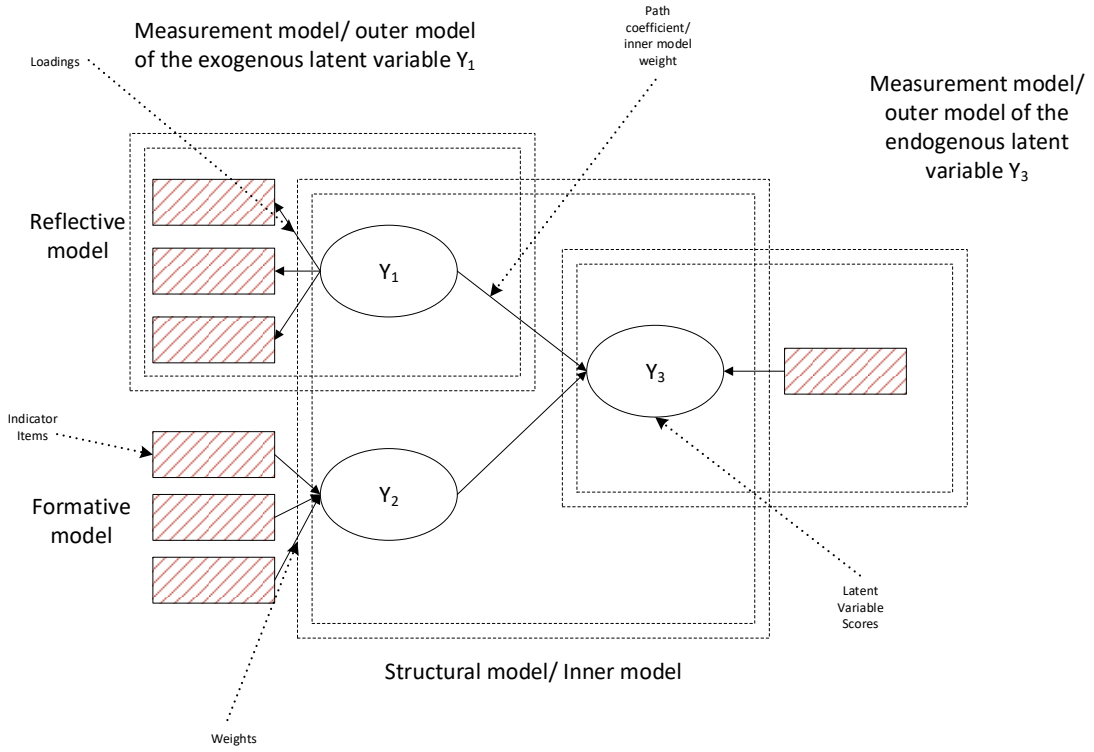

Figure 14

Structural model/Inner model

The constructs in the path model above (Figure 14) are depicted by oval shape. The constructs are essentially variables that are not directly measured. On the other hand, the indicators depicted by the small rectangles are the variables that are directly measured. The arrows in the path model and single-headed arrow and directional. The directional arrows may represent predictive relationships provided and grounded in theoretical justification. The PLS path model comprises of two components, the measurement model (outer model) and the structural model (inner model). The structural model represents the constructs and relational paths between them, and the Measurement model represents the relationship between indicators and the constructs. The path model also takes into account the Exogenous (Y_1 and Y_2 as depicted in Figure 13) and Endogenous constructs (Y_3), explains the other constructs in the model and constructs which are explained by other constructs, respectively. The reflective indicators and endogenous constructs have error terms associated with them, which is unexplained variance in the path model estimation (Hair et al., 2016). The path model distinguishes between Formative and Reflective constructs. The main difference is that the formative construct is caused by the indicators, with arrows pointing towards the construct, whereas indicators are caused by

the reflective construct, arrows pointing towards indicators. The same underlying latent construct influences the reflective indicators. It is important to avoid applying formative constructs where reflective constructs should be used. This can be achieved by looking at all the indicators and determine if they are tapping into the same underlying concept, issue, factor or phenomenon (Chin, 1998). The measurement instrument designed for this study follows this rule, as evident from the discussion in the questionnaire design. The path models enable to test the theory empirically, which is logically linked and specified using a set of hypotheses presented later in this chapter.

The PLS-SEM validation steps are depicted in Figure 15 below. The stages specified are discussed in detail in the subsequent sections of this chapter.

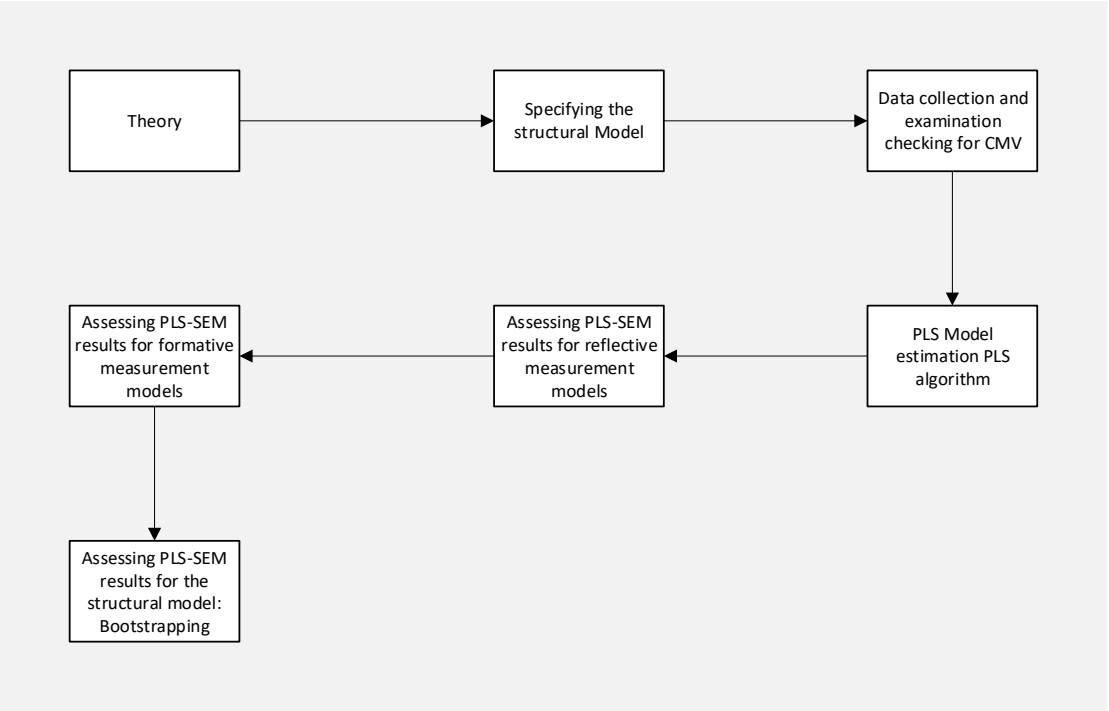

Figure 15

PLE-SEM Validation Steps

PLS-SEM Measure Model Assessment (Outer Model) involves examining Indicator Reliability, Convergent Reliability, Internal Consistency and Discriminant Validity, enabling to evaluate the reliability and validity of the constructs measured in the outer model (Hair et al., 2014). The details of these measures are provided below.

5.4 Measurement Model Assessment: Indicator Reliability

The first part of the measurement model assessment starts with the indicator/item reliability. This is assessed by loadings, depicting correlations of the measures with the relevant construct. Indicator loading of more the 0.7 generally suggests an acceptable mark to accept the item, indicating there is a

more shared variance between the measure and the construct than the error variance (Hulland, 1999). The items of low loadings should be examined carefully. These loadings will add little explanatory power to the model while reducing the effect, causing potential bias. Therefore, low-value loading should be reviewed carefully.

- Reflective indicator loadings > 0.7: shows each of the items is a good measure of the latent construct (Hulland, 1999).

The weaker outer loadings (< 0.7) are frequently used by researchers in social sciences, especially where newly developed scales are used, and indicators with outer loadings between 0.4 to .07 are retained for the contribution of the indicator to the content validity. However, outer loadings less than 0.4 are always eliminated from the construct (Hair et al., 2016, Chapter 4).

5.5 Measurement Model Assessment: Convergent Reliability

The validity of reflective indicators is further evaluated using the construct's convergent reliability. The Convergent reliability shows how well the indicators correlate with each other for a relevant construct. Convergent reliability is examined using Average Variance Extracted (AVE) and is a grand mean value of the square loadings of a set of indicators (Hair et al., 2014). It is similar to the communality of a construct and comparable to the proportion of variance explained in factor analysis.

- AVE > 0.5 is acceptable (Bagozzi, 1980, as cited in Fornell & Larcker, 1981)

The AVE of more than 0.5 indicates that the construct explains more than half of the variance of the indicator/s related to it and also implies that the variance shared between the construct and its indicators is more than measurement error variance (Hair et al., 2014).

5.6 Measurement Model Assessment: Internal Consistency

The Cronbach Alpha is traditionally the first test to evaluate indicator reliability. The Cronbach Alpha measures the intercorrelations of the observed indicator variables. The statistic of the Cronbach Alpha is defined as:

$$\text{Cronbach's } \alpha = \left(\frac{M}{M-1}\right) . \left(\frac{1 - \sum_{i=1}^{M} s_i^2}{s_t^2}\right)$$

The variance of the indicator variable 'i' is represented by s_i^2; M represents the number of indicators and s_t^2depicts the item variances and inter-item covariances. The Cronbach Alpha is sensitive to a number of indicators in the, i.e., number of items in the scale and tends to underestimate the internal consistency reliability (Cortina, 1993).

Cronbach's Alpha

- $\alpha > 0.7$ (Nunnally & Bernstein, 1978)

Cronbach's alpha evaluates the reliability of the indicators for unidimensionality of a set of scale items (Cortina, 1993). It measures the extent to which all the variables in the scale are positively related to each other.

In comparison to Cronbach's Alpha, the Composite Reliability (CR or also known as Dhillio-Goldstein's Rho) provides a more appropriate measure of internal consistency reliability (Hair et al., 2016).

$$\rho_c = \frac{(\sum_{i=1}^{M} l_i)^2}{(\sum_{i=1}^{M} l_i)^2 = \sum_{i=1}^{M} var(e_i)}$$

The standardised outer loadings of the indicator variables are denoted by l_i for the relevant construct M, e_i depicts measurement error for the indicator variable I, whereas $var(e_i)$ specifies variance of the measurement error (Hair et al., 2011).

- CR > 0.7, adequate consistency, although in exploratory research, 0.6 to 0.7 is considered acceptable (Gefen, Straub, & Boudreau, 2000).

The Composite Reliability (CR) of more than 0.7 shows adequate consistency. The Composite Reliability is a better measure in comparison of Cronbach Alpha, which is sensitive to the size of the items in the scale (Hair et al., 2016).

5.7 Measurement Model Assessment: Discriminant Validity

Discriminant validity is a measure that shows the distinctiveness of the construct, representing the extent to which the indicators relate to each other for a particular construct against other constructs, showing construct is empirically distinct from other constructs. The cross loadings is the first approach to measure to verify discriminant validity, requiring the loadings for each indicator are higher for its construct than the cross loadings on other constructs (Joseph F. Hair et al., 2016).

The approach to evaluate discriminant validity is through Fornell-Larcker criterion, which states that the average variance extracted (AVE) of a construct should be higher than the squared correlations between any other latent construct, ensuring subjective independence and helping to reduce the presence of multicollinearity ((Fornell & Larcker, 1981); see also (Hair et al., 2016)).

The measurement model utilised in this study, as depicted in Section 5.15.10, is a reflective measurement model. If the measure model contains formative indicators, then the construct evaluation is based on totally different criterion (Hair et al., 2016). This criterion is not applicable to this research study.

5.8 Structural Model: Hypothesis Testing - Bootstrapping

(Inner model Evaluations – Structural Model)

The estimates are obtained after running the PLS-SEM algorithm, depicting structural model relationships, i.e., path coefficients, representing hypothesized relationships between the constructs. The PLS model estimates the parameter in a way, so the explained variance of the endogenous variables is maximized. The steps for the Structural Model Evaluation are depicted in Figure 16 and explained in detail in subsequent sections:

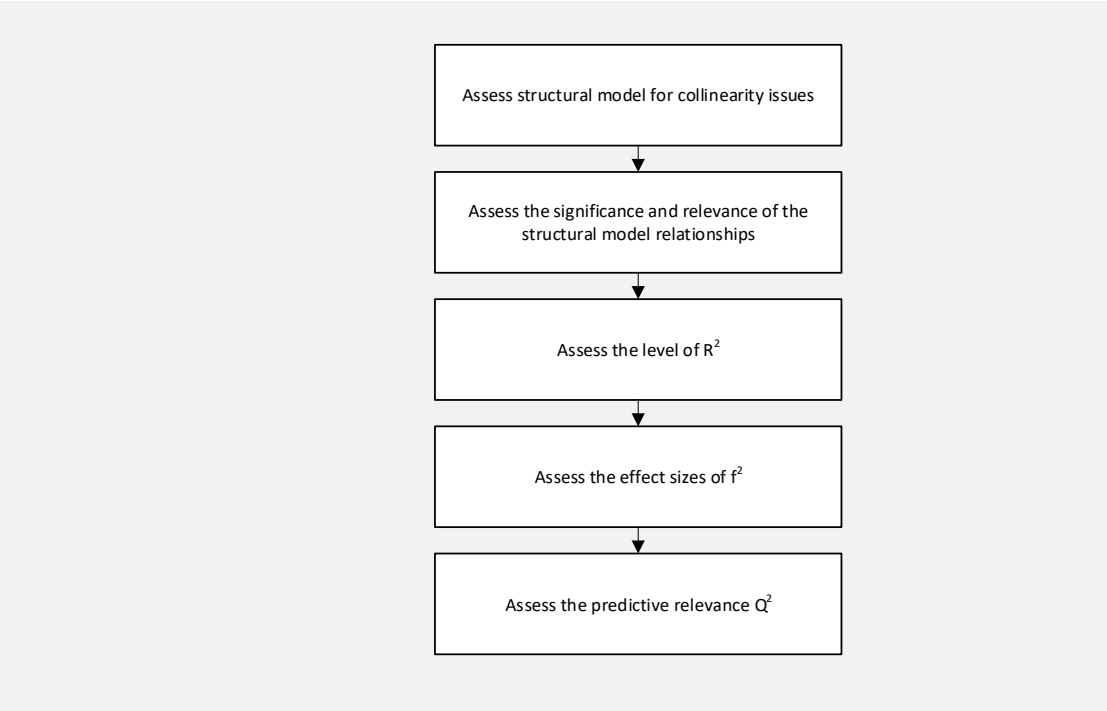

Figure 16

Structural Model Evaluation Steps

The criteria given below is used for the assessment of the model:

- Coefficient of determination R^2
- Cross-Validated Redundancy Q^2
- Path Coefficients
- Effect size f^2

However, before the analysis is conducted, the issue of collinearity needed to be checked for the inner model (structural model). The inner model estimates are obtained from the set of regression analyses, hence, subject to bias if there is high collinearity among the constructs (Hair et al., 2016).

- Path coefficients vary between -1 and +1. Higher absolute values denote stronger (predictive) relationships between the constructs.
- Types of effects

- Direct effect: A relationship linking two constructs with a single arrow between the two. As shown in Figure 16 between Y_1 and Y_2 constructs.
- Indirect effect: A sequence of relationship with at-least one intervening construct involved. As shown in Figure 17 with the path Y_1 to Y_2 and then to Y_3 constructs.
- Total effect: The sum of the direct effect and all indirect effects linking two constructs. As shown in Figure 16 for Y_3 with direct and indirect paths.

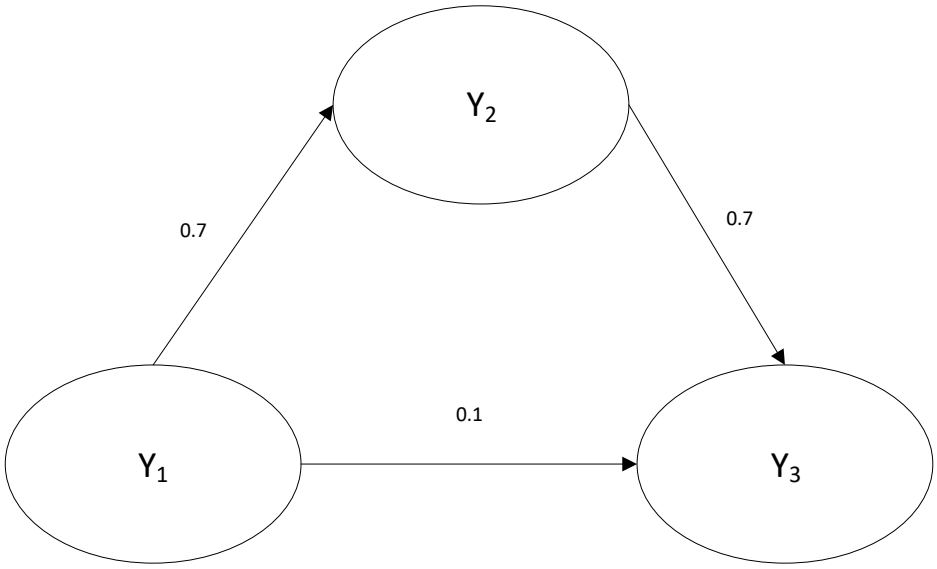

Figure 17

Inner model Evaluation - Structural Model

Path Coefficient Estimates – Assess significance and confidence intervals (Hair, Hult, Ringle, Sarstedt, & Thiele, 2017).

The bootstrapping is used to assess the path coefficient's significance. The minimum number of bootstrap samples is 5000, and the number of cases should be equal to the number of observations in the original sample.

Critical t-value for a two-tailed test is 1.65 (significance level = 10 percent), 1.85 (significance level = 5 percent) and 2.58 (significance level = 1 percent) (Hair et al., 2011).

After running the PLS model, estimates are provided for the path coefficients, representing the hypothesised relationship linking the constructs. Path coefficient values are standardised on a range from -1 to +1 with coefficients closer to +1 representing positive relationships and coefficients closer to -1, indicating strong negative relationships.

Although values close to +1 or -1 are almost always must statistically significant, a standard error must be obtained using bootstrapping to test for significance (Helm et al., 2009 as cited in Hair et al., 2016).

Bootstrapping analysis is used to evaluate the direct effects of all the hypothesised relationships represented by statistical testing of the hypothesis.

If $t_{0.05} > 1.96$ (for a 2-tailed test), a hypothesis is supported (Hair et al., 2011) suggest to assess β and corresponding t-values through a bootstrapping procedure with a resample of 5000.

5.9 Structural Model: R-Square (Coefficient of Determination)

The R^2 measures the proportion of variance explained in the dependent variable (latent endogenous construct) through all associated exogenous constructs for that dependent variable (Hulland, 1999). R^2 is a measure of the model's predictive accuracy:

- R^2 ranges between 0 and 1; the higher values indicate higher levels of predictive accuracy.

The rules of thumb are:

- $R^2 \approx 0.25$: weak
- $R^2 \approx 0.50$: moderate
- $R^2 \approx 0.75$: substantial

However, the level where the results of R could be viewed as high, moderate, and weak could be different for different disciplines. For instance, the exploratory studies may have a lower value considered as substantial in comparison (Hair et al., 2011).

The model estimates should not entirely be based on R^2. The value of R^2 increases when additional predictor constructs are included, including those that may be slightly related to endogenous construct (Hair et al., 2016, Chapter 6). The adjusted R^2 could be used with multiple regressions analysis to overcome the problem where the model is complex. The adjusted R^2 controls for the model complexity when comparing different model set-ups:

$$R^2_{adj} = 1 - (1 - R^2) \times \frac{(n-1)}{(n-k-1)}$$

- where n = sample size and
- k = number of predictor variable (exogenous latent constructs)

5.10 Structural Model: Effect Size f^2

The specific effect size for each path model is measured by omitting a specified construct is used to evaluate if the omitted construct had a substantive impact on the endogenous construct. This measure is known as the effect size of the exogenous latent variable on the model.

The assessment of the effect size is provided in guidelines, as 0.02, 0.15 and 0.35 for small, medium and large effects respectively (Jacob, 1988, Chapter 10). The effect size is calculated as:

$$f^2 = \frac{(R^2_{included} - R^2_{excluded})}{(1 - R^2_{included})}$$

- where $R^2_{included}$ and $R^2_{excluded}$ are the R^2 values of the endogenous variable when a specified exogenous latent variable is included or excluded from the model.

The change in the R^2 values is measured by evaluating the PLS path model twice: first with the exogenous latent variable included ($R^2_{included}$) and the second instance with the exogenous latent excluded ($R^2_{excluded}$) (Cohen, 1988, as cited in Henseler & Chin, 2010) .

The rules of thumb are:

- $0.02 \leq f^2 < 0.15$: weak effect
- $0.15 \leq f^2 < 0.35$: moderate effect
- $f^2 \geq 0.35$: strong effect

5.11 Structural Model: Blindfolding and Cross-Validated redundancy Q^2 (Predictive Relevance)

The Q^2 is a measure for assessing the inner model's predictive relevance or out-of-sample predictive power or predictive relevance. The measure builds on sampling re-use and blindfolding technique for a specified omission distance D. The blindfolding omits every *d*th data point for the endogenous construct indicators and estimates the model with the rest of the data points (Joseph F. Hair et al., 2016). The blindfolding is an iterative process until each data point is omitted and the model re-estimated. A smaller difference between predicted and original values indicates the stronger predictive accuracy of the model.

$$Q^2 = 1 - \frac{(\sum_D SSE_D)}{(\sum_D SSO_D)}$$

- where D indicates the omission distance, (rule of thumb: $5 \leq D \leq 10$), SSE is the sum of squares error, and SSO is the sum of squares total (Tenenhaus, Vinzi, Chatelin, & Lauro, 2005).

Care must be taken when setting the omission distance, and the number of cases in the data should not be multiple integer numbers of the omission distance. If this is the case, the blindfolding procedure will yield erroneous results.

5.13 Sampling Method

The next step will be to carry out the full-scale analysis and validation for the proposed model using PLS-SEM. The results will be presented with critical insights, and constructs will be presented for the generalisation of the findings.

5.13.1 Survey based Sampling

A sample is a subset of the population. A population comprises of the total elements/entities making up the domain. Normally, it is very time-consuming to take every instance of the population, or in many cases, impossible. For example, suppose a researcher wanted to examine commuters' satisfaction level for TFL (London Transport Network). In that case, it will be impossible to gather data from hundreds

of thousands of commuters travelling daily on the transport network. In this instance or similar cases, taking sample/s from the domain's available population would be a viable option. However, the researchers wanted the sample to represent the population, so the inferences taken from the findings of the study are reliable and depict the reality as closely as possible. This leads to the concept of generalisability, referring to the extent to which the results from the sample would be accurate for the whole population of interest (Wilson, 2017).

Any survey-based sample selection process will have some individuals who have a chance to participate in the survey, whilst others will be excluded and will not have an opportunity to take part in the survey. The people with the opportunity of being selected constitute a sampling frame. In other words, the sampling frame is a complete set of cases from the target population from which the sample will be drawn (Fowler, 2014, Chapter 3).

There are various types of sampling:

5.13.1.1 Simple Random Sampling

The simple random sampling involves choosing members of the population one at a time. The member who has been chosen for the sample has no chance of being chosen again. The simple random sample, operationally, requires numbering the population list to ensure the unique instances selected in the sample (Fowler, 2014, Chapter 3).

5.13.1.2 Systematic Sampling

The simple random sampling technique is simple from the structure of the method point of view. However, unless the population is small and numbered list for the population already available, it can be laborious to exercise simple random sampling in many real-world scenarios. Systematic sampling provides a better method comparatively where the number of elements in the list and the sample to be selected is determined. For example, if the population items are 20,000 and a sample of 100 is required. Then the dividing (100/20,000) will determine 1 out of every 200 items is to be included in the sample. The starting point is designated randomly for each sampling interval, e.g., any number from the first 200 items and so on. If the selection is not done randomly or has used a recurring pattern, e.g., 100^{th} item and then 300^{th} item and so on, then care should be taken to ensure that the sample will not be different in nature for different starts. For instance, if the population list ordered in such a way to have male and female data one after the other, then a recurring pattern may end up with a sample of only males in the data. For this reason, the sampling frame should be carefully examined that the sample resulting from one random start is not systematically different from a different random start to affect the survey results (Fowler, 2014, Chapter 3).

5.13.1.3 Stratified Sampling

The stratified sampling puts a constraint on simple random sampling to ensure certain representation from the population data. For example, if it is required that the sample should contain certain types of customers in a marketing survey for a big retail store then a constrain could be placed that certain number of samples should be taken from the pool of cosmetics customers, grocery customers, clothing customers and home & furniture customers. This way the sample will not be biased towards a particular type of retail sector (Fowler, 2014, Chapter 3).

5.13.1.4 Cluster Sampling

Cluster sampling is similar to Stratified sampling in the sense that the discrete groups are formed out of the target population prior to sampling. The formed groups are called clusters, and these clusters could only be based on naturally occurring characteristics, e.g., geographical area. The sampling frame is based on the set of the cluster rather than on individual cases of the population. The next stage is to select the clusters for the sample, and every case within the selected clusters will be chosen for the data collection. This method is suitable where constraint on resources prevents collecting data from all groupings. For example, narrowing down the sample to a few geographical compact areas could maximise the data collection using the face-to-face method with allocated time and resources; however, this could reduce the sample's representation. Hence, care should be taken when making a decision about the precision required through the sampling method (Saunders, Lewis, & Thornhill, 2016, Chapter 7).

5.13.1.4 Multistage Sampling

This sampling technique is used when there is no adequate list of the population available and no systematic way available to get to the population directly. This technique is used to address the problems associated with a geographically dispersed population where face-to-face contact is needed and geographical, time and resources constraints prevent obtaining a sampling frame from a large geographical area. For Multistage sampling, a strategy is needed to link the population to some sort of grouping to obtain the sample. The lists could be made from the first set of selected groups. Further selection could be made at the second (or later) stage of sampling from the list of groups. The process entails selecting smaller and smaller subgroups and could lead to issues of representativeness of the sample. To address these issues, stratified sampling technique could be used to minimise the impact (Saunders et al., 2019).

5.13.1.5 Sampling Method of the Research Study

For the purpose of this research, a stratified sampling method was employed. The study population comprises of students at London campuses of Northumbria University, Ulster University and Roehampton University. The students studying at the universities were exposed to various E-learning platforms such as Blackboard, Moodle, WebEx, as part of their business and computing degree

programmes, comprising of level 3 to 7, that is BSc/BA to MSc level, making it suitable and diverse population for the study. A constrain of gender was applied to the sample as a top level strata to ensure adequate representation of gender distribution is ensured and as per stratified sampling method. The male representation was accounted to 57.4% and female to 42.6% for each strata and noted for the sample in Table 9. Further constraint was used for each sample collected to ensure programme level representation. This ensured programme level distribution is not biased towards students studying Masters level degree or towards students studying Bachelor level degree. This constraint ensured the even distribution between the degree level split where students studying Bachelor's degree (level 4 to 6) account for the 46.6% of the sample and students studying Master's degree (level 7) accounted for 44.5% of the sample. Only the students with the experience of the E-learning platform were selected and from a specified level of study, enabling to maximise the representation for the sample. A sample of 212 was collected from the population of the specified students studying at the London campuses of the universities aforementioned.

5.14 Questionnaire Design

The questionnaire (or instrument) is the most widely used data collection method from marketing to research in social sciences in survey strategy. There are number of different definitions available, and different people use the term questionnaire to define different things. In this research study, the term questionnaire is used for a set of questions where participants fill the answers themselves. The questionnaire definition adopted for this study is based on (Saunders et al., 2019), where each participant is asked to respond to the same set of questions in a pre-determined order.

A questionnaire (Appendix E) is designed for the SEM validation study of Cognitive Lenses Multi Interaction ELES Effectiveness Model (CL-MIM). The themes of the findings are presented in Table 9 and cross-referenced with the existing body of literature. The items of the questionnaire are based on the findings of the Grounded Theory Method for the development of the CL-MIM ELES Effectiveness model as discussed in Chapter 4 and are informed by the existing body of literature. The PLS-SEM method was employed to investigate the conceptual model, which links the dimensions (latent or manifest) contributing to the successful utilisation of E-learning Environment and Services.

The questionnaire was designed for individuals with access to the internet and email account. The questionnaire was designed in Qualtrics software and distributed to individual email accounts, reducing the risk of contamination by consultation with others. The questionnaire comprised of 8 pages where direct questions related to the constructs were asked with an average completion time of 20 -25 minutes for the questionnaire. The of use Qualtrics (2021) software enabled participants to save the questionnaire and complete it over a period of time, hence improving the completion rate for the questionnaire. The questionnaire remained available up to 4 weeks from the distribution date for a participant. The first part

of the questionnaire comprises of factual or demographic variables. The factual variables include characteristics such as gender, age, education level, occupation, possession, access, and engagement data. The other variable could be related to attitudes or opinions, where the participants need to think to answer the question and likely to be influenced with the context provided for the question. The third type of variable common in business management and social sciences research is 'Behaviour' and 'Event' variable, capturing data related to what people did and what happened in the past or, what is happening currently or will happen in the future (Saunders et al., 2019). All three types of variables are used in the questionnaire to gather factual data, capture attitudes, opinions, behaviours, and event, enabling to capture a rich picture for the investigation and exploring various dimensions of the proposed model.

It is important to ensure that the data captured will meet the research objectives and is relevant with required level of details. A six-step process is adopted for this purpose:

1. Identify the goal of the study and outcome whether it is descriptive or explanatory in nature.
2. Subdivide the focal themes or set of hypotheses or research questions into specific questions/instruments to gather. The questions/instruments may relate to existing literature, theory or adopted from existing instruments, it should be noted.
3. Repeat the second stage if the questions/instruments are not precise to the extent for the intended purpose.
4. In the context of relevant theory and key themes in the literature, identify the variables for which data must be collected.
5. Workout the level of detail required from the data for each variable related to the investigative question to be answered.
6. Develop the measurement questions and scales to capture data for each of the variable.

The questionnaire contains factual questions to capture the general characteristics of the participants such as gender, age, education level occupation, demographic origin, access to broadband and mobile phone and which elearning platform they used and a general comment.

Table 8.

Theoretical Grounding of Data Collection Instruments

Constructs	**Item Themes**	**No: of Items**	**Theoretical Support and References**
ELES Transformation, Scale and Scope Parameters	1. Importance of sharing ideas 2. Self-efficacy in technological use 3. Support for teaching and learning 4. Enabling tracking progress 5. Importance of effectiveness of assessment tools 6. Increasing confidence in skills use in future career and jobs 7. Enhancing wider participation	11	New Item Themes derived from (Haq et al., 2018) Item Themes [4, 5] adapted from (Sun et al., 2008) and

			(Thurmond, Wambach, Connors, & Frey, 2002)
ELES Users Characteristics, Perspectives & Requirements	1. Efficacy 2. Emotional considerations 3. Community enabler 4. Enabling to become effective user of conversational channels 5. Understanding of cultural attitudes 6. Facilitating self-direction 7. Independent organisation of own learning 8. Importance of ease of use 9. Facilitating in resolving common problems 10. Enabling to obtain effective feedback 11. Facilitating awareness of organisation rules on dos and don'ts 12. Facilitating accessibility 13. Facilitating flexibility for progression in learning	12	New Item Themes [2, 3,4, 5, 11] derived from (Haq et al., 2018) Item Themes [1, 10] adapted from (Sun et al., 2008) Item Themes [6,7] adapted from (Barbeite & Weiss, 2004) and theoretical model by (Haq et al., 2018)
ELES Effectiveness	1. Collaboration 2. Impact of external social media channels on learning 3. Personalization 4. Complimenting learning enabling comprehensive options 5. Easy access to resources and Learning material - flexibility 6. Facilitating organization 7. Facilitating course management 8. Limiting forces reducing (e.g., security requirements) collaborative potential 9. Limiting forces reducing potential creating and growth of learning communities	6	New Item Themes [1, 2] derived from (Haq et al., 2018) Item Theme [3] adapted from (Y. S. Wang, 2003) Item Themes [4, 5, 6 and 7] adapted from (Arbaugh, 2000) and (Sun et al., 2008)
ELES Design, Tools & Services	1. Evolution of design, tools and services is important with changing trends 2. Changes in design, use of tools and services could trigger new patterns of working and pedagogies 3. ELES tools enabling to meet organisational requirements	12	New Item Themes [1, 2, 3, 5] derived from (Haq et al., 2018) Item Theme [7] adapted from (Y. S. Wang, 2003)

	4. Facilitating social interactions for knowledge creation and sharing 5. Facilitating integration of wider tools, enhancing learning environment and motivation of learners 6. ELES design and provided tools enable to work effectively 7. User friendliness		Item Theme [6] adapted from Item Theme [2] adapted from (Piccoli et al., 2001) Item Theme [4] adapted from (Lim et al., 2007)
ELES Networking & Collaboration	1. Enabling interaction with more people 2. Enabling effective dialogue with the instructor 3. Facilitating collaborative learning 4. Facilitating interactions beyond own class 5. Enable to address privacy concerns 6. Facilitate diversity 7. Facilitate Ease of Access in a collaborative environment	11	New Item Themes [4, 5, 6] derived from (Haq et al., 2018) Item Themes [1, 3] adopted from (Urbach et al., 2010) and (Y. S. Wang, 2003) Item Theme [2] adapted from (Piccoli et al., 2001) and (Sun et al., 2008) Item Theme [7] adopted from (Shee & Wang, 2006)
Pedagogy	1. Understanding the nature of choices available is useful in ELES for learning 2. Being part of the learning community is important 3. Developing an understanding of the context is important for the learning process 4. Enabling Personalised support for continuous engagement 5. Utilising motivational tools for engagement and retention 6. Meaningful content	10	New Item Themes [1, 3, 5, 6] derived from (Haq et al., 2018) Item Theme [2] adapted from (Y. S. Wang, 2003) Item Theme [4] adapted from (Shee & Wang, 2006)

	7. Guidelines on rationale and content helped with the achievement of the tasks		Item Theme [7] adapted from (Lim et al., 2007)

The pilot for the questionnaire was conducted for the refinements of the instruments used. At this stage, questionnaire flow and wording were tested with 10 participants and based on the feedback, the questionnaire was refined for better experience and comprehension. The main data collection was conducted using questionnaire distribution through Qualtrics (2021) and Physical copies of the questionnaire. The sample characteristics are depicted in Table 10 below.

Table 9

Sample Characteristics

		Frequency	Percent (%)
Gender	Male	116	57.4
	Female	86	42.6
	Total	202	100.0
Age	18 to 25	64	31.6
	26 to 35	77	38.1
	36 to 45	35	17.3
	46 to 55	16	7.9
	55 to 65	8	4.0
	above 65	2	1.0
	Total	202	100.0
Studying Level	Foundation Degree	12	5.9
	Bachelor's degree (2 years)	1	0.5
	Bachelor's degree (3 or 3+ years)	94	46.6
	Master's degree	90	44.5
	Above Master's degree or PhD	0	0
	Continuing Professional Development	2	1.0
	Other	3	1.5
	Total	202	100.0
Student Demographics Origin:	England	56	27.7
	Scotland	1	0.5

	EU	63	31.2
	Europe (Other)	5	2.5
	China	12	5.9
	India	8	4.0
	Asia (exec China and India)	26	12.9
	Far East	2	1.0
	Middle East	3	1.5
	North America	2	1.0
	South America	13	6.4
	Africa	7	3.5
	Unknown	4	2.0
	Total	202	100.0
Broadband/high-speed Internet access at home:	Yes	190	94.1
	No	8	4.0
	Unknown	4	2.0
	Total	202	100.0
Personal computer access at home:	Yes	195	96.5
	No	6	3.0
	Unknown	1	0.5
	Total	202	100.0
Smart mobile phone Ownership:	Yes	197	97.5
	No	4	2.0
	Unknown	1	0.5
	Total	202	100.0

Further, the discussion on the distribution of the data is provided below:

The PLS-SEM is based on nonparametric statistics and does not need the data to be normally distributed (Hair et al., 2016). In comparison, CB-SEM does require data to be normally distributed. Although, for PLS-SEM based analysis the data should not be too far from normal and extreme nonnormal behaviour of the data could cause issues for the significance of the parameters, especially inducing errors in bootstrapping, reducing the chance of some relationships to be identified as significant. The commonly used Kolmogorov-Smirnov test and Shapiro-Wilks's normality test provide limited effectiveness for PLS-SEM, as these tests provide limited guidance on the data variations as a degree of the distribution:

if too far from being normally distributed. For this purpose, Skewness and Kurtosis tests are used to assess the symmetry of the distribution (Joseph F. Hair et al., 2016, Chapter 2). The Skewness refers to distribution behaviour if it stretches left or right from the mean. Kurtosis measures the distribution for pointedness and flatness of the distribution. The cut-off point for the Kurtosis is ± 1. The values greater than +1 and lower than -1 indicate distribution is too peaked and too flat, respectively. Similarly, for Skewness, if the number is more than +1 and less than -1 indicates skewed distribution towards the right and left, respectively. This could be due to outliers, e.g., in the Likert scale of 1 to 5, if instead of 5, a value of 50 is coded when inserting values in the data set, it will cause an outlier value. The ELES model's Skewness and Kurtosis tests were conducted using statistical analysis, as noted by Cain et al. (2017). The ELES models' Skewness is within the range of ± 1 generally, but for some parameters, a variation is shown above or below ± 1, as indicated in Appendix B (Tables B.5) and Appendix C (Table C.2) for ELES models. The Kurtosis is more than 1 in many cases, indicating the distribution is not normal. The data set was also checked for the presence of outliers and where Skewness and Kurtosis values were high or low compared to cut-off values. No extreme outliers were found, confirming the integrity of the data. The distribution is not normal hence the reason for the PLS-SEM as an appropriate method.

The research has shown the issue of artificially inflated covariation when respondents of the survey reply to questions about independent and dependent variables. This could potentially lead to biased results. For this study, Harman's single factor test is used to check common method bias (Fuller, Simmering, Atinc, Atinc, & Babin, 2016). The result, as shown in Appendix B (Table B.1), indicates an overall variance of 37.71%, which is less than 50%. This result shows there is no issue of common method bias in the data used for this research study.

5.15 ELES Effectiveness Model

This part of the research modulates the ELES model and provides an opportunity to explore the effect of various proposed parameters using the PLS-SEM methodology.

The first of the PLS-SEM validation involves the model with seven theoretical constructs: Design; Pedagogy; Networking & Collaboration; User Requirements; ELES Effectiveness; ELES Transformation, Scale and Scope; User Expectations and User Perception. The ELES effectiveness model was presented in relation to these constructs in section 4.8.2. The development of the model was discussed in detail in Chapter 4. Each of the constructs used in the model is derived from the ELES effectiveness model presented. The items of the questionnaire, as depicted in Appendix E were developed based on the ELES effectiveness model and common themes by conducting a comparative evaluation and questionnaire instrument form the basis of the validation of the ELES effectiveness

model. The ELES effectiveness model explores how the design, pedagogy, networking & collaboration constructs affect user perception, user expectations and transformation for the users. In addition, user requirements relationship and their effect on the design, pedagogy and networking & collaboration is measured. These causal relations are explored based on the ELES Effectiveness model presented in section 4.8.2. Further details and the formation of the constructs are given below.

The SmartPLS software version 3 (Appendix D) was used for the statistical calculation for the measurement model structural model. The SmartPLS has become an industry standard for the testing and validation of the PLS-SEM based models reliably (Ringle, Da Silva, & Bido, 2014). The details of the measurement model and structural models testing are given in the next subsection.

Construct Formation: The formation of each construct and specified hypotheses based on the ELES effectiveness model are given below.

5.15.1 Design construct

The set of hypotheses for the Design construct and related relations to other constructs of ELES effectiveness model, as depicted in Figure 18, is given below. The hypotheses given below are based on the components of ELES effectiveness model presented in sections 4.5 and 4.8.2. Cidral et al. (2018) presented the E-learning success model, and it was based on the integration of the information systems success model presented by Delone and McLean (2015) and the E-learning success models presented by Sun et al. (2008) and Urbach et al. (Urbach et al., 2010). The study (Cidral et al., 2018) presented system quality construct related to components of design such as ease of navigation and a well-structured system and found to have a significant impact on E-learning user satisfaction and intention behaviour for the use of the system. This aligned with the GTM findings presented in section 4.5 and enabled to propose hypotheses H1a, H1c and H1d below. The hypothesis H1b is presented based on the findings of GTM alone in section 4.5 where positive relationship was noted between ELES design and transformation for the users and improvement in the efficacy for the system use. Sun et al. presented Design dimension as one of the key factor for the perceived e-learning satisfaction. In his study, the Design dimension was comprised of perceived usefulness and perceived ease of use. The Design dimension proposed by the Sun et al. was based on the Technology Acceptance Model (TAM) proposed by Davis (1989), which is widely used to access and predict users' tendency to accept technology. In his study, Sun et al. found that the perceived usefulness and perceived usefulness by learners significantly influences their satisfaction, conforming to assumptions presented below.

H1a: ELES design has a positive impact on enhancing ELES effectiveness.

H1b: ELES design has a positive impact on the ELES enabled transformation and increase in scale, and scope of its uses.

H1c: ELES design directly affects user expectations for learning experience when using e-learning platforms and services.

H1d: ELES design directly affects user perceptions of the learning experience when using e-learning platforms and services.

The items related to the Design construct are based on the themes presented in the findings of the GTM in section 4.5 and informed by the literature as presented in Table 9. The codification of the items is presented in Table E.1 (Appendix E).

5.15.2 Networking and Collaboration Construct

The set of hypotheses for the Networking and Collaboration construct and related relations to other constructs of the ELES effectiveness model, as depicted in Figure 18, is given below. The hypotheses given below are based on the components of the ELES effectiveness model presented in sections 4.6 and 4.8.2. In the study conducted by Wang (2003) Learning community construct was found to have a significant impact on E-learning satisfaction, enabling learners to interact with other learners and tutors and share content and ideas (Wang 2003). In another study, Shee and Wang (2006) presented Learning Community as a key dimension for the web based E-learning systems. The key issue for the learners was the ability to easily access shared data. Similarly, Cidral (2018) presented Collaboration quality as a significant factor in users' satisfaction with the E-learning systems' usage. This aligned with the GTM findings presented in section 4.6 and enabled to propose hypothesis H2a below. Social presence was found to have a positive impact on the learners' self-efficacy and learning satisfaction, as noted in the study by Lim et al. (2007). This observation is aligned with the findings of GTM in section 4.6 and enables to present hypothesis H2b.

H2a: Networking and Collaboration has a positive influence on ELES enabled transformation, scale and scope of its uses.

H2b: Networking and Collaboration based features help in meeting modern user expectations.

The items related to the Networking and Collaboration construct are based on the themes presented in the findings of the GTM in section 4.6 and informed by the literature as presented in Table 9. The codification of the items is presented in Table E.1 (Appendix E).

5.15.3 Pedagogy Construct

The set of hypotheses for the Pedagogy construct and related relations to other constructs of ELES effectiveness model, as depicted in Figure 18, is given below. The hypotheses given below are based on the components of ELES effectiveness model presented in sections 4.7 and 4.8.2. Piccole (2001) presented Instructor as a key dimension related to teaching style, technology control, self-efficacy and availability, contributing positively to e-learning effectiveness. Instructor characteristics, comprising of teaching style and ability to clarify the use of e-learning components, are a significant factor for the e-learning effectiveness and development of students' characteristics (Alhabeen, 2018). These observations are aligned with the findings of GTM in section 4.7 and enable to present hypotheses H3a and H3b. The hypothesis H3c is presented based on the findings of GTM alone in section 4.7, where the importance of pedagogical awareness was highlighted.

H3a: Effective utilisation of Pedagogy has a positive influence on ELES effectiveness

H3b: Effective utilisation of Pedagogy has a positive influence on ELES enabled transformation and scale and scope of its uses and for users.

H3c: Pedagogy directly guides user expectations

The items related to the Pedagogy construct are based on the themes presented in the findings of the GTM in section 4.7 and informed by the literature as presented in Table 9. The codification of the items is presented in Table E.1 (Appendix E).

5.15.4 User Requirements Construct

The set of hypotheses for the User requirements construct and related relations to other constructs of ELES effectiveness model, as depicted in Figure 18, are given below. The hypotheses given below are based on the components of ELES effectiveness model presented in sections 4.3 and 4.8.2. Mueller et al. (2017) argued the need to specify VLE design characteristics clearly. The study (Dominici & Palumbo, 2013) found the flexibility of time and hours, mandatory exercises and quizzes and download area as attractive requirements which could potentially increase the perceived valise of e-learning courses. The findings of this study implied a link between the requirements which are attractive from the learners' perspective and understood and fulfilled could improve learners' satisfaction with e-learning courses. Based on theoretical insights and findings of GTM in section 4.3, hypotheses H4a, H4b, H4c, H4d and H4e are presented below.

H4a: User requirements positively influence design decisions and features for ELES.

H4b: User requirements positively influence more networking and collaboration for ELES.

H4c: Users require better utilisation of Pedagogy for ELES.

H4d: User requirements positively influence User Expectations.

H4e: User requirements positively influence User Perception.

The items related to the User requirements construct are based on the themes presented in the findings of the GTM in section 4.3 and informed by the literature as presented in Table 9. The codification of the items is presented in Table E.1 (Appendix E).

5.15.5 ELES Effectiveness Construct

Liaw (2007) used the notion of belief that e-learning assists learning efficiently, learning performance and learning motivation to measure E-learning effectiveness. Wang (2011) used the practicality and performance of the collaboration tool as part of the dimensions for E-learning satisfaction. Cidral et al. (2018) used the supporting area of study, efficiency, and level of satisfaction as the dimensions for E-learning satisfaction. ELES Effectiveness construct is an endogenous construct informed by the theoretical observations noted above aligned with the findings of the GTM in section 4.4.

The items related to the ELES Effectiveness construct are based on the themes presented in the findings of the GTM in section 4.4 and informed by the literature as presented in Table 9. The codification of the items is presented in Table E.1 (Appendix E).

5.15.6 ELES Transformation, Scale and Scope Construct

The study presented by Chiu et al. (2005) linked e-learning satisfaction with Continuance intention, the former accounting for 48% variance in E-learning continuance intention. Continuance intention shows a characteristic of the user behaviour and is linked with the potential transformation of characteristics for the users. ELES Transformation, scale and scope construct is an endogenous construct informed by the theoretical observations noted above aligned with the findings of the GTM in section 4.2.

The items related to the ELES Transformation, Scale and Scope construct, are based on the themes presented in the findings of the GTM in section 4.2 and informed by the literature as presented in Table 9. The codification of the items is presented in Table E.1 (Appendix E).

5.15.7 ELES User Expectations Construct

The user expectations are influenced by Design, Pedagogy, Networking & Collaboration and User Requirements (Haq et al., 2018). The items related to the ELES User Expectations construct are based on the themes presented in the findings of the GTM in sections 4.3 and 4.8.3 and informed by the literature, as shown in Table 9. The codification of the items is presented in Table E.1 (Appendix E).

5.15.8 ELES User Perception construct

The user perceptions are directly influenced by Design and User Requirements (Haq et al., 2018). The items related to the ELES user perception construct are based on the themes presented in the findings of the GTM in sections 4.3 and 4.8.3 and informed by the literature as presented in Table 9. The codification of the items is presented in Table E.1 (Appendix E).

5.15.9 ELES Effectiveness Structural Model

The structural model is presented in Figure 18.

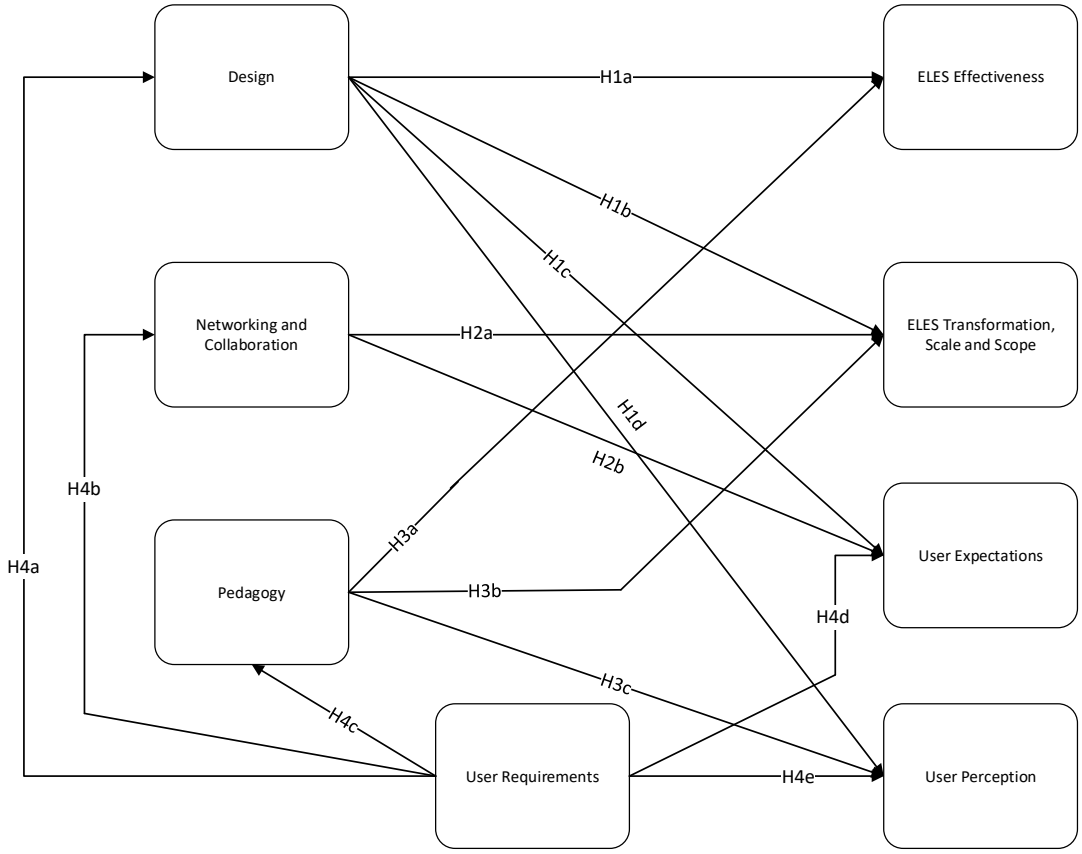

Figure 18

Proposed ELES Effectiveness Structural Model

5.15.10 ELES Effectiveness Measurement Model and Hypotheses Testing

As discussed in section 5.4, the first stage of the PLS-SEM process for the validation of the ELES effectiveness model is measurement model assessment The measure model was checked for the indicator reliability, convergent validity and discriminmant validity tests, as indicated in Table 10 and Appendix B.

The reliability of the model was established for the indicator items and construct settings. The Cronbach Alpha and Composite Reliability values are above the threshold of 0.70, indicating the reliability of the

constructs. The indicator reliability is checked for the threshold of 0.5, and the items with lower loading were omitted from the model (Appendix B). The items loading above 0.7 show good loadings. The loadings between 0.4 to .07 are considered weak loadings and only should be used due diligently for newly developed Scales and exploratory model development for content validity; any indicator loadings less than 0.4 will always be eliminated (Hair et al., 2016, Chapter 4)(Joseph F Hair, Hult, Ringle, & Sarstedt, 2017, Chapter 4). Appendix B shows the items removed which did not qualify under the measurement criteria. The convergent validity was established by checking AVE against the threshold of 0.50, and all the constructs in the model were found to be above this threshold, as indicated in Table 10 below. The Discriminant validity was established using the cross-loadings and Fornell-Larcker criterion (Appendix B). The cross-loading test entails examining each indicator's outer loading on the assigned construct and should be greater than its cross-loading with other constructs. Fornell-Larcker test examines each construct's AVE square root and compares it for its highest correlation with any other construct. The resulting items are depicted in Table 10 below. The details of these tests were specified in Sections 5.4 to 5.7. The results establish the suitability of the measurement model and suggest that all the indicator items are reliable for the respective latent variables (Table 10).

Table 10

ELES Effectiveness Measurement Model

	Items	**Loadings[a]**	**AVE[b]**	**CR[c]**	**Cronbach's Alpha[d]**
Design	DGNTS_10	0.794	0.593	0.879	0.829
	DGNTS_2	0.733			
	DGNTS_6	0.799			
	DGNTS_8	0.8			
	DGNTS_9	0.722			
Pedagogy	PEDG_2	0.76	0.584	0.894	0.857
	PEDG_3	0.767			
	PEDG_4	0.788			
	PEDG_5	0.728			
	PEDG_6	0.809			
	PEDG_8	0.731			
Networking and Collaboration	NETCC_1	0.813	0.643	0.926	0.907
	NETCC_10	0.716			
	NETCC_2	0.809			
	NETCC_3	0.852			
	NETCC_4	0.85			

	NETCC_5	0.787			
	NETCC_8	0.778			
User Requirements	UCPR_1	0.781	0.624	0.869	0.799
	UCPR_2	0.748			
	UCPR_3	0.818			
	UCPR_5	0.81			
ELES Effectiveness	CNCTL_15	0.827	0.61	0.862	0.785
	CNCTL_16	0.818			
	CNCTL_2	0.742			
	CNCTL_9	0.731			
ELES Transformation, Scale and Scope	CNCTL_12	0.709	0.571	0.842	0.749
	CNCTL_6	0.802			
	TRANSS_11	0.757			
	TRANSS_3	0.752			
User Expectations	CNCTL_12	0.765	0.602	0.883	0.834
	CNCTL_13	0.792			
	CNCTL_14	0.823			
	CNCTL_17	0.724			
	CNCTL_9	0.77			
User Perception	CNCTL_13	0.74	0.537	0.853	0.785
	CNCTL_14	0.76			
	CNCTL_19	0.722			
	EFFEC_1	0.747			
	EFFEC_2	0.695			

a. Item loadings > 0.5 indicate Indicator Reliability (Hulland, 1999)
b. Average Variance Extracted > 0.5 indicates Convergent Reliability (Fornell & Larcker, 1981)
c. Composite Reliability > 0.7 indicates Internal Consistency (Gefen et al., 2000)
d. Cronbach's Alpha > 0.7 indicates Indicator Reliability (Nunnally & Bernstein, 1978)

The result of PLS-SEM analysis is summarised in Table 11 and shown in Appendix B (Figure B.1 shows significant paths, and Figure B.2 shows R^2 values). The endogenous variables explained variance R^2 and standardised path coefficient (B), effect size (f^2) is presented and predictive relevance Q^2 evaluated. The bootstrapping was performed 5000 resamples to obtain the significance of estimates (t statistics). The structural model explains 60.9% of the variance for ELES Effectiveness (R^2= 0.609), 61.6% for ELES Transformation, Scale and Scope (R^2 = 0.616), 61.5% for User Expectations (R^2 = 0.615), 56.6% for

User Perception (R^2 = 0.566), 31.6% for Design (R^2 = 0.316), 23.8% for Pedagogy (R^2 = 0.238) and 31.6% for Networking and Collaboration. The details and the discussion on the analysis are given below.

The ELES Effectiveness base model (without applying CL-MIM) results for PLS-SEM structural model.

Table 11

Hypotheses Testing results for base ELES Effectiveness model

Hypothesis	Relationship	Std Beta	Std Error	|t-value|^	Decision	f^2	95% CI LL	95% CI UL
H1a	Design -> ELES Effectiveness	0.353	0.099	3.557**	Supported	0.1432	0.189	0.516
H1b	Design -> ELES Transformation, Scale and Scope	0.391	0.097	4.061**	Supported	0.1484	0.226	0.548
H1c	Design -> User Expectations	0.222	0.100	2.194*	Supported	0.0442	0.050	0.385
H1d	Design -> User Perception	0.683	0.057	11.828**	Supported	0.3180	0.581	0.766
H2a	Networking and Collaboration -> ELES Transformation, Scale and Scope	0.227	0.082	2.741**	Supported	0.0182	0.092	0.363
H2b	Networking and Collaboration -> User Expectations	0.131	0.100	1.376	Rejected	0.0156	-0.033	0.296
H3a	Pedagogy -> ELES Effectiveness	0.486	0.093	5.168**	Supported	0.2634	0.328	0.635
H3b	Pedagogy -> ELES Transformation, Scale and Scope	0.246	0.086	2.838**	Supported	0.0625	0.103	0.388
H3c	Pedagogy -> User Expectations	0.321	0.086	3.715**	Supported	0.0987	0.177	0.460
H4a	User Requirements -> Design	0.566	0.061	9.198**	Supported	0.4620	0.460	0.661
H4b	User Requirements -> Networking and Collaboration	0.567	0.056	10.035**	Supported	0.4620	0.472	0.655

H4c	User Requirements -> Pedagogy	0.494	0.070	7.01**	Supported	0.3123	0.373	0.604
H4d	User Requirements -> User Expectations	0.248	0.070	3.517**	Supported	0.1013	0.130	0.358
H4e	User Requirements -> User Perception	0.398	0.081	4.888**	Supported	0.24194	0.258	0.053

**P < 0.01, *p<0.05

- R^2 (ELES Effectiveness = 0.609; ELES Transformation, Scale and Scope = 0.616; User Expectations = 0.615; User Perception = 0.566; Design = 0.316; Pedagogy = 0.238; Networking and Collaboration = 0.316).
- Effect Size impact indicator is according to Hair et al. (2014): f^2 values: 0.35 (large), 0.15 (medium), and 0.02 (small).
- Q^2 (ELES Effectiveness = 0.346; ELES Transformation, Scale and Scope = 0.325; User Expectations = 0.333; User Perception = 0.274; Design =0.172; Pedagogy = 0.127; Networking and Collaboration = 0.186).

The results show significant positive relationship between Design and ELES Effectiveness (*t = 3.557; p < 0.01*) (**H1a**); Design and ELES Transformation, Scale and Scope (*t = 4.061; p < 0.01*) (**H1b**); Design and User Expectations (*t = 2.194; p < 0.05*) (**H1c**) and the strongest relationship for this set of hypotheses is shown between Design and User Perception (*t = 11.828; p < 0.01*) (**H1d**). The significant relationship of Networking and Collaboration influencing ELES Transformation, Scale and Scope established with (*t = 2.741; p < 0.01*) (**H2a**). The hypothesis that the Networking and Collaboration influencing User Expectations was rejected with (*t = 1.376; p > 0.1*) (**H2b**). The Pedagogy has significant relationship for ELES effectiveness with (*t = 5.168; p < 0.01*) (**H3a**); Pedagogy and ELES Transformation, Scale and Scope (*t = 2.838; p < 0.01*) (**H3b**); Pedagogy and User Expectations with (*t = 3.715; p < 0.01*) (**H3c**). The results also indicate relationship between User Requirements and Design with (*t = 9.198; p < 0.01*) (**H4a**); User Requirements and Networking and Collaboration with (*t = 10.035; p < 0.01*) (**H4b**); User Requirements and Pedagogy with (*t = 7.01; p < 0.01*) (**H4c**); User Requirements and User Expectations with (*t = 3.517; p < 0.01*) (**H4d**); User Requirements and User Perception with (*t = 4.888; p < 0.01*) (**H4e**).

The Design has shown medium effect size (f^2) (Cohen, 1998, as cited Hair et al., 2016) on endogenous constructs of ELES Effectiveness and ELES Transformation, Scale and Scope. Design construct has a medium effect but more towards a strong effect size for the User Perception with 0.318 noted for the effect size, approaching the strong effect metric of 0.350. Pedagogy has shown a medium effect on ELES effectiveness. The strongest effect size was noted for user requirements on design, networking & collaboration, confirming the need to develop a deeper understanding of the users' requirements.

All of the values of Q^2 are above the cut-off point (more than zero), depicting the model has strong predictive relevance for the endogenous constructs ELES Effectiveness; ELES Transformation, Scale and Scope; User Expectations; User Perception; Design; Pedagogy; Networking and Collaboration. The results show similar consistency for the effect size (Cohen, 1988, as cited in Teik, 2015) and predictive relevance (Henseler, Ringle, & Sinkovics, 2009). Further discussion and comparative evaluation of this model is provided in section 5.16.

5.15.11 ELES CL-MIM Effectiveness Model

The structure of the model is enhanced by applying the CL-MIM dimension as depicted in Section 4.8, and details of the enhanced model are given below, along with validation for the measurement model and structural model. Structural equation modelling connects a multi-item scale into constructs and defines relationships between constructs. SEMs handles complex relationships between latent constructs and is able to handle multiple dependent constructs within a single model.

The CL-MIM dimension is used to enhance ELES effectiveness model and materialise the themes presented in sections 4.2 to 4.8 with better granularity. The themes and hypotheses presented below are discussed in detail and compared against existing literature as below.

Construct Formation: The formation of each construct and specified hypotheses based on the ELES effectiveness model are given below.

5.15.11.1 ELES Design Construct (CL-MIM)

Learner Interface plays an important role in determining e-learning effectiveness. The user-friendliness and ability to comprehend the content design are important factors in determining ease of use for the Learner Interface. The ability to easily find the relevant content is also determining factor for Learner Interface construct (Wang, 2003). The study by Shee and Wang (2006) also found the Learner interface to be the most important dimension comprising attributes such as ease of use, ease of understanding, user-friendliness and operational stability. The findings of the GTM in section 4.5 ELES design, tools and services noted the importance of effective utilisation of ELES environmental features and ease of use and access through better awareness of design rationale for learners. The increasing understanding of design rationale may enable learners to use the ELES platform in novel ways and create transformation in them and broaden their abilities and make them more independent learners. Design is not seen only at the simplistic interface level but through a complex interplay of various dimensions from different perspectives and levels, consequently enriching the formation of design construct and its relationships with other constructs. The CL-MIM enables one to better understand the dimensional interplay and see the forces impacting e-learning effectiveness at a more granular level. For example, the application of CL-MIM equation for design construct helps to understand the interplay of dimensions based on the existing theoretical perspective and findings of the GTM in section 4.5.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Relation (Component) – Interface is a component Design; Implication (Application) – Good ELES design enables to use of the features effectively; Requirement (direct) – Better awareness of design rationale; Consequence (Indirect) – Learner transformation; Context (Constraint) – Learner able to meet organisational needs; Relation (Indirect) – Users becoming more vigilant for privacy and its importance for others; Consequence (Indirect) – Better working ethics acquired by ELES users; Significance (Gradual) – Learner efficacy improvement potential in a broader perspective; Significance (Growth) – Potential contribution for professional development;

The CL-MIM equation given above enabled to see the relationships between the theoretical underpinning and GTM findings (presented in section 4.5 ELES design, tools and services) and

facilitated to propose hypotheses (H1a, H1b, H1d, H1g, H1f, H1h, H1i, H1k) and linkages to the dimensions used for the Design construct [DGNTS_10, DGNTS_6, DGNTS_4, DGNTS_8], given in Table E.1 (Appendix E). Course flexibility was considered a significant factor in the study by (Sun et al., 2008). The course flexibility comprises the ability to arrange work via the internet, saving time in terms of commuting, the ability to attend classes regularly and the ability to schedule work effectively. The relationship was understood by applying CL-MIM equation (in a similar way as the example provided above) considering the theoretical perspective, GTM findings given in section 4.5 and proposed hypothesis (H1d) and the dimensions used [DGNTS_11, DGNTS_12 - (related to Table E.1 (Appendix E)). Furthermore, Technology infrastructure was presented as a significant factor for E-learning success in the study by Alhabeeb and Rowley (2018). It was comprised of ease of access to the internet, availability of communication tools and reliable systems. The relationship was understood by applying CL-MIM equation considering theoretical perspective, GTM findings given in section 4.5 and proposed hypotheses (H1e, H1j, H1k), and the dimensions used [DGNTS_1, DGNTS_2, DGNTS_10, DGNTS_6, DGNTS_10 - (related to Table E Appendix E)].

The set of hypotheses for the Design construct and related relations for the specified model in Figure 19 are given below and based on the findings of GTM presented in Chapter 4 with the application of CL-MIM equation:

H1a: ELES design has a positive impact on the continuity of progression & contributions importance.

H1b: ELES design has a positive impact on enhancing ELES effectiveness.

H1c: ELES design positively influences the perception of the importance of awareness for design rationale.

H1d: ELES design positively influences the perception of the importance of ease of access and flexibility

H1e: ELES design positively influences the perception of the importance of social media-based services within ELES

H1f: ELES design positively influences the perception of the learning context's importance and requirement.

H1g: ELES design positively influences the perception of collaboration enhancement

H1h: ELES design positively influences the perception of the self-direction/independent-learner importance and enhancement.

H1i: ELES design positively influences the perception of the privacy importance

H1j: ELES design positively influences the perception for the enhancement using socially driven learning

H1k: ELES design positively influences ELES enabled transformation and scale and scope of its uses and for users.

5.15.11.2 Choice and Planning Facilitator Construct (CL-MIM)

According to Shee and Wang (2006), personalisation is characterised by the ability to control own learning progress and record learning performance and is found to be an important construct for e-learning satisfaction. The ELES as a choice and planning facilitator enhances the personalisation concept and the ability to improve learners' capabilities to become better organisers and make informed choices, as discussed in GTM findings section 4.8.1. The chaining of CL-MIM equations shows a direct relationship between ELES as a planning facilitator and enabler for better learning choices, encouraging and facilitating in development of organisational capabilities in the learners intrinsically through learning interaction within ELES environment. The whole experience will lead to an engaging learning environment and enable learners to develop lifelong soft-skill. The CL-MIM equation helps to understand the interplay of dimensions based on the existing theoretical perspective and findings of the GTM in section 4.8.1.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Feature) – Personalisation is essential to engage when using ELES; Relation (Direct) – ELES provides opportunities to plan own learning; Relation (Direct) – ELES able to suggest possible learning directions; Relation (Indirect) – Facilitating planning for learning direction; Significance (Capability) – Learners becoming better planners and organisers for own learning; Implication (Long-term) learners develop life-long soft-skill

The hypothesis for the Choice and planning facilitator construct and related relation for the specified model in Figure 19 is given below and is based on the findings of GTM presented in Chapter 4 with the application of CL-MIM equation and comprised of dimensions (as given in Table E.1 Appendix E): Enabling planning for learning direction [CNCTL_10, CNCTL_11]; Enabling to become better organiser [CNCTL_18]; Enable to make informed choices [PEDG_1]; Enable to understand the consequence of choices [PEDG_2]

H2: ELES as a choice and planning facilitator positively influences planning and organisational capability development.

5.15.11.3 ELES Effectiveness Construct (CL-MIM)

In the study by Alhabeeb & Rowley (2018), availability of communications with the instructor, course interactivity, up-to-date material, and ability to measure learning progress were contributing factors to the dimension of E-learning systems resources and consequently found to be significant for the E-learning satisfaction. This need for active participation is aligned with the finding of the GTM in section

4.4. The study by Sun et al. (2008) found that the Perceived ease of use was linked to a degree to which users could control features in the E-learning system and make it do what they wanted it to do. The perceived ease of use and consequent ELES Effectiveness is linked to the importance of language constructs, as noted in the GTM findings in section 4.4. Perceived usefulness is defined as the degree of efficiency and effectiveness of the e-learning system (Cidral et al., 2018). Multimedia instructions such as the use of voice and video media were found to significantly impact e-learning effectiveness (Liaw, 2007). The more effective E-learning systems perceive to increase E-learning satisfaction. The level of desire to improve own ability to complete the tasks and acquire knowledge from the online training program was found to be an important factor for learning performance and e-learning satisfaction (Lim et al., 2007). The CL-MIM equation helps to understand the interplay of dimensions and relationship of ELES Effectiveness with other constructs based on the existing theoretical perspective and findings of the GTM in section 4.4.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Relation (Direct) – Effective E-learning utilisation links to active participation; Requirement (Medium) – Use of multimedia for active participation; Implication (Indirect) – Participating learners becoming better communicators; Relation (Direct) – ELES Effectiveness evaluated as capability enhancer; Significance (Growth) – Ability to continually learn and progress beyond the current course; Relevance (Practical-Application) – Able to tracking own progress; Relation (Direct) – ELES Effectiveness and growth for learners; Relation (Indirect) – Facilitating transformation for learners; Relation (Direct) – Effective E-learning utilisation links to perceived improved learner satisfaction; Relation (Direct) – Effective E-learning utilisation links to perceived improved learner experience;

The set of hypotheses for the ELES Effectiveness construct and related relations for the specified model in Figure 19 are given below and based on the findings of GTM presented in Chapter 4 with the application of CL-MIM equation and comprised of dimensions (as given in Table E Appendix E): Facilitating Organization [EFFEC_4]; Facilitating personalisation [EFFEC_5]; Capability enhancer as and for continuous professional progression [CNCTL_15]; Enabling to develop deeper language meaning understanding [CNCTL_23]; Enabling tracking progress [TRANSS_6]; Enabling tracking progress through visual graphics [TRANSS_7].

H3a: ELES Effectiveness positively influences active participation needs.

H3b: ELES Effectiveness positively influences the perception of the importance of language constructs.

H3c: ELES Effectiveness positively influences the perception of learner satisfaction.

H3d: ELES Effectiveness positively influences the perception of improved learner experience.

H3e: ELES Effectiveness positively influences ELES enabled Transformation and scale and scope of its uses and for users.

5.15.11.4 Networking and Collaboration Construct (CL-MIM)

The E-learning system is perceived to be an enhancer for the learners to feel part of the learning community. The E-learning platform enables them to share content and engage in dialogues (Wang, 2003). In the study conducted by Shee and Wang (2006), the Learning community was found to be a key dimension for the web-based e-learning systems, and the vital issue for the learners was the ability to easily access shared data. The findings of the GTM in section 4.6 elaborated further on Networking and Collaboration and linked to ELES effectiveness, highlighting the importance for the use of social media-based services and learning enhancement and transformation. The CL-MIM equation helps to understand the interplay of dimensions and the relationship of ELES networking and collaboration with other constructs based on the existing theoretical perspective and findings of the GTM in section 4.6.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Relation (Direct) – Networking and Collaboration features facilitate collaborative learning; Implication (Design) - ELES Effectiveness enhanced; Meaningful (Use) – ELES Social media-based services utility; Significance (Impact) – Enabling interaction and dialogue; Perspective (Promotion) – Promoting diversity; Significance (Behaviour) – Facilitating to remove barriers among participants; Implication (Enhancement) – Improved behaviour; Relation (Indirect) – Becoming ethical members of the learning community; Relation (Indirect) – Becoming an ethical member of wider society;

The set of hypotheses for the Networking and Collaboration construct and related relations for the specified model in Figure 19 are given below and based on the findings of GTM presented in Chapter 4 with the application of CL-MIM equation and comprised of dimensions: Facilitating collaborative learning [NETCC_3]; Facilitating interactions beyond own class [NETCC_5; Facilitate diversity of perspectives [NETCC_8]; Facilitate to remove barriers and promotes interactions among participants with diverse backgrounds [NETCC_10]; Facilitator to become an ethical member of the learning community [CNCTL_2].

H4a: ELES enabled networking and collaboration positively influences ELES Effectiveness.

H4b: ELES enabled networking and collaboration positively influences the perception of the importance of social media-based services for learning.

H4c: ELES enabled networking and collaboration positively influences interaction and dialogue.

H4d: ELES enabled networking and collaboration positively influences the perception of collaboration enhancement.

H4e: ELES enabled networking and collaboration positively influences socially driven learning enhancement.

H4f: ELES enabled networking and collaboration positively influences E-learning practices and transformation for users.

5.15.11.5 Pedagogy Construct (CL-MIM)

The instructor's ability to guide in applying acquired training in practical settings was a significant factor in the learning performance and e-learning satisfaction (Lim et al., 2007). Service quality was defined as service personnel's readiness to help and give personal attention to solve the problem within a committed timeframe. Service personnel demonstrate a high degree of system knowledge to answer questions (Cidral et al., 2018). In this context, Pedagogy relates to service quality and consequently contributes toward ELES Effectiveness. Diversity in assessment is defined as a variety of ways to assess the learning process. The study by Cidral et al. found it a significant factor affecting users' perceived satisfaction with E-learning. As noted in the GTM findings in section 4.7, it is important for the instructors to understand the nature of the content and how to use it effectively through the learning process. Furthermore, according to the study by Alhabeeb & Rowley (2018), Instructor's teaching style when using e-learning is a key determiner of e-learning success. The CL-MIM equation helps to understand the interplay of dimensions and the relationship of ELES Pedagogy with other constructs based on the existing theoretical perspective and findings of the GTM in section 4.7.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Relation (Direct) – ELES Pedagogy influences the effectiveness of E-learning systems; Relevance (Applicability) – Instructors Efficacy; Relation (Direct) – Pedagogical efficacy; Implication (Opportunity) – Leveraging collaborative learning opportunities; Relation (Indirect) – Improving awareness for learners for their own learning process; Significance (Motivation) – Enhancing Self-direction for learning;

The set of hypotheses for the Pedagogy construct and related relations for the specified model in Figure 19 are given below and based on the findings of GTM presented in Chapter 4 with the application of CL-MIM equation and comprised of dimensions: Understanding the nature of choices available is useful in ELES for learning [PEDG_3]; Enable to understand nature of the content [PEDG_4]; Enabling to make collaborative learning valuable [NETCC_4]; Importance of understanding the rationale for settings and configurations done with ELES [PEDG_5]; Developing an understanding of the context is important for learning process [PEDG_6]; Perception of effective use of ELES features by instructors [PEDG_8]; Need for tutor efficacy [PEDG_9]

H5a: Effective utilisation of Pedagogy positively influences ELES's use as a choice and planning facilitator

H5b: Effective utilisation of Pedagogy perceive to increase the importance of cultural understanding.

H5c: Effective utilisation of Pedagogy perceive to increase the importance of diversity.

H5d: Effective utilisation of Pedagogy positively influences ELES effectiveness

H5e: Pedagogy positively influences the need for an instructor's efficacy.

H5f: Effective utilisation of Pedagogy positively influences self-direction/independent learning.

H5g: Effective utilisation of Pedagogy positively influences ELES enabled transformation and scale and scope of its uses and for users.

5.15.11.6 ELES Transformation, Scale and Scope Construct (CL-MIM)

The E-learning system enables learners to choose learning content and control learning progress, increasing learner satisfaction (Wang, 2003). Perceived behaviour control is defined as the ability to use an E-learning system without help and use it with own control, improving self-efficacy for the use of the E-learning system (Chu & Chen, 2016). As noted in the GTM findings in section 4.2, ELES transforms the learners by enabling them to build self-efficacy and increase confidence and skills to use the tools and features in complex learning settings and take the acquired skills beyond normal classroom settings. The learning performance in the e-learning settings was evaluated as the degree to which the learners acquire new skills and improve their attitude toward the tasks and found to be contributing factor to the transformation in the performance (Lim et al., 2007).

The CL-MIM equation helps to understand the interplay of dimensions and relationship of ELES Transformation, Scale and Scope with other constructs based on the existing theoretical perspective and findings of the GTM in section 4.2.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Relation (Direct) – ELES improving self-efficacy; Implication (Experience) – Better learning and supportive teaching; Meaningful (Emotional) – Sense of accomplishment; Significance (Goal) – Achieving learning targets; Relation (Indirect) – Improved ability to work in complex settings; Relation (Indirect) – Improved ability to work people with diverse backgrounds; Implication (Efficacy) – Job readiness in professional settings;

The set of hypotheses for the ELES Transformation, Scale and Scope construct and related relations for the specified model in Figure 19 are given below and based on the findings of GTM presented in Chapter 4 with the application of CL-MIM and comprised of dimensions: Self-Efficacy in technological use [TRANSS_3, TRANSS_4]; Supporting teaching and learning [TRANSS_5]; Being able to track

progress motivates for the accomplishment of learning goals [Enabling tracking progress [TRANSS_8]; Facilitating job/work environment readiness [TRANSS_10]

H6a: ELES enabled transformation, scale and scope of its uses and for users positively influences the perception of importance for progression continuity and ability to carry forward learning contributions.
H6b ELES enabled transformation, scale and scope of its uses and for users perceive to enhance collaboration.
H6c ELES enabled transformation, scale and scope of its uses and for users perceive to enhance emotional intelligence and, consequently, engagement.

5.15.11.7 Active Participation Need Construct (CL-MIM)

The study (Lim et al., 2007) showed that communication and interaction with the instructor using electronic communication tools were significant factors for E-learning satisfaction. The GTM findings in section 4.3 noted the importance of active participation need.
The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.3.
Lens (Dimension) – statement/action-statement/qualifying statement;
Equation: L (D) – QS;
Context (Use) – Effective use of communication tools; Implication (Capability) – Ability to use ELES tools for active participation; Implication (Implicit) – Building social network;
The Active participation need construct acts as an endogenous construct and is based on the dimension: Able to become an effective user of ELES tools and conversational channels [UCPR_6].

5.15.11.8 Continuity of Progression & Contributions Importance Construct (CL-MIM)

The GTM findings in section 4.8.1 noted the importance of contributions by the learners during the learning process and owning these contributions. This observation is aligned with the study by Haq et al. (2018). The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.
Lens (Dimension) – statement/action-statement/qualifying statement;
Equation: L (D) – QS;
Context (Use) – Actively engaged using ELES features; Implication (Capability) – Becoming power user; Implication (Capability) – Able to carry forward own contributions; Significance (Growth) – Able to grow continuously in different settings; Significance (Motivation) – Becoming role model for other learners; Implication (Professionalism) – Demonstrating better work ethics and ownership of own learning;

The Continuity of progression and contributions importance construct acts as an endogenous construct and is based on the dimension: Importance to carry forward the contributions in the ELES beyond the current course [CNCTL_17].

5.15.11.9 Cultural Understanding Importance Construct (CL-MIM)

The GTM findings in section 4.8.1 noted the importance of cultural understanding in E-learning settings. This observation is aligned with the study by Haq et al. (2018). The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Behaviour (Sensitivity) – Showing cultural sensitivity; Relation (Soft-skill); Showing improved emotional intelligence; Significance (Communication) – Becoming a better communicator; Implication (Implicit) Effective use of communication tools;

The Cultural understanding importance construct acts as an endogenous construct and is based on the dimension: Enhancing cultural awareness through ELES [UCPR_5].

5.15.11.10 Diversity Importance Construct (CL-MIM)

Diversity in assessment was found to be a significant factor for E-learning satisfaction (Cidral et al., 2018) (Sun et al., 2008). The GTM findings in section 4.8.1 noted the importance of diversity in a broader sense.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) –Opportunity to hear diverse views; Implication (Ability) – Showing tolerance in a team setting; Relation (direct) – Become a valuable contributor to the team; Implication (Broad) – Developing emotional intelligence for interactions with others;

The Diversity Importance construct acts as an endogenous construct and is based on the dimension: Importance of having a diversity of perspectives [NETCC_9].

5.15.11.11 Ethics Awareness Enhancement Construct (CL-MIM)

The GTM findings in section 4.8 noted importance of ethics awareness. This observation is aligned with the study by Haq et al. (2018). The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Conducting ethically in learning settings; Implication (Capability) – Ability to use ELES tools for due diligently; Implication (Consequence) – Potential risk for self and others; Significance (Capability) – Developing ability of forward-looking and risk planning;

The Ethics awareness construct acts as an endogenous construct and is based on the dimension: Importance of ethics awareness for learning progression in learning communities [CNCTL_3]; Developing an understanding of the consequence of actions in the learning process [CNCTL_13].

5.15.11.12 Importance of Awareness for Design Rationale Construct (CL-MIM)

The research study (Lim et al., 2007) found guidelines provided for the training content as an important factor in evaluating whether the training content actually contributed to work activities. The GTM findings in section 4.8 noted the importance of awareness for design rationale.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Relevance (Awareness) – Guidance available for the use of learning tools; Meaningful (Performance) – Able to perform better in the E-learning environment; Significance (Design) – Able to appreciate design rationale and patterns of working; Implication (Experience) – Getting better value out of learning experience;

The Importance of awareness for design rationale construct acts as an endogenous construct and based on the dimension: Enough guidance availability needs on how to use collaborative learning tools [CNCTL_5]; Importance of clarity on design rationale [CNCTL_7, CNCTL_8].

5.15.11.13 Importance of Ease of Access and Flexibility Construct (CL-MIM)

E-learning system is perceived to be useful in providing up-to-date content (Wang, 2003). The usefulness and ease of use were found to improve learner satisfaction (Vitoria, Mislinawati, & Nurmasyitah, 2018). The GTM findings in section 4.8 noted the importance of ease of access and flexibility.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Relevance (Applicability) – Able to access easily; Relation (Implicit) – Increased productivity and completion of a task with relative ease;

The Importance of Ease of Access and Flexibility construct acts as an endogenous construct and is based on the dimension: Enable to access content with ease [DGNTS_7].

5.15.11.14 Importance of Language Construct (CL-MIM)

Information Quality is defined as the usefulness and comprehension of the information provided. It also evaluates the reliability of the information and the level of interest triggered by the provided information. Information quality affected both the e-learning use and perceived user satisfaction for the e-learning systems (Cidral et al., 2018). Information quality is an important aspect of the ELES Design. The findings of GTM in section 4.5 ELES Design, tools and services noted the quality of information links to driving purpose and direction for learning, enriching the notion of information quality, consequently enhancing ELES effectiveness. The GTM findings in section 4.8 noted the importance of language construct.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.3.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Perspective (Use) – Able to use language appropriately; Significance (Enhancement) – Getting improved comprehension ability; Implication (Implicit) – Building social network; Relation (Implicit) – Acquiring skills to lead better; Relation (Implicit) – Becoming better contributor in group setting;

The Importance of language construct acts as an endogenous construct and is based on the dimension: Understanding the typical meaning behind language construct and its importance [CNCTL_22, CNCTL_24]

5.15.11.15 Importance of Social-Media based Services Construct (CL-MIM)

The GTM findings in section 4.8 noted the importance of social-media based services.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.3.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Effective use of communication tools; Implication (Capability) – Ability to use ELES tools for reaching out and building a network; Implication (Capability) – Effective use of technology; Relevance (Applicability) – Leveraging social media tools for own learning;

The importance of social-media based services construct acts as an endogenous construct and is based on the dimension: Complimenting learning through social media-based Collaboration [EFFEC_3].

5.15.11.16 Importance of being part of Learning Community Construct (CL-MIM)

A social bond is defined as a sense of belonging and being at ease within the group and able to build relationships. Social bond affects the intention to use e-learning systems (Chu & Chen, 2016). The GTM findings in section 4.8 noted the importance of being part of the learning community.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.3.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Effective use of interaction tools; Implication (Capability) – Ability to use ELES tools for relation-building; Implication (Implicit) – Building learning network and community; Significance (Goal) – Supporting each other to achieve learning goals; Significance (Relationship) – building long term relations with learning community and sense of belonging and purpose;

The importance of being part of the Learning Community construct acts as an endogenous construct and is based on the dimension: Importance of using collaborative tools [CNCTL_4]; Importance of being part of the learning community [CNCTL_21].

5.15.11.17 Instructor Pedagogical Efficacy Need Construct (CL-MIM)

Instructor attitude toward e-learning affects users' perceived satisfaction with E-learning(Cidral et al., 2018). Instructor attitude toward the technology was perceived to be a significant contributor to E-learning satisfaction (Sun et al., 2008). Learners want the same due diligence and care from the instructors in the e-learning environments as they experience in the traditional learning environment.

The GTM findings in section 4.8 noted the importance of instructor pedagogical efficacy need.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.3.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Ability) – Better tutor skills with the ELES will help; Relevance (Awareness) – Able to understand why working is a specific way; Implication (Behaviour) – Able to engage more with the learning activities

The importance of instructor pedagogical efficacy needs construct acts as an endogenous construct and is based on the dimension: Tutor efficacy for ELES; Need for tutor efficacy [PEDG_9, PEDG_10].

5.15.11.18 Interaction Enabler Construct (CL-MIM)

Interactive learning activities were found to impact E-learning effectiveness and enable to share e-learning experiences (Liaw, 2007). The GTM findings in section 4.8 noted the importance of the Interaction Enabler need.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.6 and 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Able to interact more using ELES; Implication (Capability) – Able to have meaningful dialogue with the tutor; Implication (Implicit) – Building good relations with people;

The importance of interaction enabler need construct acts as an endogenous construct and is based on the dimension: Enabling interaction with more people [NETCC_1]; Enabling effective dialogue with instructor [NETCC_2].

5.15.11.19 Learning Context Importance and Understanding Requirements Construct (CL-MIM)

The study by (Chiu et al., 2005) highlighted the importance of comprehension of the information provided in the e-learning environment as an important contributing factor to the perceived quality construct. The GTM findings in section 4.8 noted the importance of learning context importance and understanding requirements.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Able to use various components in ELES; Relation (Indirect) – Able to see patterns of working; Meaningful (Emotional) – Started to enjoy working with various components in ELES; Significance (Behaviour) – Engaging more for learning when using ELES;

The importance of learning context importance and understanding requirements construct acts as an endogenous construct and is based on the dimension: Need for contextual information for the content [CNCTL_9]; Importance of developing an understanding of the learning rationale relations between components used in ELES [PEDG_7].

5.15.11.20 Perception of Collaboration Enhancement Construct (CL-MIM)

Collaboration quality was found to affect E-learning use (Cidral et al., 2018). Collaboration quality was defined as the ability of the E-learning system to facilitate easy location and communication with colleagues and sharing of documents as well as easy storage of documents with colleagues.

The GTM findings in section 4.8 noted the importance of collaboration Enhancement.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Effective use of communication tools; Implication (Capability) – Able to share ideas; Implication (Implicit) – Building relations beyond own typical working space; Relevance (Contribution) – Feels good to help others;

The collaboration Enhancement Importance construct acts as an endogenous construct and based on the dimension: Importance of guidance on the use of collaborative learning tools [CNCTL_6]; Collaboration Perception [EFFEC_2]; Facilitating sharing of ideas [TRANSS_1]; Enhancing the wider contribution of ideas and knowledge [TRANSS_2].

5.15.11.21 Perception of Emotional Intelligence Enhancing Engagement Construct (CL-MIM)

The GTM findings in section 4.8 noted the importance of emotional Intelligence.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Use of emotional tools in ELES with others; Relation (Direct) – Able to understand others feeling better; Relation (Implicit) – Understand my own feelings better; Relation (Implicit) – Building trust with others; Relation (Direct) – Able to participate better in a group;

The perception of emotional intelligence enhancing engagement construct acts as an endogenous construct and is based on the dimension: Perception of emotional Intelligence enhancing engagement [UCPR_1, UCPR_2].

5.15.11.22 Perception of Enhancement of Self-direction/Independent-Learner Construct (CL-MIM)

The sense of accomplishment, self-fulfilment and independence were taken as contributing factors to evaluating the perceived value of E-learning in the study by (Chiu et al., 2005). The GTM findings in section 4.8 noted the importance of enhancement of self-direction/Independent-learner.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Effective use of organisational tools in ELES; Implication (Capability) – Ability to prioritise own learning needs when using ELES tools; Significance (Maturity) – Developing understanding of consequences of action;

The the importance of enhancement of self-direction/Independent-learner construct acts as an endogenous construct and based on the dimension: Importance of awareness for the consequence of actions in the learning process [CNCTL_14]; Facilitating Self-direction [UCPR_7].

5.15.11.23 Perception of Importance of Improved Learner Experience Construct (CL-MIM)

Using an E-learning system found to enhance the effectiveness, performance and productivity of the users (Sun et al., 2008). The GTM findings in section 4.8 noted the importance of improved learner experience. The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Context (Use) – Effective use ELES tools and services; Perspective (Viewpoint) – Developing ability to share ideas; Significance (Harmony) – Removing barriers in learning settings; Significance (Motivation) – Enjoying better learning experience with others and sense of contributing for others;

The importance of improved learner experience construct acts as an endogenous construct and is based on the dimension: Enhancing awareness through ELES [UCPR_3].

5.15.11.24 Importance of Perception of Organisational Capability Development Construct (CL-MIM)

The GTM findings in section 4.8 noted importance of perception of organisational capability development. The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Effective use of planning ELES tools; Implication (Capability) – Ability to use ELES tools for active participation; Implication (Implicit) – Improved technical efficacy;

The importance of perception of organisational capability development construct acts as an endogenous construct and is based on the dimension: Importance of developing organisation capability [CNCTL_19]; Learner satisfaction and motivation with an enhancement of planning capability [CNCTL_12].

5.15.11.25 Perception of Privacy Importance Construct (CL-MIM)

The GTM findings in section 4.8 noted the perception of privacy importance.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Control) – Able to control the level of privacy when using ELES; Relevance (Protection) – Increased awareness of the privacy concerns when using ELES;

The perception of privacy importance construct acts as an endogenous construct and is based on the dimension: Importance of privacy and concerns [NETCC_6].

5.15.11.26 Importance of Socially Driven Learning Enhancement Construct (CL-MIM)

The GTM findings in section 4.8 noted the importance of socially driven learning enhancement.

The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.6.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Collaboration) – Sharing ideas in ELES is fun; Implication (Behaviour) – Able to engage and learn better when using ELES with others;

The Continuity of Progression & Contributions Importance construct acts as an endogenous construct and is based on the dimension: Facilitating wider professional progression [CNCTL_16]; Collaboration enabler [EFFEC_1, EFFEC_6].

5.15.11.27 Importance of ELES as Wider Participation Enabler Construct (CL-MIM)

Learner perceived interaction with others affects users' perceived satisfaction with the E-learning (Cidral et al., 2018). The GTM findings in section 4.8 noted the importance of ELES as a wider participation enabler. This observation is aligned with the study by Haq et al. (2018). The CL-MIM equation helps to understand the interplay of dimensions and formation of this construct based on the existing theoretical perspective and findings of the GTM in section 4.8.

Lens (Dimension) – statement/action-statement/qualifying statement;

Equation: L (D) – QS;

Context (Use) – Using open ELES; Implication (Capability) – Able to learn via ELES and to acquire new skills after a long gap in education; Significance (Motivation) – Building confidence and purpose of moving ahead and knowing; Implication (Growth) – Able to tap into new opportunities for the career goals with confidence;

The importance ELES as a wider participation enabler construct acts as an endogenous construct and is based on the dimension: Enabler to be part of larger learning community beyond the current course [CNCTL_20]; Increasing confidence in skills use in future career and jobs; Enhancing wider participation to education TRANSS_11].

5.15.12 ELES CL-MIM Effectiveness Structural Model

The CL-MIM lenses were applied and relations noted as detailed in above section, and the Design Construct was linked with ELES effectiveness and ELES transformation. More so, Design was linked with socially driven learning enhancement; active participation need; importance of awareness of design

rationale; continuity of progression & contributions importance; perception of privacy importance; importance of ease of access and flexibility; importance of social media based services within ELES; learning context importance and requirement; perception of collaboration enhancement; perception of enhancement of self-direction/independent-learner. The design construct is showing much richer relational depth and insights when CL-MIM is applied for the construction of the effectiveness model, as depicted in Figure 19 below. The ELES effectiveness shows direct relationships with active participation need; importance of language constructs; learner satisfaction; perception of improved learner experience; transformation, scope and scale. The networking & collaboration show direct relationships with ELES effectiveness; importance of social media based services within ELES; interaction enabler; perception of collaboration enhancement; socially driven learning enhancement; transformation, scope and scale. The pedagogy shows direct relationshi[s with choice and planning facilitator; cultural understanding importance; diversity importance; ELES effectiveness; instructor pedagogical efficacy need perception; perception of enhancement of self-direction/independent-learner; transformation, scope and scale. The transformation, scope and scale show direct relationships with continuity of progression & contributions importance; perception of collaboration enhancement; perception of emotional intelligence enhancing engagement. All the structural relations are depicted in Figure 19 below.

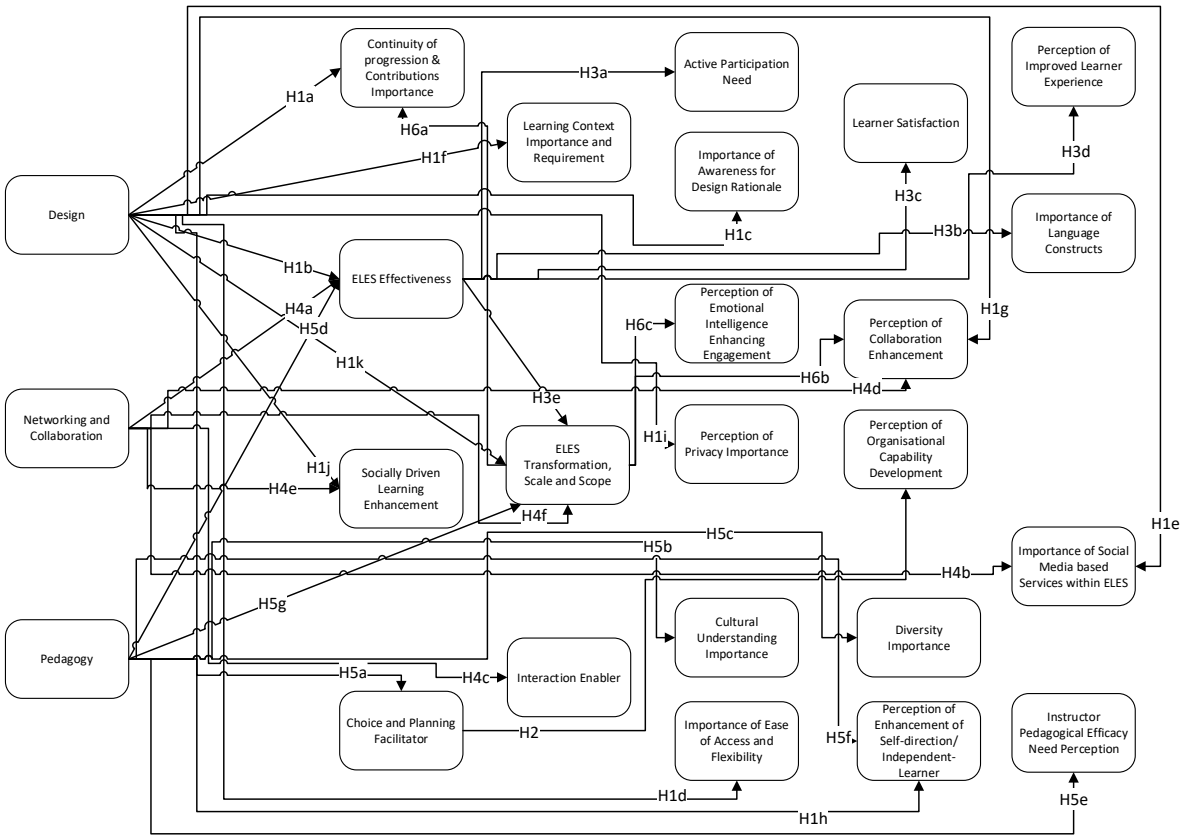

Figure 19

Proposed CL-MIM ELES Effectiveness Structural Model

5.15.13 CL-MIM ELES Effectiveness Measurement Model and Hypotheses Testing

The measurement model results are given below in Table 13, similar to Section 5.15.10, providing context for the use of the measurement model.

The measurement model for CL-MIM ELES Effectiveness was checked for the indicator reliability, convergent validity and discriminant validity tests, as indicated in Table 12. As with the base model measured in section 5.15.10, the Discriminant validity was established using the cross-loadings and Fornell-Larcker criterion (Appendix C). The cross-loading test entails examining each indicator's outer loading on the assigned construct and should be greater than its cross-loading with other constructs. Fornell-Larcker test examines each construct's AVE square root and compares it for its highest correlation with any other construct. Appendix C shows the items removed which did not qualify measurement criteria.

Table 12

CL-MIM ELES Effectiveness Measurement Model

	Items	Loadings[a]	AVE[b]	CR[c]	Cronbach's Alpha[d]
Active Participation Need	UCPR_6	1	1	1	1
Choice and Planning Facilitator	CNCTL_10	0.784	0.599	0.882	0.832
	CNCTL_11	0.805			
	CNCTL_18	0.83			
	PEDG_1	0.707			
	PEDG_2	0.737			
Continuity of progression & Contributions Importance	CNCTL_17	1	1	1	1
Cultural Understanding Importance	UCPR_5	1	1	1	1
Design	DGNTS11	0.653	0.503	0.917	0.9
	DGNTS12	0.678			
	DGNTS_1	0.771			
	DGNTS_10	0.788			
	DGNTS_2	0.689			
	DGNTS_4	0.647			
	DGNTS_5	0.698			
	DGNTS_6	0.772			
	DGNTS_8	0.689			
	DGNTS_9	0.671			
	NETCC_11	0.727			
Diversity Importance	NETCC_9	1	1	1	1
ELES Effectiveness	CNCTL_15	0.711	0.491	0.852	0.791
	CNCTL_23	0.627			
	EFFEC_4	0.646			
	EFFEC_5	0.726			
	TRANSS_6	0.699			
	TRANSS_7	0.784			
Ethics Awareness Enhancement Perception	CNCTL_3	0.76	0.636	0.777	0.431
	CNCTL_13	0.834			
Importance of Awareness for Design Rationale	CNCTL_5	0.774	0.665	0.856	0.748
	CNCTL_7	0.863			
	CNCTL_8	0.807			
Importance of Ease of Access and Flexibility	DGNTS_7	1	1	1	1
Importance of Language Constructs	CNCTL_22	0.873	0.718	0.836	0.609
	CNCTL_24	0.82			
Importance of Social-Media based Services within ELES	EFFEC_3	1	1	1	1
Importance of part of Learning Community	CNCTL_21	0.747	0.633	0.774	0.424
	CNCTL_4	0.841			

Instructor Pedagogical Efficacy	PEDG_10	0.908	0.845	0.916	0.818
Need Perception	PEDG_9	0.931			
Interaction Enabler	NETCC_1	0.916	0.836	0.911	0.804
	NETCC_2	0.913			
Learner Satisfaction	TRANSS_9	1	1	1	1
Learning Context Importance and Requirement	CNCTL_9	0.869	0.762	0.865	0.688
	PEDG_7	0.877			
Networking & Collaboration	CNCTL_2	0.661	0.598	0.881	0.83
	NETCC_10	0.742			
	NETCC_3	0.831			
	NETCC_5	0.803			
	NETCC_8	0.818			
Pedagogy	NETCC_4	0.735	0.531	0.888	0.852
	PEDG_3	0.714			
	PEDG_4	0.773			
	PEDG_5	0.713			
	PEDG_6	0.781			
	PEDG_8	0.724			
	PEDG_9	0.654			
Perception of Collaboration Enhancement	CNCTL_6	0.735	0.537	0.822	0.712
	EFFEC_2	0.729			
	TRANSS_1	0.78			
	TRANSS_2	0.683			
Perception of Emotional Intelligence Enhancing Engagement	UCPR_1	0.879	0.745	0.854	0.658
	UCPR_2	0.846			
Perception of Enhancement of Self-direction/Independent-Learner	CNCTL_14	0.886	0.653	0.789	0.484
	UCPR_7	0.723			
Perception of Improved Learner Experience	UCPR_3	1	1	1	1
Perception of Organisational Capability Development	CNCTL_12	0.868	0.777	0.875	0.714
	CNCTL_19	0.894			
Perception of Privacy Importance	NETCC_6	1	1	1	1
Socially Driven Learning Enhancement `	CNCTL_16	0.715	0.581	0.805	0.636
	EFFEC_1	0.833			
	EFFEC_6	0.732			
Transformation, Scope and Scale	TRANSS_10	0.723	0.591	0.878	0.827
	TRANSS_3	0.805			
	TRANSS_4	0.747			
	TRANSS_5	0.819			
	TRANSS_8	0.746			
Wider Participation Enabler	CNCTL_20	0.838	0.654	0.79	0.472
	TRANSS_11	0.777			

a. Item loadings > 0.5 indicate Indicator Reliability (Hulland, 1999)
b. Average Variance Extracted > 0.5 indicates Convergent Reliability (Fornell & Larcker, 1981)
c. Composite Reliability > 0.7 indicates Internal Consistency (Gefen et al., 2000)
d. Cronbach's Alpha > 0.7 indicates Indicator Reliability (Nunnally & Bernstein, 1978)

The reliability of the model was established for the indicator items. The next stage of evaluation of the structural model discussed in the next section.

The structural model presented in Figure 19 as the result of PLS analysis is summarised in Table 13 shown in Appendix C (Figure C.1 showing significant paths and C.2 showing R^2 values). The endogenous variables explained variance R^2 and standardised path coefficient (B), effect size (f^2) and predictive relevance (q^2) are presented. The bootstrapping was performed 5000 resamples to obtain the significance of estimates (t statistics). The structural model explains 56.6% of the variance for ELES Effectiveness (R^2= 0.566), 62.5% for ELES Transformation, Scale and Scope (R^2 = 0.625), 27.8% for Socially Driven Learning Enhancement (R^2 = 0.278), 17.2.6% for Active Participation Need (R^2 = 0.172), 41.0% for Importance of Awareness of Design Rationale (R^2 = 0.410), 36.6% for Continuity of progression & Contributions Importance (R^2 = 0.366), 1.100% for Perception of Privacy Importance (R^2 = 0.011), 35.9% for Importance of Ease of Access and Flexibility(R^2 = 0.359); 22.7% for Importance of Social Media based Services within ELES (R^2= 0.227); 44.3% for Learning Context Importance and Requirement (R^2 = 0.443); 46.8% for Perception of Collaboration Enhancement (R^2 = 0.468); 33.5% for Perception of Enhancement of Self-direction/Independent-Learner (R^2 = 0.335); 17.2% for Active Participation Need (R^2 = 0.172); 44.3% for Importance of Language Constructs (R^2 = 0.443); 25.5% for Learner Satisfaction (R^2 = 0.255); 25.0% for Perception of Improved Learner Experience (R^2 = 0.250); 56.3% Interaction Enabler (R^2 = .0563); 54.7% of Choice and Planning Facilitator (R^2 = 0.547); 11.6% for Cultural Understanding Importance (R^2 = 0.116); 16.9% for Diversity Importance (R^2 = 0.169); 24.0% for Instrutor Pedagogical Efficacy Need Perception = 0.240 and 35.5% for Perception of Emotional Intlelligence Enhancing Engagement = 0.350).

The Hypothesis test results show that there is a significant relationship between Choice and Planning Facilitator and Perception of Organisational Capability Development (**H2**) (*t = 10.857; p < 0.01*). The results show significant positive relationship between Design and Continuity of Progression and Contributions (*t = 3.995; p < 0.01*) (**H1a**); Design and ELES Effectiveness (*t = 3.824; p < 0.01*) (**H1b**); Design and Importance of Ease of Access and Flexibility (*t = 7.463; p < 0.01*) (**H1d**); Design and Learning Context Importance and Requirement (t= *10.039; p < 0.01*) (**H1f**); Design and Perception of Enhancement of Self-direction/Independent-Learner (t= *3.494; p < 0.01*) (**H1h**); Design and socially Driven Learning Enhancement (t= *3.887; p < 0.01*) (**H1j**); Design and Transformation, Scope and Scale (t= *3.943; p < 0.01*) (**H1k**). Although the hypothesis that the Design has influence the Importance of

Social Media based Services within ELES was rejected (*t = 1.209; p > 0.1*) (**H1e**), so as for Design and Perception of Collaboration Enhancement (t= *0.326; p > 0.1*) (**H1g**) and Design and Perception of Privacy Importance (t= *1.196; p > 0.1*) (**H1i**). The results show positive relationship between ELES Effectiveness and Active Participation Need (t= *4.786; p < 0.01*) (**H3a**); ELES Effectiveness and Importance of Language Constructs (t= *7.846; p < 0.01*) (**H3b**); ELES Effectiveness and Learner Satisfaction (t= *6.294; p < 0.01*) (**H3c**); ELES Effectiveness and Perception of Improved Learner Experience (t= *6.637; p < 0.01*) (**H3d**); ELES Effectiveness and Transformation, Scope and Scale (t= *5.370; p < 0.01*) (**H3e**). The significant relationship is noted for Networking & Collaboration contributing towards ELES Effectiveness (t= *2.221; p < 0.05*) (**H4a**); Networking & Collaboration and Importance of Social Media based Services within ELES (t= *3.198; p < 0.01*) (**H4b**); Networking & Collaboration and Interaction Enabler (t= *17.848; p < 0.01*) (**H4c**); Networking & Collaboration and Perception of Collaboration Enhancement (t= *3.201; p < 0.01*) (**H4d**). More so, relationship between Networking & Collaboration and Socially Driven Learning Enhancement was rejected (t= *1.228; p > 0.1*) (**H4e**), so as between Networking & Collaboration and Transformation, Scope and Scale (t= *1.012; p > 0.1*) (**H4f**). The significant relationship was noted for Pedagogy facilitating Choice and Planning within the context of ELES application (t= *14.254; p < 0.01*) (**H5a**); Pedagogy informing Cultural Understanding Importance (t= *3.676; p < 0.01*) (**H5b**); Pedagogy informing Diversity Importance (t= *4.380; p < 0.01*) (**H5c**); Pedagogy affecting ELES Effectiveness (t= *3.265; p < 0.01*) (**H5d**) and Pedagogy and Instructor Pedagogical Efficacy Need Perception (t= *2.862; p < 0.01*) (**H5f**). The hypothesis for the significant relation between Pedagogy and Transformation, Scope and Scale was rejected (t= *4.380; p < 0.01*) (**H5c**). The significant relation was found for Transformation, Scope and Scale impacting Continuity of progression & Contributions Importance (t= *2.536; p < 0.05*) (**H6a**); Transformation, Scope and Scale impacting Perception of Collaboration Enhancement (t= *5.369; p < 0.01*) and Transformation, Scope and Scale impacting Perception of Emotional Intelligence Enhancing Engagement (t= *9.884; p < 0.01*).

Apart from the endogenous construct 'Perception of Privacy Importance,' rest of the values of Q^2 are above the cut-off point (more than zero), depicting the model has strong predictive relevance for the endogenous constructs as indicated under Table 14. The results show similar consistency for the effect size (Cohen, 1988, as cited in Teik, 2015) and predictive relevance (Henseler et al., 2009).

Table 13 shows direct relationships for Hypothesis testing

Table 13

Hypothesis Testing results for CL-MIM ELES Effectiveness model

Hypothesis	Relationship	Std Beta	Std Error	|t-value|^	Decision	f^2	95%CI LL	95% CI UL
H1a	Design -> Continuity of progression & Contributions Importance	0.407	0.100	3.995**	Supported	0.117	0.237	0.568
H1b	Design -> ELES Effectiveness	0.383	0.100	3.824**	Supported	0.115	0.217	0.545
H1c	Design -> Importance of Awareness for Design Rationale	0.641	0.054	11.934**	Supported	0.694	0.55	0.724
H1d	Design -> Importance of Ease of Access and Flexibility	0.590	0.080	7.463**	Supported	0.560	0.446	0.708
H1e	Design -> Importance of Social Media based Services within ELES	0.144	0.122	1.209	Rejected	0.013	-0.058	0.345
H1f	Design -> Learning Context Importance and Requirement	0.668	0.066	10.039**	Supported	0.796	0.552	0.77
H1g	Design -> Perception of Collaboration Enhancement	0.036	0.110	0.326	Rejected	0.001	-0.149	0.213
H1h	Design -> Perception of Enhancement of Self-direction/Independent-Learner	0.341	0.098	3.494**	Supported	0.077	0.182	0.504
H1i	Design -> Perception of Privacy Importance	0.107	0.090	1.196	Rejected	0.012	-0.043	0.255
H1j	Design -> Socially Driven Learning Enhancement	0.423	0.110	3.887**	Supported	0.114	0.235	0.601
H1k	Design -> Transformation, Scope and Scale	0.392	0.099	3.943**	Supported	0.126	0.225	0.55
H2	Choice and Planning Facilitator -> Perception of Organisational Capability Development	0.644	0.059	10.857**	Supported	0.710	0.538	0.734
H3a	ELES Effectiveness -> Active Participation Need	0.414	0.087	4.786**	Supported	0.208	0.264	0.548
H3b	ELES Effectiveness -> Importance of Language Constructs	0.547	0.070	7.846**	Supported	0.429	0.425	0.655
H3c	ELES Effectiveness -> Learner Satisfaction	0.506	0.080	6.294**	Supported	0.342	0.369	0.629
H3d	ELES Effectiveness -> Perception of Improved Learner Experience	0.496	0.075	6.637**	Supported	0.333	0.364	0.612
H3e	ELES Effectiveness -> Transformation, Scope and Scale	0.390	0.074	5.37**	Supported	0.183	0.267	0.511
H4a	Networking & Collaboration -> ELES Effectiveness	0.175	0.079	2.221*	Supported	0.029	0.045	0.303
H4b	Networking & Collaboration -> Importance of Social Media based Services within ELES	0.357	0.112	3.198**	Supported	0.075	0.174	0.542
H4c	Networking & Collaboration -> Interaction Enabler	0.750	0.042	17.848**	Supported	1.288	0.677	0.814
H4d	Networking & Collaboration -> Perception of Collaboration Enhancement	0.290	0.091	3.201**	Supported	0.071	0.136	0.438
H4e	Networking & Collaboration -> Socially Driven Learning Enhancement	0.129	0.102	1.228	Rejected	0.010	-0.034	0.3
H4f	Networking & Collaboration -> Transformation, Scope and Scale	0.076	0.072	1.012	Rejected	0.006	-0.039	0.198
H5a	Pedagogy -> Choice and Planning Facilitator	0.738	0.052	14.254**	Supported	1.207	0.646	0.816
H5b	Pedagogy -> Cultural Understanding Importance	0.338	0.093	3.676**	Supported	0.131	0.179	0.485

H5c	Pedagogy -> Diversity Importance	0.408	0.094	4.38**	Supported	0.204	0.247	0.553
H5d	Pedagogy -> ELES Effectiveness	0.268	0.082	3.265**	Supported	0.067	0.131	0.403
H5e	Pedagogy -> Instructor Pedagogical Efficacy Need Perception	0.487	0.081	6.081**	Supported	0.316	0.347	0.614
H5f	Pedagogy -> Perception of Enhancement of Self-direction/Independent-Learner	0.275	0.097	2.862**	Supported	0.050	0.118	0.435
H5g	Pedagogy -> Transformation, Scope and Scale	0.008	0.079	0.071	Rejected	0.000	-0.122	0.139
H6a	Transformation, Scope and Scale -> Continuity of progression & Contributions Importance	0.238	0.097	2.536*	Supported	0.044	0.074	0.397
H6b	Transformation, Scope and Scale -> Perception of Collaboration Enhancement	0.433	0.080	5.369**	Supported	0.156	0.298	0.565
H6c	Transformation, Scope and Scale -> Perception of Emotional Intelligence Enhancing Engagement	0.595	0.060	9.884**	Supported	0.537	0.491	0.686

**P < 0.01, *p<0.05

- R^2 (ELES Effectiveness = 0.566; ELES Transformation = 0.625; Socially Driven Learning Enhancement = 0.278; Active Participation Need = 0.172; Importance of Awareness of Design Rationale = 0.410; Continuity of progression & Contributions Importance = 0.366; Perception of Privacy Importance = 0.011; Importance of Ease of Access and Flexibility = 0.359; Importance of Social Media based Services within ELES = 0.227; Learning Context Importance and Requirement = 0.443; Perception of Collaboration Enhancement = 0.468; Perception of Enhancement of Self-direction/Independent-Learner = 0.335; Active Participation Need = 0.172; Importance of Language Constructs = 0.443; Learner Satisfaction = 0.255; Perception of Improved Learner Experience = 0.250; Interaction Enabler = .0563; Choice and Planning Facilitator = 0.547; Cultural Understanding Importance = 0.116; Diversity Importance = 0.169; Instrutor Pedagogical Efficacy Need Perception = 0.240; Perception of Emotional Intlelligence Enhancing Engagement = 0.350)
- Effect Size impact indicator are according to (J. Cohen, 1992), f^2 values: 0.35 (large), 0.15 (medium), and 0.02 (small)
- Q^2 (ELES Effectiveness = 0.317; ELES Transformation, Scale and Scope = 0.389; Perception of Organisational Capability Development = 0.314; Continuity of progression & Contributions Importance = 0.345; Importance of Awareness for Design Rationale = 0.267; Importance of Ease of Access and Flexibility = 0.334; Importance of Social Media based Services within ELES = 0.192; Learning Context Importance and Requirement = 0.332; Perception of Collaboration Enhancement = 0.326; Perception of Enhancement of Self-direction/Independent-Learner = 0.315; Perception of Privacy Importance = -0.02; Socially Driven Learning Enhancement = 0.245; Active Participation Need = 0.152; Importance of Language Constructs = 0.204; Learner Satisfaction = 0.246; Perception of Improved Learner Experience = 0.237; Interaction Enabler = 0.464; Socially Driven Learning Enhancement = 0.245; Choice and Planning Facilitator = 0.330; Cultural Understanding Importance = 0.097; Diversity Importance = 0.151; Instructor Pedagogical Efficacy Need Perception = 0.189; Perception of Emotional Intelligence Enhancing Engagement = 0.249)

Table 14

Hypothesis Testing results for base CL-MIM ELES Effectiveness model - In-direct relationships depiction

Hypothesis	Relationship	Std Beta	Std Error	|t-value|^	Decision	95%CI LL	95% CI UL
H7a	Design -> ELES Effectiveness -> Active Participation Need	0.159	0.056	2.838**	Supported	0.080	0.264
H7b	Networking & Collaboration -> ELES Effectiveness -> Active Participation Need	0.072	0.037	1.956	Rejected	0.022	0.146
H7c	Pedagogy -> ELES Effectiveness -> Active Participation Need	0.111	0.040	2.774**	Supported	0.055	0.190
H8a	Design -> Transformation, Scope and Scale -> Continuity of progression & Contributions Importance	0.091	0.041	2.381*	Supported	0.045	0.181
H8b	Design -> ELES Effectiveness -> Transformation, Scope and Scale -> Continuity of progression & Contributions Importance	0.036	0.021	1.825	Rejected	0.013	0.084
H8c	Networking & Collaboration -> ELES Effectiveness -> Transformation, Scope and Scale -> Continuity of progression & Contributions Importance	0.017	0.011	1.499	Rejected	0.004	0.045
H8d	ELES Effectiveness -> Transformation, Scope and Scale -> Continuity of progression & Contributions Importance	0.096	0.046	2.123*	Supported	0.032	0.184
H8e	Pedagogy -> ELES Effectiveness -> Transformation, Scope and Scale -> Continuity of progression & Contributions Importance	0.026	0.015	1.705	Rejected	0.008	0.063
H8f	Networking & Collaboration -> Transformation, Scope and Scale -> Continuity of progression & Contributions Importance	0.017	0.020	0.906	Rejected	-0.004	0.065
H8g	Pedagogy -> Transformation, Scope and Scale -> Continuity of progression & Contributions Importance	0.004	0.021	0.066	Rejected	-0.026	0.043
H9a	Design -> ELES Effectiveness -> Importance of Language Constructs	0.211	0.065	3.239**	Supported	0.110	0.323
H9b	Networking & Collaboration -> ELES Effectiveness -> Importance of Language Constructs	0.095	0.046	2.093*	Supported	0.027	0.179
H9c	Pedagogy -> ELES Effectiveness -> Importance of Language Constructs	0.149	0.051	2.908*	Supported	0.071	0.238
H10a	Design -> ELES Effectiveness -> Learner Satisfaction	0.194	0.062	3.105**	Supported	0.098	0.300
H10b	Networking & Collaboration -> ELES Effectiveness -> Learner Satisfaction	0.087	0.043	2.065*	Supported	0.026	0.166
H10c	Pedagogy -> ELES Effectiveness -> Learner Satisfaction	0.136	0.046	2.971**	Supported	0.068	0.218
H11a	Design -> Transformation, Scope and Scale -> Perception of Collaboration Enhancement	0.171	0.055	3.086**	Supported	0.089	0.267

H11b	Design -> ELES Effectiveness -> Transformation, Scope and Scale -> Perception of Collaboration Enhancement	0.066	0.026	2.509*	Supported	0.032	0.120
H11c	Networking & Collaboration -> ELES Effectiveness -> Transformation, Scope and Scale -> Perception of Collaboration Enhancement	0.029	0.015	1.972*	Supported	0.010	0.061
H11d	ELES Effectiveness -> Transformation, Scope and Scale -> Perception of Collaboration Enhancement	0.171	0.046	3.72**	Supported	0.104	0.258
H11e	Pedagogy -> ELES Effectiveness -> Transformation, Scope and Scale -> Perception of Collaboration Enhancement	0.046	0.020	2.307*	Supported	0.020	0.089
H11f	Networking & Collaboration -> Transformation, Scope and Scale -> Perception of Collaboration Enhancement	0.031	0.032	0.987	Rejected	-0.015	0.090
H11g	Pedagogy -> Transformation, Scope and Scale -> Perception of Collaboration Enhancement	0.004	0.035	0.069	Rejected	-0.054	0.062
H12a	Design -> Transformation, Scope and Scale -> Perception of Emotional Intelligence Enhancing Engagement	0.236	0.068	3.428**	Supported	0.121	0.343
H12b	Design -> ELES Effectiveness -> Transformation, Scope and Scale -> Perception of Emotional Intelligence Enhancing Engagement	0.091	0.035	2.598**	Supported	0.043	0.157
H12c	Networking & Collaboration -> ELES Effectiveness -> Transformation, Scope and Scale -> Perception of Emotional intelligence Enhancing Engagement	0.040	0.019	2.152*	Supported	0.014	0.077
H12d	ELES Effectiveness -> Transformation, Scope and Scale -> Perception of Emotional intelligence Enhancing Engagement	0.234	0.050	4.721**	Supported	0.158	0.323
H12e	Pedagogy -> ELES Effectiveness -> Transformation, Scope and Scale -> Perception of Emotional intelligence Enhancing Engagement	0.063	0.022	2.845**	Supported	0.033	0.108
H12f	Networking & Collaboration -> Transformation, Scope and Scale -> Perception of Emotional intelligence Enhancing Engagement	0.044	0.043	0.999	Rejected	-0.022	0.119
H12g	Pedagogy -> Transformation, Scope and Scale -> Perception of Emotional intelligence Enhancing Engagement	0.004	0.047	0.070	Rejected	-0.077	0.079
H13a	Design -> ELES Effectiveness -> Perception of Improved Learner Experience	0.191	0.058	3.268**	Supported	0.102	0.297
H13b	Networking & Collaboration -> ELES Effectiveness -> Perception of Improved Learner Experience	0.087	0.044	1.989*	Supported	0.022	0.168
H13c	Pedagogy -> ELES Effectiveness -> Perception of Improved Learner Experience	0.136	0.048	2.785**	Supported	0.065	0.221
H14	Pedagogy -> Choice and Planning Facilitator -> Perception of Organisational Capability Development	0.478	0.065	7.317**	Supported	0.363	0.577
H15a	Design -> ELES Effectiveness -> Transformation, Scope and Scale	0.152	0.055	2.77**	Supported	0.074	0.258
H15b	Networking & Collaboration -> ELES Effectiveness -> Transformation, Scope and Scale	0.067	0.032	2.19*	Supported	0.023	0.129
H15c	Pedagogy -> ELES Effectiveness -> Transformation, Scope and Scale	0.105	0.037	2.913**	Supported	0.056	0.178

**P < 0.01, *p<0.05

All the indirect relationships are given in the Table 14 above with the outcome for the support of the hypotheses based on the empirical data. The results show significant positive indirect relationship for Design impacting Active Participation need through ELES Effectiveness (*t = 2.838; p < 0.01*) (**H7a**). Interestingly, the empirical evidence suggests that the indirect relation between Networking & Collaboration through ELES Effectiveness (*t = 1.956; p > 0.1*) (**H7b**) is not significant. This implies that the Design has more role to play, impacting Active Participation need perception, signifying need for care to be given during Design process to achieve the objective of enhancing engagement and active participation within ELES environment during the learning process. An interesting pattern is emerging that predominantly where Design is the trigger for other constructs e.g., H9a (*t = 3.239; p < 0.01*), H10a (*t = 3.105; p < 0.01*), H11a (*t = 3.086; p < 0.01*), H11b (*t = 2.509; p < 0.01*), H12a (*t = 3.428; p < 0.01*), H12b (*t = 2.598; p < 0.01*), H13a (*t = 3.268; p < 0.01*), H15a (*t = 2.770; p < 0.01*) had significant impact through mediating constructs. Another useful insight has emerged for the mediating impact for Perception of Emotional Intelligence Enhancing Engagement, H12e and H12f. In the case of Pedagogy, facilitating transformation scope and scale through enhancing ELES Effectiveness had a significant impact. In comparison, the significant impact could not be supported when Networking and Collaboration has direct relationship with Transformation, Scope and Scale for mediating effect. This suggests that the ELES Effectiveness has stronger mediation capability to make an impact, and when planning learning activities, the attention should be given to constitute approaches and activities perceive to enhance ELES Effectiveness, consequently, will impact more on learning experience and engagement.

5.16 Discussion, Comparison and Evaluation of Proposed ELES Effectiveness Models

The Pedagogy construct for the base model is comprised of the dimension of 'pedagogies enabling to understand the learning and instructional choices available for the learners'. The construct comprises other dimensions such as an enabler for informing rationale for the arrangement of content in terms of the order, combining learning components and structure. Also, as an enabler to see the bigger picture, how various learning components are related to each other through the learning journey. The tutors and instructors efficacy was deemed necessary in terms of clarifying pedagogical approaches applied. Many e-learning effectiveness studies provided details on the importance of information, course quality and instructors characteristics (Bhuasiri et al., 2012; Cidral et al., 2018; Pham et al., 2019). However, the Pedagogical construct and deeper relation with other constructs lack vigour and deserve better attention as a primary contributing factor to E-learning effectiveness. This study contributes to this dimension. The Pedagogical construct was empirically found to impact ELES effectiveness, ELES transformation for learners and practitioners, broadening scope and scale for them, and influencing user expectations. The CL-MIM enabled Pedagogy construct comprised the same dimensions overall as the base model. However, it was found to have an elaborated relation with Cultural Understanding Importance, which is

related to understanding local cultural terms, language constructs and practices. This is another contribution of this study as other E-learning effectiveness models don't focus explicitly on the importance of local cultural incorporation to make the E-learning environment and experience more engaging. Pedagogy also found to be a choice and planning facilitator. The choice and planning construct comprised the dimension: ELES provides opportunities to plan learners' own work and activities. Consequently enabling learners to become better organisors and make informed choices for own learning journey and become more aware of the consequences of the choices made for learning with ELES settings. Indirectly, this will contribute to developing soft skills and the ability to cope with the pressures and develop attributes such as grit, which is extremely valuable in challenging and uncertain situations (Mueller, Wolfe, & Syed, 2017). This is another area of development where more focus and energy should be given implicitly and explicitly, and further research would be useful to incorporate the enhancement of soft-skills elements within pedagogical strategies. Pedagogy construct also influences diversity importance, enabling learners and practitioners to hear diverse views and perspectives and incorporate the ELES environment's necessary features for collaborative interactions. A significant relationship was found between the Pedagogy construct and Instructor Pedagogy's need perception, accounting for tutor/instructor's efficacy for the planning, elaborating rationale for learning activities, and using features and tools within ELES settings, impacting better learning experience. The pedagogy influenced the learners to become independent learners. As noted in the base model, the Pedagogy construct had an impact on ELES Effectiveness for the CL-MIM applied model. However, Pedagogy was found to have a weak impact on the transformation, scope and scale, and the direct relationship between the constructs was rejected. This means that Pedagogy directly would not impact the transformation of the learners but through enhancing learners' efficacy and ELES effectiveness and indirectly impact the transformation, scope and scale enhancement for the learners, as indicated in Table 15, H11e hypothesis. The practitioners might implement a certain pedagogy, but it has to be relevant and meaningful for learners, and they should be able to understand a particular approach to engage fully – this way our research findings conform with (Kirschner, 2004, p. 6) e-learning effectiveness factor, when he defined it as, 'a fitting pedagogy'.

The importance of design is acknowledged by Urbach et al. (2010) in the context of system quality and highlights the importance of navigation, accessibility, searchability, usability and functionality. The study by Urbach et al. showed that the collaboration factor had more impact than the system quality on user satisfaction and system use. This observation aligns with the Design construct's dimension for social interactions for knowledge creation and sharing. The Design dimension of perceived ease of use has a significant impact on perceived usefulness and towards working effectively in the e-learning context, and this observation was consistent with the previous studies (Chen et al., 2008; Fang et al., 2004; Friman et al., 2001; Lin et al., 2010; Lin, 2011). The existing literature has little or no focus on

this dimension for ELES design, where the use of tools with effective design enables to meet the organisation's requirements and wider objectives. Some of the literature, for instance, by Cidral et al. (2018), indicates the importance of management support; however, the implications in the context of the organisation's wider objectives and requirements needed further exploration. The dimension that the ELES design and tools play a part in enabling to meet the organisation's requirements and wider objectives to draw focus for this perspective and substantiated during the ELES model validation. In addition to all the dimensions covered by the base model, the design construct developed through the CL-MIM application incorporates the ELES as a facilitator dimension for the learning community development. The base model found the Design construct to significantly impact ELES Effectiveness, ELES transformation, scale and ccope, user expectations and user perceptions. Piccoli et al. (2001) found the design dimension significant for the effectiveness of technology-mediated learning and web-based learning. The design dimension was considered in terms of learning model, technology, learning control, content and interaction and found to have an effect on student satisfaction, self-efficacy, and performance. The finding of the results is in line with the study's existing findings. However, the CL-MIM enabled model provides further granularity and found that the design also facilitates the continuity of progression for the learners and enables learners to contribute proactively improves e-learning effectiveness. The importance of awareness for design rationale construct comprises guidance for learning tools, understanding the purpose and rationale behind the course design within ELES settings, and perception of its importance for the learning experience. The Design construct was found to significantly impact the importance of awareness of design rationale. Piccoli et al. incorporated the learning model in the design dimension, which is essentially learning and instructional design and was found to be a key component of the virtual learning environment effectiveness. This study's findings align with the previous studies for emphasizing an understanding of the awareness for design rationale both in terms of instructional design and the tools. In many studies, system quality entailing usability and accessibility (Bhuasiri et al., 2012; Cidral et al., 2018; Urbach et al., 2010) was linked to user satisfaction. Our findings are consistent with other studies; however, system quality components have a strong relationship with the design planning and rationale used in offering flexibility for the learners. The e-learning effectiveness models presented by (Xu et al., 2014) and (Piccoli et al., 2001) showed the relationship of Design with perceived learning performance, user satisfaction and self-efficacy. However, this study shows a relationship of design with the understanding of learning context from the learners' perspective. It deems a key requirement for a successful ELES design. Hence, design impacts the perception of enhancement of self-direction and facilitating attributes to become an independent learner and socially driven learning enhancement. The Learning Context Importance construct was based on the dimension for understanding the linkages between various learning components and contextual information for the content and linking it to the learners and users' perceived usefulness. This study also noted that the Design construct has no significant impact on the importance of social-media-

based services within ELES, although the Networking and Collaboration construct noted to have a significant impact in this context. Cidral et al. (2018) found that collaboration quality positively influences the use of the e-learning system. This means solely relying on design for the effective utilisation of social media and collaborative tools e.g., discussion boards, sharing external media and resources, will not be enough. Active collaboration should be promoted to have a significant impact on learning quality. Design construct also found to have no significant impact for the perception of privacy importance. This could be due to the study being conducted in blended settings and privacy may not be a major concern for the learners in those settings. This study has added new dimensions for the Design construct as well as aligned with existing studies and deepen the understanding for this construct as discussed above. Corroborating (Wang, 2003), the research validated four instruments for measuring the e-learning effectiveness namely: Personalisation, Learning Community, Content and Learner Interface. However, modern users perceive the value of meaningful interactions within learning communities more than other factors, e.g., just providing a good learner interface might not increase user satisfaction, it has to fit meaningfully within overall learning experience driven by thoughtful design makeup.

The Networking and Collaboration construct was based on the dimensions, the perception of engagement and interaction improvement through ELES. The importance of dialogue with peers and instructors impacts learners' behaviour, communication level and responsiveness. This engagement facilitates collaborative learning, encourages diversity of opinion and perspectives, and, importantly, facilitates interactions beyond defined classroom settings and boundaries. The CL-MIM enabled Networking and Collaboration construct had a similar formation as the base construct with an explicit relational richness to ELES Effectiveness and enhancing the importance of social media-based services for learning within ELES settings. The networking and collaboration construct doesn't directly impact socially driven learning enhancement and transformation. This means the coupling of Design and Pedagogy improves ELES effectiveness and the effective utilisation of networking and collaborative approaches and tools, causing learner transformation. Just providing networking tools and a collaborative environment is not enough. The interplay of the dimensions and utilisation for specific purposes is required for learners and users' intended transformation. The findings developed a deeper understanding of the role of Networking and Collaboration and in line with the previous studies of (Chen & Hsiang, 2007; Cidral et al., 2018; Shee & Wang, 2006; Y. S. Wang, 2003) in terms of community influence and collaboration impact.

This study findings reveal that the E-learning effectiveness dimensions (Human factors, e.g. Students, Instructors; Learning Model; Technology; Learner Control; Content; Interaction) presented by Piccoli et al. (Piccoli et al., 2001)are still valid for modern ELES system. Although the focus has shifted from

just considering these dimensions to how these dimensions could be used effectively and how users and practitioners are informed and educated about the choices available to them, more importantly, develop an understanding of these choices and related implications. The relevance of the Human dimension, e.g., Instructors immediacy behaviour (reducing social distance between the tutor and learner) for e-learning effectiveness, was highlighted by the research presented by Arbaugh (2000) and corresponds to our findings that despite the changing scope and scale of ELES, learners still expect and desire to have meaningful interactions with their tutors. Thus 'human dimension' is one of the key factors impacting e-learning effectiveness (Fuhrmann, Kali, & Hoadley, 2008).

There seems to be a lack of communication and understanding between users and practitioners for enabling each other to understand the rationale for doing things in a particular way. The central role of 'CL-MIM' dimension could bridge this gap by linking and enabling all stakeholders better to understand the design, learning process and pedagogy. For example, learning design (Koper, 2006, p 13) is more abstract in nature, and Instructional design (Merrill et al., 1996) is more procedural in nature. Learning practitioners may think about the tools and technologies first and then think about the learning concept to be taught, resulting in distorted pedagogy where learners are not the central focus. A mapping layer may help in bridging the gap between the two, resulting in more informed practitioners. This layer could help and inform users explicitly about the relations between learning design, users characteristics, instructional design and ELES services & tools. The need for mapping may not be new. Previously, some (limited) attempts (Conole, Dyke, Oliver, & Seale, 2004) have been made to map learning theories, pedagogical processes and characteristics to a learning model. However, these attempts have been limited to a specific type of learning model. There seems to be a need for a more generic way of mapping, which is not constrained to a specific model. 'CL-MIM,' opens up the possibility of this new dimension to be used as a key instrument in building a mapping layer independent of specific learning models.

The researchers have highlighted the problem of lack of understanding of users of the Instructional Design (ID) products in terms of the ID products they use, for example, how the ID product was developed and how it should be used (Wildman & Burton, 1981). Despite a long history of research work in this domain, the problem still persists, and the recent challenge of the COVID19 pandemic has made it even more acute to address this challenge with a concerted effort. The basic challenge lies in examining the need to integrate assumptions related to learning processes when designing instructional systems. There is a need to understand learning theories and relationships it has for the construction of instructional design to improve the design process. For example, system approaches to design instructions made an explicit decision for generally accepted components of instructional design, such as Identifying/Prioritising Instruction goals; performing learning outcome analysis, describing students entry behaviour; grouping and sequencing learning objectives, designing delivery systems, designing or

selecting learning activities – these explicit decisions depends on the implicit assumptions which designer makes for what, how and why people learn. If the theoretical and psychological underpinning of learning is not understood fully or misunderstood, then this could result in incoherent components being arbitrary put together. Similarly, understanding the practical implications of theoretical frameworks such as Laurillard's conversational framework, which is based on principles presented by Dewey, Vygotsky, Piaget, Gagne, Bruner, Papert, Marton and Bransford, would enhance the experience for both instructors and learner, enabling them to use the tools consciously for its design purpose and implication for internal and psychological processes for learners and instructors and impact on learner practise and resultant refinement and modelling of the learning environment. The CL-MIM dimension presented in this study could facilitate the process of developing a deeper understanding of relations between learning theories, instructional design, learning practises and the learning environments.

Just because a tool or a service is available - merely providing it, is not enough in modern ELES systems. This study highlights designers' need to think about how a 'tool or service' could be meaningful for practitioners by giving a context and how practitioners could be informed through design in achieving a better learner experience. Our research conforms with many studies reporting technology as an important dimension (Bhuasiri et al., 2012; Liaw, 2007; Piccoli et al., 2001; Sun et al., 2008). However, we found user focus is perceived to be shifting in utilising the relationships that exist between technology and other dimensions such as pedagogy, networking and collaboration. This study contributes to developing a deeper understanding of learners' and users' requirements and perceptions and presents a practical model to use and adaptable to cater to contextual layers of technological developments, instructional and system design rationale and pedagogical constructs.

Conclusion

This chapter entails the validation of the ELES effectiveness model as part of the mixed methodology design for this research and triangulation. For this purpose, a comparative evaluation was carried out for choosing an appropriate method for the validation of the model, considering the model attributes and objectives of the study. An instrument for the data collection was devised and based on the grounded theory results for the ELES Effectiveness model and utilised theoretical underpinnings from the existing literature. The data collection instrument was approved by the Ethics body of the university. Data collection was conducted using both physical and electronic mediums based on the systematic procedure. The findings of the analysis were presented using PLS-SEM for both the ELES Effectiveness base model and CL-MIM ELES Effectiveness model. The utility of the CL-MIM dimension was discussed. A discussion for the findings was presented, including comparative evaluations and insights against existing literature for the domain of the study. The results helped in developing a deeper

understanding of e-learning effectiveness factors and provided a framework for the practitioners and learners to practically enhance the learning and teaching experience when using e-learning environment and services. The proposed core dimension of CL-MIM plays a critical role to achieve this goal in complex and dynamic settings and often when faced with conflicting requirements and expectations of multiple stakeholders.

Chapter 6: Conclusion and Further Research

Chapter Overview

The chapter concludes the research carried out in this thesis and presents its achievements and contributions. The theoretical and practical implications are discussed in this chapter. The research limitations are highlighted, and the proposed areas for further research and future direction are presented. This chapter summarises an overview of the research conducted in this thesis and draws conclusions derived from the literature and empirical findings reported in chapters 2 to 5.

6.1 Research Overview

We are living in unprecedented times, and many industries are facing changing working patterns from technological disruptions to challenges posed by COVID19. For example, recently, analysts from the LinkedIn company used non-traditional methods to tap into the talent pool to hire new sales support staff (Andrew, 2021). The company identified that service staff redundant from the many Café's restaurants and hospitality industries have 70 percent of skills needed for customer service specialists. So, they scrapped the requirement of traditional first degree or prior experience for the candidates and guaranteed interviews for candidates who had completed LinkedIn online training courses and able to fill gaps in customer care and help them in the transformation in customer care. In their regional headquarters, nearly 1000 candidates applied, 219 passed the assessments, and 28 candidates were hired, 43 percent of whom did not have prior experience or a first degree. The company is now scaling this approach across the US and partnered with dozen other employers for other jobs.

This example shows one instance of the disruption of the traditional patterns of skilling people and the value given by the employers to new educational systems and processes.

Higher education, particularly facing challenges and traditional educational models were increasingly questioned in terms of value and quality for modern learners and to meet the needs of employers in technology-driven changing working patterns (Gallagher & Palmer, 2020). The higher education institutions should do deep introspection and evolve their provision to meet the modern-day challenges and remain relevant.

In this context, E-learning has taken centre stage for learning provision, whether used entirely remotely or in blended settings, especially due to disruption caused by COVID19 in recent times (World Economic Forum, 2020).

6.2 Meeting the Aim and Objectives of this Thesis

This is timely research. The main challenge was to explore and present an E-learning effectiveness model that can adapt to the changing needs of the users, practitioners, and institutions.

This research study is based on a mixed-method approach, as indicated in sections 3.1.2, 3.2 and 3.4, with two distinct phases. The first phase relates to developing the conceptual model for the ELES Effectiveness, and the second phase refers to the validation of the proposed conceptual model, and comparative evaluation is being conducted in both phases. Objective-1 of the research is met in Chapter 2 to review the literature related to Elearning Success Factors and evolutionary trends of the domain. The appropriate research design was identified, and the protocols were laid out for the reliability and validity of the research, and an appropriate data collection was designed and carried out for this purpose. The details of this process are given in Chapters 3 and 4, and this relates to Objective 3. The systematic investigation and evaluation of the factors influencing the adoption of E-learning technologies and services are conducted in Chapter 4 and help meet Objective-2. The Grounded Theory method is employed based on justified reasoning for the longitudinal research study. An analysis is carried out in Chapter 4 to propose a model for successfully utilising E-learning Systems and Services, facilitating better adoption by various stakeholders, which relates to Objective 4. The validation and evaluation of the proposed E-learning systems and services effectiveness model are carried out and detailed in Chapter 5 and relate to Objective-5 of the thesis. Evaluation of the proposed E-learning systems and services effectiveness model against the specified objectives and comparisons with existing E-learning effectiveness models are presented in Chapters 4 and 5 – these relate to Objective-5. The research's theoretical and practical implications and limitations are discussed below, aligning with Objective-5.

6.3 Key Findings of this Thesis

This thesis contributes to the body of knowledge for the E-learning domain. To this effect, a critical review of the evolution of prevalent E-learning models was carried out, as shown in chapter two, with interesting insights emerging from the discussions on the E-learning trends during various periods. For example, early studies were more concerned with the technology features and interface design (Chiu et al., 2005; Wang, 2003) in comparison to later studies, where the focus shifted to the system and information quality (Cidral et al., 2018; Urbach et al., 2010). This presented a challenge and need for a cohesive model for E-learning to capture not only the needs and requirements of a specific time period but be able to capture the evolving trends. Such a model should capture the essence of the challenges thrown by modern practices in education, learning, and societal and emerging technological patterns. In this context, a deeper study was conducted to understand the multilayered factors affecting the E-learning effectiveness constructs, incorporating E-learning success models, and learning theories and the multidisciplinary underpinning for these theoretical constructs, e.g., from the field of psychology,

behaviour science and information systems. Compared to other ELES Effectiveness models as depicted in Table 2, the CL-MIM offers a unique perspective and a concrete tool to cohesively evaluate traditional success factors and capture the success factors for ELES Effectiveness in a changing dynamic setting with a contemporary outlook, building on the success of earlier works. This gives practitioners and learners a powerful tool at their disposal to enhance the learning experience and focus their energies on solving specific challenges they might be facing. Practical scenarios for the use of CL-MIM to complement Affordance techniques and to develop meaningful insights were provided in section 4.9 with the use of Persona. The proposed CL-MIM ELES effectiveness model offers not only new dimensions to understand contemporary issues and what the users perceive as useful for their own learning and progression in specific settings in the ever-changing technological, social, and cultural fabric of the society but also the CL-MIM offers wider applications in other areas of interest, e.g., in management sciences and behavioural sciences.

Compared to previous studies, this thesis sets Pedagogy at the centre stage along with Design and Networking and Collaboration constructs and is found to have a relation with new factors such as Cultural understanding importance, which is related to understanding local cultural terms and language constructs and practices. Pedagogy was also found to be a choice and planning facilitator and enriches the instructor dimension presented by (Bhuasiri et al., 2012; Sun et al., 2008) and again opens up new directions for further research. This research opens new aspects for the learner dimension and is not just limited to technical efficacy and self-efficacy (Liaw, 2007) or learner anxiety (Sun et al., 2008) concerning the learner dimension. This research shows learner efficacy in broader cultural settings with various influences playing their part, such as emotional intelligence importance.

This research enriches the dimension of learning motivation (Lim et al., 2007) and learning quality. To this effect, the proposed ELES effectiveness model emphasises the need to enhance ‘Soft-skills’ leveraging E-learning provision, hence driving the debate forward.

6.4 Research Contribution and Novelty

The proposed ELES effectiveness model linked the Design dimension to the ‘Perception of Enhancement of Self-direction’ and becoming an independent learner. This research highlighted that ‘Transformation’ for learners in an E-learning setting is linked to the ‘Perception of Emotional Intelligence’ to enhance engagement. Also, ELES effectiveness is perceived to be linked to the ‘Importance of Language’ constructs used. Likewise, the proposed ELES effectiveness model emphasises the need to enhance ‘Soft-skills’ utilizing E-learning tools, hence driving the debate forward. Similarly, pedagogy is perceived to be linked to ‘Cultural Understanding Importance.’ Pedagogical constructs could be very powerful when combined with other effectiveness factors and enable to advance the agenda for better adoption of Elearning systems and engagement with learners and enhancing

learners as the contributors to ELES effectiveness. The pedagogy dimension takes center stage in the proposed ELES effectiveness model, not just one of the dimensions in the plethora of dimensions. Furthermore, in the context of learning and using E-learning tools and services, 'Transformation' for users is linked to the 'Importance of continuity of progression' beyond the classroom boundary, feeding into life-long learner agenda. These insights contribute to developing a further understanding of Design and Human dimension presented by Xu et al. (2014) and capture evolving trends for ELES Effectiveness. Further theoretical and practical contributions are given in next section.

6.5 Research Implications

The theoretical and practical implications are discussed below.

6.5.1 Implications to Theory

This study contributes from many angles and provides theoretical contributions as well as practical contributions.

The first theoretical contribution of the research is the development of a multi-dimensional, interactive model for E-learning effectiveness with the dimensions of design, networking & collaboration, pedagogy and impact dimensions as ELES effectiveness, ELES transformation, scope and scale, and the capturing of user requirements dimension. In addition, the dimension of Cognitive Lenses Multiple Interaction for the dynamic interplay of all dimensions and latent themes was presented and applied for the enhanced ELES effectiveness model. To this effect, the model has shown strong predictive relevance for ELES effectiveness, ELES transformation, scale and scope, user expectations, user perception, design, pedagogy, networking and collaboration. The model has significantly explained the variance for ELES perceived effectiveness with 63% for ELES Transformation scope and scale, 41% of Importance of awareness of design rationale, 44% of Learning context importance and requirement, 47% of Perception of collaboration enhancement, 44% of Importance of language constructs, 56% of Interaction enabler, 55% of Choice and planning facilitator. In section 5.15.12 all new and dimensions conforming to existing literature for latent constructs contributing towards ELES effectiveness are presented and examined.

The model was developed through systematic analysis using the Grounded Theory method, review of the literature and constant comparative analysis embedded in the chosen methodological approach. Prevalent E-learning models further informed the GTM analytical process. The theoretical insights were used from information systems success models, learning theories, learning design, instructional design, technology acceptance model, user intention behaviour and E-learning quality models.

The proposed new model is perceived to be relevant and provides useful insights because different contexts and perspectives have been taken into account in relation to varying aspects of usefulness, user acceptance, social factors, cultural factors, quality, satisfaction, apprehensions & anxieties and benefits

of using E-learning Environments and Services, encompassing the core components of the existing theoretical and practical approaches.

Second, in contrast to previous work, where design was more focused on technical system quality and usability aspects (Piccoli et al., 2001; Sun et al., 2008; Xu et al., 2014), this thesis shows effective design has multi-layered implications for factors such as perception of enhancement of self-direction and facilitates to become an independent learner within E-learning environment, consequently impacts ELES effectiveness. Furthermore, design is perceived to be directly related to socially driven learning enhancement and linked to meeting the organisation's requirements and wider objectives. These new aspects open up space for further research. Many studies noted Learning community and collaboration as important factors for E-learning effectiveness (Chen, 2011; Chen & Hsiang, 2007; Cidral et al., 2018; Shee & Wang, 2006; Wang, 2003). The proposed model further enriches this notion with emphasis on closer links to Pedagogy and purposeful interaction and stronger relation to the quality of exchanges in a conducive environment leveraging technology-mediated learning opportunities. Just providing networking tools is no longer enough in contemporary learning settings. A deeper understanding of the interplay of the dimensions and utilisation for specific purposes is required for learners' and users' intended transformation. Holistically, all these factors are valid, and the interplay of the factors is further elaborated with the application of CL-MIM dimension to enhance understanding at a deeper level for the identification of E-learning Environment and Services success factors, highlighting the contribution of this research study. The CL-MIM dimension provides flexibility and visibility for the practitioners, users, administrators, learners and institutions and acts as a cognitive tool.

This dimension is used during the validation process using PLS-SEM and provides a basis to test CL-MIM enhanced model empirically, shedding light on new relations contributing to a better realisation of E-learning effectiveness in a unified manner. This is the third contribution of the study.

6.5.2 Implications to Practice

The importance of E-learning effectiveness has increased manifold due to the COVID19 pandemic, and the need to develop an ever-deeper understanding of the effectiveness factors is a timely contribution.

The presented ELES Effectiveness model is intuitive and dynamic in adapting to changing users' perceptions and requirements and utilised CL-MIM dimension to this effect. The practitioners can understand the evolution of design tools and services and how these fit a particular working pattern and pedagogical construct. For example, having the option of a podcast tool or service within an E-learning environment can be useful, and tutors may feel excited about this feature and how it is embedded in the environment's interface design. However, a podcast is just another medium to communicate concepts as the tutors do in a physical setup. This model can make the practitioners aware of the pedagogical relevance of this tool and how it relates to triggers for conversations and enablers for the internal cognitive processes of learners and triggering changes to the actions of the learners and eventually

improved reflection and engagement with a better worldview. The CL-MIM dimension capture this interplay systematically and facilitates capturing increasingly deep insights intuitively to achieve learning goals and become better professionals and learners.

For example, CL-MIM can be used to understand Luarillards Conversational framework (1999) in practical settings. Consequently, the CL-MIM dimension could elaborate the Teacher Communication Cycle and its impact on learner concepts and on the Peer Communication Cycle and Peer Modelling Cycle within the Conversational framework. The chaining process proposed for CL-MIM could facilitate understanding and interplay of different Conversational framework components, hence contributing towards better adoption of the model. The same principle could be applied in other settings to leverage educational technologies and derive guidelines for e-learning technologies and services that better meet learners' and practitioners' needs or as an analytical tool to evaluate aspects of available e-learning technologies and services.

Therefore, CL-MIM dimension has substantial potential for applications in various fields such as Information Systems, Education, Marketing, Strategy, General Management, Governance, Entrepreneurship, and many more in terms of theoretical development and to develop deeper insights. The CL-MIM has the potential to further enhance the research methods itself. For example, many qualitative research methods depend on the coding of the data, which leads to the generation of conceptual themes. This dimension could enrich the gap between the coding and generation of conceptual framework and could provide insights into the relationship between various categories and themes presented. The application of CL-MIM could improve the traceability of research methods when theoretical models are proposed to be validated.

The UK universities are facing challenges, as is the trend all over the world. The tried and tested models of working are increasingly challenged, and governments, policymakers and taxpayers are asking questions about value for money and accountability for the resources utilised by the higher education institutions (Hall, 2021). The main challenge for the universities is how to remain relevant and have a sustainable business model (Adams, 2022). Learners today have many ways to gain and share knowledge, as mentioned in section 6.1 with the LinkedIn example. The universities and higher education institutions cannot afford to work in a closed eco system anymore. The changes in society and demands from the stakeholders push them outward-looking and able to adapt to changes, build partnerships, and contribute in a real sense towards social mobility (“How can higher education thrive post-pandemic?,” 2022). The effective use of online platforms will play a crucial role in fostering partnerships with international education providers, edu-tech companies, industry partners, and, most importantly, learners themselves. The universities would need to rethink their business model and how they as institutions could exploit technology to reframe interactions and experiences. The universities would need to stop thinking in transactional terms and see learners as lifelong learners and partners. For this purpose, universities will need to provide value at various stages of the learner journey. This means

profiling the learners, understanding their needs better, offering customized solutions in partnership with industry and research bodies, offering flexibility for the course credit system, creating an eco system of technologies to facilitate the learner journey and enable learners to acquire soft skills as well as technical skills attuned to contemporary challenges. The E-learning platforms will play a central role in this new eco system that most forward-looking universities will build. This study has highlighted many factors that will play a central role as the transitions to new business models are rolled out by the higher education institutions, particularly in the UK as an international education destination for students from around the world. This study presented the factors like: the importance of cultural understanding, the value of enhancing soft skills implicitly and explicitly, understanding learners' requirements, building awareness of learners for the learning approaches employed and design choices made, and the central role of pedagogies, design and networking and collaboration. These factors will play a role to build value for learners and enable institutions to have a sustained business model.

6.6 Research Limitations

The first part of the study used Blogs as the secondary data. This choice served the purpose of the longitudinal research and captured varied and in-depth perspectives presented over time. However, this data had inherent limitations; for example, secondary data was not produced for this research investigation. At times, it was difficult to access all the relevant data related to a particular case associated with a particular conversation taking place through a specific Blog. The iterations embedded in the Grounded Theory Method helped eliminate some of the limitations but were not completely removed. This study presented new theoretical constructs and provided grounding for future research to use specific cases in specific settings.

The survey gathered data from UK universities, mainly based on London campuses. The students came from multitudes of backgrounds, cultures, and countries, but the model's reliability and validity would be improved further if the model is tested across the UK universities, and further studies could be done in European, US, Asian and African contexts.

The investigation for the validation was based on the perceptions of the students. Further research in the context of primary schools, secondary schools, colleges, instructor specific, administrators specific, senior management or policymakers specific would benefit in developing and enriching this research domain for applicability of the proposed model and contribute towards addressing the issues of adoption, engagement and performance concerning E-learning environments and services.

6.7 Future Research Recommendations

The proposed model has explained 56% ELES Effectiveness; 63% ELES Transformation; 28% of Socially Driven Learning Enhancement; 17% of Active Participation Need; 41% of Importance of Awareness of Design Rationale; 37% of Continuity of progression & Contributions Importance; 11%

Perception of Privacy Importance; 36% Importance of Ease of Access and Flexibility; 23% of Importance of Social Media based Services within ELES; 44% of Learning Context Importance and Requirement; 47% of Perception of Collaboration Enhancement; 36% of Perception of Enhancement of Self-direction/Independent-Learner; 17% of Active Participation Need; 44% of Importance of Language Constructs; 26% of Learner Satisfaction; 25% Perception of Improved Learner Experience; 56% of Interaction Enabler; 55% of Choice and Planning Facilitator; 11% of Cultural Understanding Importance ; 17% of Diversity Importance; 24% of Instructor's Pedagogical Efficacy Need Perception and 35% of Perception of Emotional Intelligence Enhancing Engagement for the ELES Effectiveness factors. The proposed model has opened up many investigation vectors. There is a need for further research to explain the remaining variance not examined by the model; for example, 56% of the variance for Importance of Language Constructs is yet to be explored and examined. There is still room to investigate this quality factor for ELES Effectiveness.

The ELES Effectiveness model and CL-MIM dimension proposed in this study provide the researchers' themes and a tool for further research.

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Appendix A: Publications of the candidate

This thesis gives an account of the research undertaken by Anwar ul Haq. Aspects of research from Chapter 4, in particular, were published in:

[J1] Haq, A. U; Magoulas, G. ; Jamal, A ; Majeed, A. (2018), Users Perceptions of E-Learning Environments and Services Effectiveness: The Emergence of the Concept Functionality Model , Journal of Enterprise and Information Management Emerald, London, UK

Appendix B: ELES Effectiveness Model, Cross Loadings, Discriminant Validity and Indicator Item Reliability

Harman's single factor test Result

Table B.1

Harman's Test

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	30.611	37.791	37.791	30.611	37.791	37.791
2	3.752	4.632	42.424			
3	2.557	3.157	45.581			
4	2.251	2.78	48.36			
5	2.185	2.698	51.058			
6	1.913	2.362	53.42			
7	1.842	2.274	55.694			
8	1.73	2.136	57.83			
9	1.583	1.954	59.784			
10	1.478	1.824	61.608			
11	1.449	1.789	63.397			
12	1.389	1.715	65.112			

13	1.239	1.53	66.642
14	1.154	1.424	68.066
15	1.086	1.341	69.407
16	1.058	1.306	70.713
17	0.973	1.202	71.915
18	0.952	1.176	73.09
19	0.942	1.163	74.253
20	0.901	1.112	75.365
21	0.861	1.063	76.427
22	0.841	1.039	77.466
23	0.827	1.021	78.487
24	0.767	0.947	79.435
25	0.747	0.923	80.357
26	0.718	0.886	81.243
27	0.706	0.871	82.115
28	0.68	0.84	82.954
29	0.62	0.766	83.72
30	0.603	0.745	84.465
31	0.598	0.738	85.203
32	0.57	0.704	85.906
33	0.559	0.69	86.596

34	0.531	0.655	87.251
35	0.495	0.611	87.862
36	0.462	0.57	88.432
37	0.446	0.551	88.984
38	0.438	0.54	89.524
39	0.424	0.523	90.047
40	0.418	0.516	90.563
41	0.39	0.481	91.044
42	0.382	0.471	91.515
43	0.372	0.459	91.974
44	0.353	0.436	92.41
45	0.338	0.417	92.827
46	0.324	0.4	93.227
47	0.315	0.389	93.615
48	0.295	0.364	93.979
49	0.29	0.358	94.337
50	0.28	0.345	94.683
51	0.277	0.342	95.025
52	0.256	0.316	95.34
53	0.251	0.31	95.651
54	0.243	0.3	95.951
55	0.237	0.292	96.243
56	0.225	0.278	96.521
57	0.22	0.272	96.793
58	0.211	0.261	97.054

59	0.204	0.251	97.305
60	0.189	0.234	97.538
61	0.184	0.227	97.765
62	0.173	0.213	97.978
63	0.155	0.191	98.17
64	0.151	0.186	98.356
65	0.147	0.182	98.538
66	0.13	0.16	98.698
67	0.128	0.158	98.856
68	0.117	0.144	99
69	0.113	0.139	99.139
70	0.104	0.129	99.268
71	0.1	0.124	99.392
72	0.098	0.121	99.512
73	0.086	0.106	99.618
74	0.079	0.097	99.716
75	0.068	0.084	99.799
76	0.059	0.073	99.872
77	0.035	0.044	99.916
78	0.024	0.03	99.946
79	0.018	0.023	99.969

80	0.014	0.017	99.986
81	0.011	0.014	100

Extraction Method: Principal Component Analysis.

Table B.2

Component Matrix[a]

	Component 1
UCPR_1	0.515
UCPR_2	0.529
UCPR_3	0.619
UCPR_4	0.325
UCPR_5	0.557
UCPR_6	0.472
UCPR_7	0.468
EFFEC_1	0.657
EFFEC_2	0.608
EFFEC_3	0.501
EFFEC_4	0.555
EFFEC_5	0.642
EFFEC_6	0.586
TRANSS_1	0.624
TRANSS_2	0.544

TRANSS_3	0.707
TRANSS_4	0.582
TRANSS_5	0.674
TRANSS_6	0.588
TRANSS_7	0.618
TRANSS_8	0.592
TRANSS_9	0.546
TRANSS_10	0.67
TRANSS_11	0.621
DGNTS_1	0.742
DGNTS_2	0.659
DGNTS_3	0.501
DGNTS_4	0.632
DGNTS_5	0.574
DGNTS_7	0.586
DGNTS_8	0.643
DGNTS_6	0.729
DGNTS_9	0.578
DGNTS_10	0.72
DGNTS11	0.596
DGNTS12	0.582
NETCC_1	0.716

NETCC_2	0.703
NETCC_3	0.673
NETCC_4	0.707
NETCC_5	0.705
NETCC_6	0.222
NETCC_7	0.468
NETCC_8	0.678
NETCC_9	0.559
NETCC_10	0.625
NETCC_11	0.635
PEDG_1	0.635
PEDG_2	0.621
PEDG_3	0.612
PEDG_4	0.677
PEDG_5	0.6
PEDG_6	0.671
PEDG_7	0.684
PEDG_8	0.645
PEDG_9	0.626
PEDG_10	0.573
CNCTL_1	0.496
CNCTL_2	0.631
CNCTL_3	0.588
CNCTL_4	0.632
CNCTL_5	0.571
CNCTL_6	0.691

CNCTL_7	0.598
CNCTL_8	0.629
CNCTL_9	0.679
CNCTL_10	0.68
CNCTL_11	0.722
CNCTL_12	0.618
CNCTL_13	0.678
CNCTL_14	0.665
CNCTL_15	0.669
CNCTL_16	0.636
CNCTL_17	0.67
CNCTL_18	0.758
CNCTL_19	0.619
CNCTL_20	0.595
CNCTL_21	0.496
CNCTL_22	0.561
CNCTL_23	0.533
CNCTL_24	0.511

Extraction Method: Principal Component Analysis.[a]

a. 1 components extracted.

Indicator Items Cross Loadings for ELE Effectiveness Model presented in Table B.3.

Table B.3

Cross Loadings for ELE Effectiveness Base Model

	Design	ELES Effectiveness	ELES Transformation, Scale and Scope	Networking and Collaboration	Pedagogy	User Expectations	User Perception	User Requirements
CNCTL_12	0.485	0.525	0.709	0.476	0.470	0.765	0.702	0.411
CNCTL_12	0.485	0.525	0.709	0.476	0.470	0.765	0.702	0.411
CNCTL_13	0.522	0.702	0.621	0.511	0.611	0.792	0.740	0.464
CNCTL_13	0.522	0.702	0.621	0.511	0.611	0.792	0.740	0.464
CNCTL_14	0.531	0.657	0.670	0.533	0.526	0.823	0.760	0.416
CNCTL_14	0.531	0.657	0.670	0.533	0.526	0.823	0.760	0.416
CNCTL_15	0.552	0.827	0.594	0.546	0.585	0.702	0.649	0.389
CNCTL_16	0.564	0.818	0.518	0.554	0.601	0.631	0.565	0.394
CNCTL_17	0.598	0.619	0.591	0.533	0.536	0.724	0.570	0.528
CNCTL_19	0.470	0.492	0.558	0.400	0.484	0.617	0.722	0.480
CNCTL_2	0.553	0.742	0.560	0.539	0.579	0.520	0.470	0.459
CNCTL_6	0.577	0.647	0.802	0.549	0.556	0.670	0.606	0.469
CNCTL_9	0.548	0.731	0.619	0.519	0.555	0.770	0.653	0.498
CNCTL_9	0.548	0.731	0.619	0.519	0.555	0.770	0.653	0.498

DGNTS_10	0.794	0.513	0.628	0.556	0.627	0.574	0.612	0.492
DGNTS_2	0.733	0.537	0.539	0.699	0.631	0.476	0.468	0.427
DGNTS_6	0.799	0.639	0.617	0.614	0.557	0.618	0.598	0.453
DGNTS_8	0.800	0.530	0.572	0.533	0.576	0.510	0.474	0.450
DGNTS_9	0.722	0.509	0.475	0.433	0.459	0.483	0.434	0.327
EFFEC_1	0.517	0.445	0.543	0.609	0.491	0.480	0.747	0.545
EFFEC_2	0.440	0.422	0.507	0.536	0.403	0.492	0.695	0.474
NETCC_1	0.615	0.568	0.613	0.813	0.589	0.536	0.591	0.484
NETCC_10	0.497	0.475	0.465	0.716	0.485	0.487	0.549	0.437
NETCC_2	0.596	0.592	0.518	0.809	0.566	0.532	0.566	0.541
NETCC_3	0.591	0.560	0.534	0.852	0.572	0.536	0.557	0.403
NETCC_4	0.630	0.607	0.542	0.850	0.580	0.557	0.556	0.447
NETCC_5	0.595	0.535	0.625	0.787	0.602	0.563	0.578	0.436
NETCC_8	0.610	0.537	0.557	0.778	0.611	0.519	0.572	0.398
PEDG_2	0.506	0.562	0.504	0.553	0.760	0.523	0.518	0.465
PEDG_3	0.536	0.547	0.476	0.548	0.767	0.475	0.510	0.330
PEDG_4	0.636	0.545	0.626	0.532	0.788	0.559	0.572	0.386
PEDG_5	0.549	0.540	0.544	0.452	0.728	0.575	0.508	0.354
PEDG_6	0.603	0.588	0.510	0.629	0.809	0.519	0.517	0.343
PEDG_8	0.564	0.626	0.521	0.567	0.731	0.549	0.536	0.357
TRANSS_11	0.545	0.504	0.757	0.499	0.490	0.528	0.519	0.392
TRANSS_3	0.617	0.535	0.752	0.553	0.576	0.553	0.587	0.600
UCPR_1	0.439	0.398	0.462	0.370	0.378	0.404	0.440	0.781

UCPR_2	0.429	0.372	0.449	0.426	0.342	0.430	0.488	0.748
UCPR_3	0.487	0.538	0.544	0.525	0.445	0.562	0.553	0.818
UCPR_5	0.416	0.429	0.511	0.437	0.368	0.483	0.555	0.810

Discriminant Validity (Fornell and Larcker Criterion)

Table B.4

Discriminant Validity (Fornell and Larcker Criterion)

	Design	ELES Effectiveness	ELES Transformation, Scale and Scope	Networking and Collaboration	Pedagogy	User Expectations	User Perception	User Requirements
Design	0.770							
ELES Effectiveness	0.711	0.781						
ELES Transformation, Scale and Scope	0.740	0.733	0.756					
Networking and Collaboration	0.738	0.692	0.690	0.802				

Pedagogy	0.742	0.744	0.696	0.715	0.764			
User Expectations	0.696	0.839	0.826	0.666	0.700	0.776		
User Perception	0.679	0.748	0.794	0.708	0.690	0.882	0.733	
User Requirements	0.562	0.556	0.626	0.562	0.489	0.601	0.647	0.790

*The diagonals are the square root of AVE of latent variables and highest in any row or column

Items remove: Indicator items are below 0.5:- UCPR_4, UCPR_6, UCPR_7, EFFEC_3, EFFEC_4, EFFEC_5, EFFEC_6, TRANSS_1, TRANSS_2, TRANSS_3, TRANSS_4, TRANSS_5, TRANSS_6, TRANSS_7, TRANSS_8, TRANSS_9, TRANSS_10, DGNTS_1, DGNTS_3, DGNTS_4, DGNTS_5, DGNTS_7, DGNTS_11, DGNTS_12, NETCC_6, NETCC_7, NETCC_9, NETCC_11, PEDG_1, PEDG_7, PEDG_9, PEDG_10, CNCTL_1,

Normality Tests presented in Table B.5.

Sample size: 202

Number of Variables: 8

Table B.5

ELES Skewness and Kurtosis

Constructs	Skewness	Kurtosis

Design	-0.789	2.260
ELES Effectiveness	-0.808	2.042
ELES Transformation Scale and Scope	-0.840	2.201
Networking and Collaboration	-0.434	0.835
Pedagogy	-0.747	2.311
User Expectations	-1.117	3.554
User Perception	-1.141	3.671
User Requirements	-0.830	1.548

Latent Variables Standardised Scores presented in Table B.6.

Table B.6

ELES Latent Variables Standardised Scores

Design	ELES Effectiveness	ELES Transformation, Scale and Scope	Networking and Collaboration	Pedagogy	User Expectations	User Perception	User Requirements
-0.197	0.498	0.665	0.768	-0.167	0.295	0.683	0.493
-0.491	-0.196	0.665	0.414	-1.633	-0.272	-0.238	1.539
0.397	-0.866	-0.108	0.573	-0.635	-0.272	0.358	0.883
0.145	-0.194	0.309	0.381	0.309	0.295	0.367	-0.529
-0.494	-0.934	-0.483	-0.582	-0.723	-1.221	-1.191	-0.215
0.059	0.498	0.309	0.381	-0.165	-0.317	0.024	0.493
-0.702	-0.55	-1.536	-0.544	-1.457	-0.883	-0.595	-2.806
0.145	0.498	-0.108	0.38	0.316	0.295	0.367	0.175
0.145	-0.552	-0.479	-0.602	0.062	-0.272	0.358	-0.846
-0.157	0.142	0.313	0.394	0.579	0.871	1.027	0.489

-0.163	0.824	01.1	0.56	0.802	1.473	0.697	0.493
-0.157	0.892	0.669	0.38	0.555	1.21	0.43	1.221
0.145	-0.205	-0.052	0.381	-0.962	-0.281	-0.572	-0.867
0.649	0.498	0.309	0.766	0.555	0.295	0.367	0.155
0.79	1.218	01.1	-1.702	-0.378	1.811	0.756	0.587
0.483	0.074	-1.266	0.187	-1.263	-0.679	0.367	0.175
0.397	0.498	0.309	0.185	0.555	-0.023	0.338	-1.16
0.06	0.498	-0.479	-0.217	0.063	-0.306	-0.532	-0.477
0.14	-0.194	0.309	-0.773	0.307	0.011	0.064	0.806
0.14	0.151	0.309	0.204	0.326	0.011	0.064	0.175
-1.65	-0.531	-0.525	-0.581	-1.732	-0.023	-0.516	-0.138
-2.576	-3.443	-3.18	-2.716	-2.478	-4.254	-3.992	-3.586
-1.083	0.142	-0.108	0.016	-0.225	-0.023	0.367	0.175
1.884	1.931	1.873	1.919	2.071	1.811	1.926	1.514
-1.009	-0.541	0.309	0.765	0.098	-0.59	-0.238	0.155
0.397	0.498	1.081	0.782	0.555	0.295	0.993	1.221
-0.535	-0.587	-0.483	0.191	0.309	-1.221	-0.882	-0.602
0.06	-0.184	-0.839	-0.178	0.307	-0.883	-1.787	-1.599
-0.455	-0.215	0.309	-0.006	0.064	0.295	0.058	-0.159
-4.062	-2.618	-2.872	-2.925	-3.487	-1.463	-2.502	-2.952
-0.123	1.537	0.328	0.812	0.771	1.473	0.704	0.883
-1.787	-2.677	0.237	0.191	-0.7	-0.964	0.078	-2.227
0.987	1.19	1.873	1.342	1.572	1.155	1.329	0.151
0.993	0.498	0.725	0.573	0.555	0.295	0.367	0.493
1.884	1.931	1.873	1.919	1.825	1.811	1.926	1.852
-1.089	0.093	-1.256	-0.773	-0.962	-1.221	-0.904	-1.571
0.397	0.498	0.309	0.573	0.555	0.295	0.367	0.175
-1.089	0.498	-0.464	-0.773	0.555	0.295	0.367	0.493
-1.392	-0.529	0.725	-0.199	-0.397	0.011	-0.252	-0.138
0.619	-0.184	-0.123	-0.39	-0.403	-0.272	-1.144	-0.236

-0.751	-0.934	-0.539	-0.177	-0.723	-0.929	-0.555	0.493
0.649	0.498	0.309	0.971	0.555	0.295	0.654	0.883
0.145	-0.934	-0.824	-0.977	-0.977	-1.221	-1.191	-0.867
-0.797	0.046	0.177	-0.796	-0.488	-1.314	-0.559	-2.248
-0.701	-1.579	-1.672	-0.794	-1.733	-0.554	-0.238	-0.55
1.324	-0.897	0.669	1.144	-0.989	0.009	0.078	0.102
-0.157	0.498	-0.464	0.38	0.307	0.295	0.367	-0.867
-1.038	-1.223	-0.843	-2.119	-0.405	-1.743	-2.117	-1.254
-0.494	-0.571	-0.479	-1.177	-0.24	0.295	-0.229	-0.843
-0.277	-0.934	-0.9	-1.543	-0.962	-0.903	-1.162	-1.596
0.397	-0.205	-0.052	0.189	-0.192	-0.599	-0.888	-0.867
0.059	-0.541	0.309	-0.004	-0.903	0.011	0.064	0.175
-1.649	-0.934	-1.256	-0.58	-0.962	-0.903	-0.875	0.493
0.483	0.855	0.669	1.326	0.802	0.861	1.266	1.539
1.329	0.179	1.025	1.919	0.098	1.494	1.013	0.493
0.397	0.498	0.309	0.573	0.555	0.295	0.367	0.179
0.096	-0.194	-0.058	0.782	0.79	0.543	0.67	0.81
0.906	0.855	0.65	1.376	0.776	0.011	-0.252	-0.163
-0.667	-1.223	-0.479	-0.791	-1.651	-0.624	0.064	-0.211
0.397	0.498	0.309	0.573	0.555	0.295	0.367	0.907
-1.044	0.21	0.744	-0.425	-0.708	0.598	0.087	0.493
1.289	0.845	1.085	0.958	0.783	0.577	0.963	0.182
1.884	1.931	1.081	0.401	2.071	1.53	0.424	1.852
0.397	0.142	-0.047	0.573	0.309	0.295	0.051	0.493
-0.163	0.498	0.365	0.171	0.023	-0.588	0.351	0.175
1.884	1.574	1.873	1.919	2.071	1.811	1.926	1.852
1.072	0.498	0.309	0.222	0.301	0.011	0.064	0.155
0.397	0.151	0.309	0.38	0.555	0.295	0.367	0.493
0.397	-1.689	-0.941	-1.112	-0.924	-1.572	-2.419	-3.586
-0.752	-0.184	-0.483	-0.001	0.078	-0.247	-0.279	0.175

0.397	-1.579	-1.275	-0.967	0.555	-1.482	-1.507	-1.934
-0.409	0.498	-0.403	-0.2	0.555	0.306	-0.498	0.493
0.1	0.189	0.248	-0.17	-0.101	0.055	-0.279	-0.867
0.397	0.498	1.085	0.573	0.555	0.577	0.683	0.806
0.145	-0.897	-0.123	-0.372	0.309	-0.306	0.064	-0.215
-0.167	-0.934	-1.256	-0.773	0.628	-1.221	-0.559	-0.867
0.729	-0.866	1.517	0.624	-0.654	0.554	0.997	1.148
0.095	0.902	0.313	0.347	0.079	0.632	0.667	0.489
0.7	0.498	0.309	1.919	1.589	0.295	0.367	-0.211
0.397	0.498	0.665	0.94	0.555	0.295	0.683	1.514
0.397	0.498	0.74	0.551	0.062	0.295	-0.604	-0.798
0.734	0.498	0.725	-0.004	0.555	0.295	0.367	-0.236
1.209	0.151	0.665	0.943	0.023	-0.023	0.367	0.493
0.476	0.834	1.513	0.013	0.547	0.579	0.384	0.175
0.397	0.498	0.309	0.573	0.555	0.295	0.367	0.493
0.305	0.498	1.085	1.531	0.541	1.473	1.609	1.462
-0.276	-1.591	-0.123	-0.375	-0.65	0.035	0.037	0.879
-0.277	0.498	0.669	0.364	0.848	0.871	1.307	1.535
-0.242	-0.252	0.009	0.016	-0.962	-0.609	0.661	1.535
0.129	0.498	-1.622	-1.343	0.555	0.295	0.367	-0.184
-0.529	-1.663	-0.824	-1.347	0.073	-2.161	-1.184	-1.257
0.397	0.142	-0.047	0.573	-0.484	-0.272	-0.238	0.155
-0.752	-0.934	-0.479	0.207	-0.167	-0.35	0.121	0.175
-0.242	-0.876	-0.971	-0.234	-0.397	-0.624	-0.252	-0.163
-1.713	-0.909	0.309	-0.925	0.332	0.295	-0.252	0.175
-0.197	0.498	-0.464	-0.406	-0.225	0.295	0.058	0.155
1.884	1.931	1.517	1.919	2.071	1.811	1.926	0.099
0.734	0.834	0.252	1.534	0.62	0.577	0.367	-0.309
0.397	0.498	0.309	0.38	0.079	-0.283	-0.279	-0.138
0.397	-0.205	-0.967	-0.949	0.079	0.554	0.43	-0.867

-1.089	-0.934	-1.256	-0.773	-0.733	-1.221	-1.191	-0.867
-2.141	-0.32	-2.114	-1.529	-2.708	-0.064	-1.451	-2.488
0.397	0.498	-0.047	0.573	0.555	0.623	0.414	0.175
-0.535	0.489	-0.829	-0.581	0.547	-0.813	-0.898	0.102
-0.157	0.557	-0.052	-0.194	-0.43	0.068	0.381	-0.142
-0.243	0.105	0.309	0.398	0.307	-0.656	-0.285	-0.138
0.649	-0.205	0.248	0.364	-0.716	0.011	0.064	0.493
-0.449	0.142	-0.047	0.381	0.081	-0.023	-0.545	-0.452
0.145	0.142	-0.052	-0.409	0.818	-0.599	-0.292	-0.846
-0.751	-0.934	-1.668	-0.406	-0.708	-0.361	-0.545	-0.477
-0.5	0.461	0.233	0.583	0.557	-0.043	-0.229	0.493
1.884	1.931	1.873	-0.014	-0.744	1.517	-0.265	1.852
1.632	1.931	1.096	0.172	0.815	1.246	0.717	1.197
-0.157	0.163	0.309	-0.002	0.309	0.001	-0.285	0.493
0.397	-0.205	0.684	0.012	0.555	0.611	0.381	-0.867
1.279	1.537	0.294	1.152	1.325	0.907	1.027	1.2
-0.752	-0.956	-0.464	-0.598	-1.208	-0.929	-0.864	-0.529
-0.157	-0.897	0.669	-0.794	-0.96	0.905	0.724	-0.163
-0.163	0.151	0.309	0.013	-0.716	-0.306	-0.848	0.155
0.649	-0.208	1.441	0.38	0.883	1.155	1.013	0.179
1.884	0.824	1.441	1.727	2.071	1.473	1.926	1.852
0.649	0.142	-0.108	1.744	-0.438	-0.023	1.28	-0.77
-1.227	-0.159	-0.952	-2.119	-0.677	-0.038	-0.222	-1.237
0.095	0.498	0.309	0.187	0.081	0.59	1.027	0.493
1.209	-0.126	-0.052	0.573	0.302	1.248	0.417	0.179
-0.106	-0.541	0.593	0.005	0.864	0.282	0.024	0.127
0.397	0.498	0.309	1.164	0.555	0.295	0.367	0.493
-0.449	-0.934	-1.312	-0.773	-0.886	-1.257	-0.875	-1.257
1.884	1.218	1.873	1.919	0.815	1.811	1.926	1.124
0.06	0.498	0.309	0.573	0.555	0.295	0.367	0.175

0.397	0.151	-0.123	1.518	-0.495	0.011	0.351	-0.211
0.397	0.498	0.309	0.573	0.555	0.295	0.367	0.175
0.397	0.855	0.309	0.172	0.301	0.295	0.367	0.155
0.397	0.151	-0.9	0.38	0.307	0.013	-0.229	-0.794
-1.089	-0.934	-1.256	-0.773	-0.962	-1.221	-0.595	0.155
0.397	0.151	-0.108	0.573	0.301	0.295	0.654	0.493
-1.169	0.468	-0.108	-0.947	0.251	0.59	0.71	-0.77
1.884	1.931	1.096	1.726	1.595	1.246	1.004	0.569
1.245	-1.27	1.157	-0.356	0.643	-0.02	0.024	0.493
0.82	1.574	1.441	0.989	0.62	1.21	0.71	0.269
0.059	1.574	-0.047	0.748	1.053	1.212	1.329	-0.473
0.174	0.498	0.237	-0.043	-0.15	0.871	0.401	-0.239
-1.557	-1.579	-1.555	-1.702	-1.422	-2.06	-1.83	-1.261
1.368	0.892	1.1	1.729	1.31	0.926	0.694	1.145
0.397	0.142	0.309	0.381	-0.231	0.613	0.367	0.179
-0.449	-0.243	-0.479	-1	-0.896	-0.361	0.058	-0.236
-0.831	-0.135	0.665	-0.947	-0.18	0.305	-0.269	0.545
-1.227	-1.164	-2.403	-0.997	-1.228	-1.699	-1.577	0.493
-0.163	-0.205	0.309	0.573	0.555	-0.023	0.397	0.179
-0.163	0.151	0.309	-0.369	0.555	0.295	-0.229	-0.477
0.095	-0.541	-0.104	0.191	-0.41	-0.308	-0.835	0.231
0.476	0.477	-0.46	0.173	0.547	0.577	0.683	0.907
-0.797	-0.205	-0.483	0.187	-1.448	-0.304	-0.252	-0.211
0.573	-3.443	-0.91	-1.944	-1.387	-2.455	-1.88	0.493
-0.415	0.163	-0.483	0.204	-0.175	-0.27	-0.532	0.179
0.14	0.142	-0.047	-0.406	-0.47	0.613	0.058	1.514
-4.062	-3.443	-3.612	-3.257	-3.994	-4.254	-4.308	-2.959
-1.089	-0.934	-1.256	-0.038	-0.43	-1.221	-0.308	1.221
-1.341	-1.244	-0.525	-1.927	-1.137	-0.023	-0.561	-0.456
-3.245	-3.8	-4.384	-3.465	-3.994	-4.254	-4.308	-0.344

-0.444	0.142	-0.956	-1.169	-0.937	-0.023	-0.825	-1.55
1.072	0.142	1.441	0.573	0.572	0.861	1.583	0.883
-0.163	0.142	0.309	-0.021	-0.175	0.001	0.024	0.493
-0.628	-0.151	-0.535	-0.349	0.45	-0.59	-0.655	0.562
0.397	-0.599	-0.9	-0.386	-0.658	-0.643	0.051	0.493
0.059	0.498	-0.052	-0.598	0.079	-0.849	-1.207	0.155
0.397	0.498	0.309	0.009	0.555	0.295	0.367	0.155
-0.501	-0.194	-1.185	-0.759	0.054	-0.563	-0.285	-0.553
-0.197	0.142	0.294	-0.773	0.555	0.295	0.963	0.831
0.992	1.19	1.081	1.537	1.578	0.897	0.957	1.539
0.397	0.498	-0.108	0.573	0.555	0.295	0.367	-0.215
-1.168	-0.934	-0.895	-0.602	-1.184	-0.939	-0.618	-0.529
-0.788	-0.609	-1.256	-0.388	-0.683	-0.643	-0.838	-0.867
0.397	0.498	0.309	0.573	0.555	0.295	0.367	0.493
-0.112	0.142	0.313	-0.773	0.326	0.259	-0.229	-0.55
1.884	1.931	1.517	1.919	2.071	1.811	1.616	0.831
1.036	1.239	0.248	0.782	0.555	0.928	0.71	0.175
1.884	1.574	1.081	1.919	2.071	0.634	0.683	1.218
0.734	0.163	-0.052	0.766	0.324	-0.565	-0.279	-0.163
-1.089	-0.934	-1.256	-0.773	-0.962	-1.221	-1.191	0.151
0.573	1.249	1.513	-1.14	-0.857	0.61	1.623	1.852
-0.409	0.151	-0.525	0.573	0.555	-0.023	0.367	-1.233
1.329	0.142	0.313	-0.001	0.079	0.577	0.683	0.59
-1.347	-0.252	0.74	-1.155	-1.188	-0.35	-0.505	-0.138
0.106	-0.946	-0.347	-0.777	1.332	-0.961	-0.825	-0.501
0.403	-0.972	-0.123	-0.564	0.079	-0.666	-0.532	0.179
-1.598	-1.638	-1.312	-1.927	-1.207	-1.541	-0.575	-0.191
-0.157	-0.205	-0.615	-0.39	0.316	-0.34	-0.252	-0.818
-0.494	-0.205	-0.479	-0.773	-0.413	-0.306	-0.532	-0.867
0.735	1.227	1.04	-0.166	1.595	0.926	-0.189	-1.502

0.573	1.237	1.873	-1.14	-0.857	1.494	1.926	1.072
1.072	1.227	0.669	0.748	1.096	1.233	0.367	0.493
-1.341	-0.934	-1.968	-0.773	-0.962	-1.221	-1.787	-1.056
-2.232	-0.934	0.177	-1.945	-0.47	0.499	1.307	-1.986
0.397	0.142	-0.108	0.38	0.555	0.295	-0.229	-0.215
0.649	0.902	1.517	1.164	1.514	0.892	0.401	1.535
-0.112	0.498	-0.525	-0.582	0.555	0.295	0.654	-0.211
1.884	1.931	1.873	1.919	2.071	1.811	1.926	1.852
0.784	0.508	1.025	-0.194	0.324	1.155	0.424	0.493
-1.089	-0.934	-1.256	0.573	-0.962	-1.221	-0.595	-0.138
-1.981	-1.319	-0.885	-1.156	-1.635	-1.549	-2.373	-2.077
-0.192	-0.194	-0.123	-0.773	-0.658	0.011	-0.532	0.493

Model

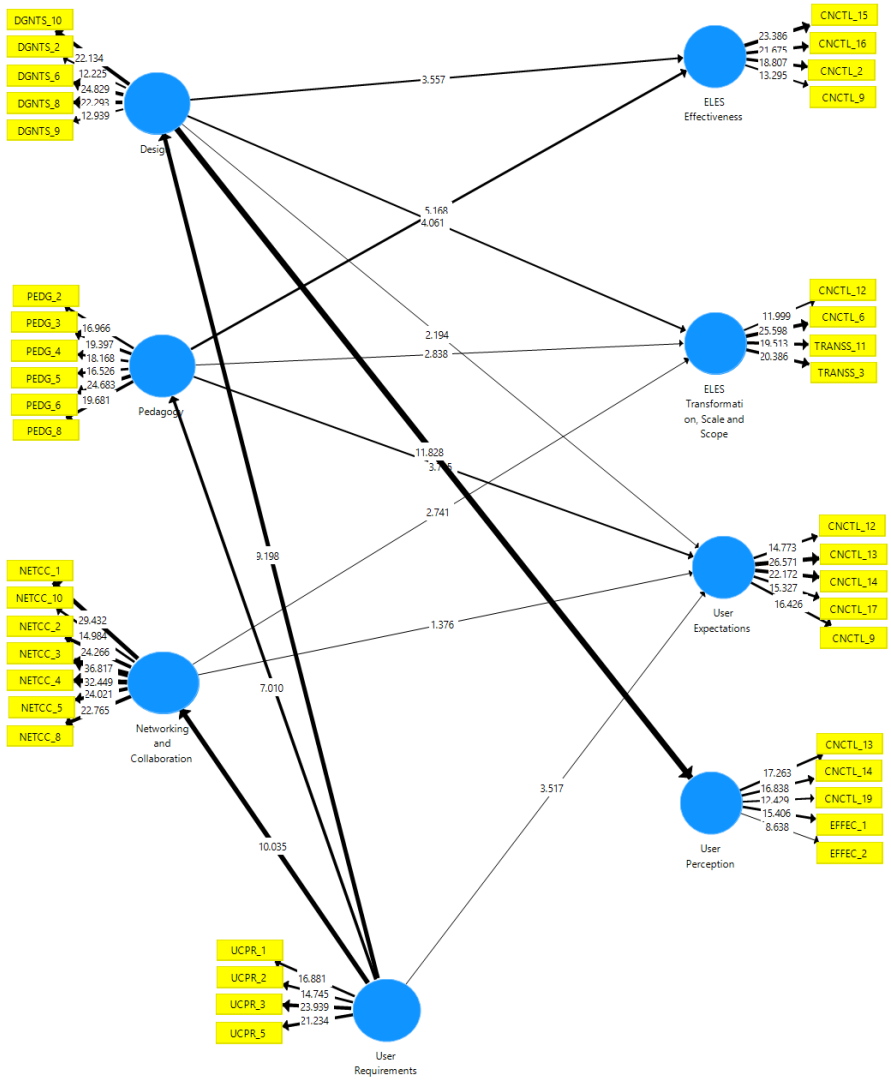

Figure B.1

ELES Effectiveness Structural Model with Significant Paths (t-values depicted on paths)

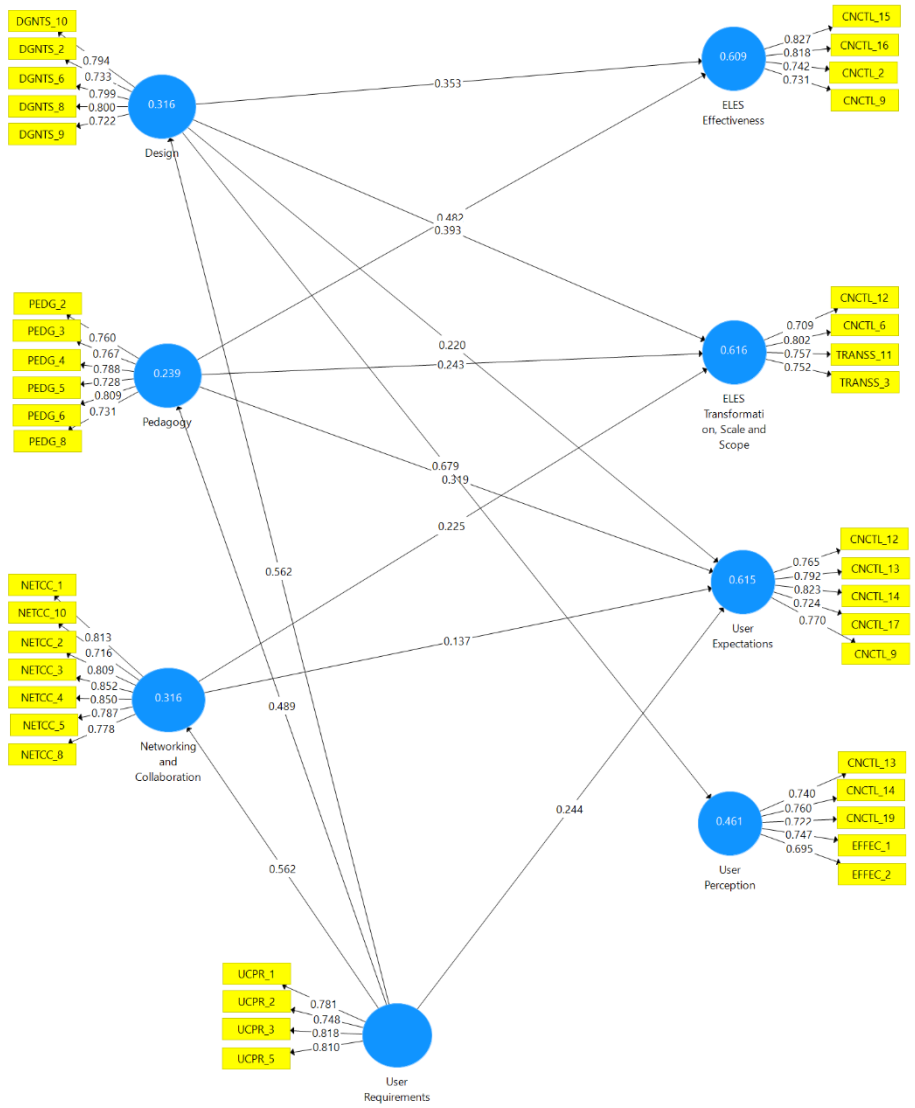

Figure B.2

ELES Effectiveness Structural Model with R^2 values

Appendix C: ELES CL-MIM Effectiveness Model, Cross Loadings, Discriminant Validity and Indicator Item Reliability

Indicator Items Cross Loadings for CL-MIM enabled ELE Effectiveness Model presented in Figure C.1 to Figure C.3

	Active Participation Need	Choice and Planning Facilitator	Continuity of progression & Contributions Importance	Cultural Understanding Importance	Design	Diversity Importance	ELES Effectiveness	Importance of Awareness for Design Rationale	Importance of Ease of Access and Flexibility	Importance of Language Constructs	Importance of Social Media based Services within ELES	Instructor Pedagogical Efficacy Need Perception	Interaction Enabler	Learner Satisfaction	Learning Context Importance and Requirement	Networking & Collaboration	Pedagogy	Perception of Collaboration Enhancement	Perception of Emotional Intlelligence Enhancing Engagement	Perception of Enhancement of Self-driection/Independent-Learne	Perception of Improved Learner Experience	Perception of Organisational Capability Development	Perception of Privacy Importance	Socially Driven Learning Enhancement	Transformation, Scope and Scale
CNCTL_10	0.255	**0.784**	0.399	0.332	0.586	0.321	0.538	0.617	0.396	0.424	0.241	0.467	0.530	0.382	0.587	0.550	0.600	0.595	0.389	0.395	0.392	0.455	0.179	0.518	0.573
CNCTL_11	0.435	**0.805**	0.465	0.398	0.662	0.352	0.680	0.454	0.476	0.432	0.412	0.428	0.487	0.477	0.552	0.556	0.601	0.584	0.336	0.571	0.376	0.606	0.142	0.575	0.633
CNCTL_12	0.383	0.535	0.409	0.353	0.546	0.344	0.542	0.423	0.338	0.412	0.393	0.385	0.393	0.269	0.542	0.499	0.515	0.482	0.325	0.630	0.371	**0.868**	0.071	0.502	0.508
CNCTL_14	0.291	0.549	0.463	0.342	0.585	0.364	0.616	0.510	0.394	0.442	0.293	0.462	0.439	0.331	0.602	0.553	0.576	0.502	0.311	**0.886**	0.412	0.632	0.073	0.555	0.525
CNCTL_15	0.290	0.622	0.471	0.330	0.543	0.247	**0.711**	0.595	0.294	0.355	0.273	0.442	0.453	0.412	0.557	0.549	0.625	0.502	0.283	0.594	0.388	0.513	0.207	0.580	0.517
CNCTL_16	0.340	0.547	0.560	0.294	0.518	0.279	0.610	0.513	0.282	0.379	0.228	0.296	0.525	0.331	0.417	0.544	0.585	0.526	0.292	0.487	0.421	0.361	0.298	**0.715**	0.473
CNCTL_17	0.359	0.556	**1.000**	0.373	0.592	0.404	0.593	0.456	0.347	0.374	0.310	0.414	0.482	0.372	0.557	0.527	0.589	0.565	0.441	0.481	0.510	0.450	0.179	0.577	0.532
CNCTL_18	0.336	**0.830**	0.479	0.412	0.675	0.345	0.657	0.547	0.427	0.450	0.374	0.475	0.578	0.413	0.544	0.613	0.645	0.594	0.387	0.574	0.439	0.591	0.061	0.656	0.626
CNCTL_19	0.246	0.594	0.387	0.404	0.550	0.346	0.527	0.377	0.516	0.378	0.377	0.491	0.350	0.297	0.605	0.427	0.504	0.432	0.411	0.511	0.396	**0.894**	0.074	0.497	0.549
CNCTL_22	0.141	0.528	0.304	0.301	0.514	0.193	0.554	0.402	0.404	**0.873**	0.304	0.330	0.461	0.207	0.325	0.372	0.488	0.528	0.223	0.368	0.270	0.387	0.058	0.516	0.446
CNCTL_23	0.134	0.486	0.368	0.347	0.392	0.284	**0.627**	0.398	0.258	0.515	0.276	0.403	0.489	0.330	0.463	0.368	0.446	0.488	0.319	0.396	0.409	0.434	0.117	0.502	0.376
CNCTL_24	0.125	0.424	0.333	0.286	0.433	0.280	0.472	0.356	0.286	**0.820**	0.167	0.363	0.352	0.261	0.545	0.322	0.462	0.419	0.343	0.333	0.354	0.371	0.204	0.437	0.424
CNCTL_5	0.257	0.499	0.400	0.282	0.475	0.311	0.479	**0.774**	0.170	0.303	0.189	0.293	0.512	0.274	0.417	0.566	0.560	0.508	0.241	0.337	0.325	0.290	0.251	0.401	0.351
CNCTL_6	0.286	0.588	0.523	0.416	0.586	0.431	0.570	0.624	0.403	0.459	0.311	0.467	0.538	0.372	0.624	0.546	0.597	**0.734**	0.345	0.502	0.451	0.476	0.135	0.577	0.537
CNCTL_7	0.174	0.491	0.293	0.258	0.558	0.208	0.442	**0.863**	0.402	0.383	0.187	0.335	0.453	0.219	0.448	0.508	0.596	0.497	0.363	0.411	0.253	0.317	0.219	0.424	0.436
CNCTL_8	0.180	0.569	0.431	0.265	0.538	0.303	0.492	**0.807**	0.349	0.407	0.266	0.530	0.465	0.304	0.706	0.500	0.544	0.550	0.372	0.518	0.373	0.494	0.164	0.493	0.447
CNCTL_9	0.207	0.639	0.465	0.419	0.583	0.369	0.519	0.592	0.435	0.492	0.275	0.520	0.478	0.304	**0.869**	0.521	0.590	0.599	0.403	0.504	0.448	0.570	0.180	0.516	0.543
DGNTS12	0.223	0.479	0.315	0.284	**0.677**	0.282	0.440	0.393	0.425	0.443	0.265	0.283	0.424	0.266	0.438	0.495	0.483	0.429	0.316	0.404	0.322	0.460	-0.099	0.439	0.519

Figure C.1

CL-MIM ELES Effectiveness model Indicator Item Cross Loading – Part 1

DGNTS_1	0.353	0.641	0.528	0.379	**0.771**	0.374	0.555	0.541	0.343	0.448	0.283	0.516	0.588	0.461	0.611	0.664	0.657	0.617	0.524	0.470	0.395	0.416	0.082	0.577	0.648
DGNTS_10	0.320	0.646	0.379	0.391	**0.788**	0.371	0.567	0.550	0.522	0.513	0.372	0.442	0.480	0.309	0.532	0.568	0.656	0.556	0.447	0.458	0.393	0.583	0.043	0.544	0.637
DGNTS_2	0.192	0.501	0.460	0.227	**0.689**	0.417	0.510	0.525	0.281	0.289	0.268	0.364	0.633	0.318	0.430	0.666	0.678	0.601	0.410	0.350	0.406	0.304	0.163	0.469	0.505
DGNTS_4	0.290	0.511	0.407	0.282	**0.647**	0.312	0.564	0.461	0.365	0.351	0.207	0.534	0.412	0.276	0.502	0.553	0.593	0.502	0.332	0.556	0.336	0.437	0.148	0.425	0.549
DGNTS_5	0.331	0.450	0.312	0.280	**0.700**	0.274	0.440	0.356	0.530	0.277	0.274	0.490	0.365	0.280	0.411	0.477	0.548	0.374	0.355	0.489	0.188	0.489	-0.066	0.481	0.514
DGNTS_6	0.336	0.647	0.520	0.338	**0.772**	0.431	0.623	0.510	0.536	0.483	0.283	0.392	0.587	0.507	0.526	0.612	0.608	0.566	0.387	0.494	0.416	0.502	0.128	0.587	0.614
DGNTS_7	0.238	0.514	0.347	0.298	0.595	0.370	0.444	0.384	**1.000**	0.412	0.226	0.443	0.370	0.230	0.484	0.409	0.530	0.439	0.286	0.447	0.308	0.490	0.013	0.411	0.579
DGNTS_8	0.287	0.594	0.482	0.381	**0.689**	0.353	0.515	0.471	0.409	0.255	0.288	0.423	0.496	0.401	0.488	0.519	0.607	0.531	0.397	0.381	0.355	0.333	0.144	0.503	0.513
DGNTS_9	0.248	0.458	0.470	0.248	**0.671**	0.184	0.567	0.407	0.315	0.347	0.148	0.436	0.338	0.396	0.406	0.460	0.522	0.367	0.281	0.399	0.296	0.320	0.211	0.444	0.508
EFFEC_1	0.427	0.553	0.392	0.492	0.540	0.383	0.577	0.449	0.305	0.402	0.408	0.414	0.592	0.336	0.440	0.561	0.532	0.712	0.463	0.420	0.429	0.464	0.204	**0.834**	0.532
EFFEC_2	0.387	0.495	0.420	0.423	0.506	0.464	0.554	0.460	0.298	0.436	0.425	0.330	0.471	0.204	0.429	0.523	0.468	**0.729**	0.415	0.441	0.359	0.438	0.188	0.606	0.520
EFFEC_3	0.368	0.453	0.310	0.302	0.411	0.416	0.475	0.263	0.226	0.284	**1.000**	0.262	0.371	0.225	0.347	0.440	0.409	0.474	0.285	0.361	0.292	0.436	0.152	0.458	0.406
EFFEC_4	0.266	0.507	0.420	0.229	0.494	0.361	**0.646**	0.405	0.188	0.342	0.456	0.236	0.442	0.210	0.291	0.508	0.524	0.468	0.258	0.356	0.297	0.266	0.195	0.507	0.378
EFFEC_5	0.443	0.517	0.414	0.315	0.556	0.447	**0.726**	0.392	0.392	0.397	0.431	0.399	0.481	0.298	0.429	0.496	0.516	0.527	0.345	0.548	0.326	0.493	0.152	0.621	0.609
EFFEC_6	0.364	0.506	0.361	0.448	0.528	0.248	0.563	0.257	0.356	0.518	0.414	0.441	0.437	0.352	0.442	0.431	0.449	0.539	0.395	0.497	0.354	0.470	-0.019	**0.732**	0.523
NETCC_1	0.370	0.628	0.448	0.379	0.618	0.450	0.542	0.567	0.334	0.406	0.353	0.347	**0.916**	0.418	0.478	0.709	0.628	0.683	0.418	0.454	0.423	0.389	0.196	0.638	0.527
NETCC_10	0.368	0.587	0.341	0.332	0.546	0.482	0.497	0.484	0.264	0.333	0.374	0.293	0.536	0.363	0.467	**0.743**	0.504	0.547	0.405	0.401	0.344	0.425	0.220	0.478	0.443
NETCC_11	0.311	0.544	0.364	0.317	0.728	0.360	0.498	0.399	0.551	0.420	0.405	0.502	0.435	0.279	0.490	0.537	0.558	0.446	0.334	0.471	0.288	0.536	0.054	0.524	0.535
NETCC_2	0.278	0.591	0.432	0.418	0.608	0.468	0.595	0.496	0.341	0.479	0.326	0.404	**0.913**	0.399	0.502	0.698	0.614	0.629	0.417	0.389	0.540	0.379	0.153	0.614	0.523
NETCC_3	0.327	0.563	0.446	0.294	0.619	0.391	0.528	0.498	0.231	0.289	0.390	0.392	0.701	0.361	0.477	**0.835**	0.648	0.569	0.323	0.415	0.401	0.390	0.237	0.58	0.476
NETCC_5	0.325	0.582	0.447	0.365	0.633	0.459	0.561	0.482	0.402	0.355	0.330	0.483	0.623	0.421	0.507	**0.801**	0.673	0.539	0.334	0.550	0.420	0.460	0.198	0.562	0.584
NETCC_6	0.063	0.178	0.179	0.005	0.108	0.165	0.180	0.257	0.013	0.147	0.152	0.205	0.191	0.032	0.180	0.261	0.264	0.208	0.049	0.051	0.150	0.082	**1.000**	0.219	0.117
NETCC_8	0.292	0.519	0.377	0.300	0.655	0.492	0.550	0.484	0.335	0.324	0.429	0.352	0.579	0.249	0.426	**0.820**	0.654	0.608	0.315	0.474	0.393	0.390	0.230	0.000	0.488
NETCC_9	0.265	0.448	0.404	0.338	0.480	**1.000**	0.445	0.332	0.370	0.274	0.416	0.228	0.502	0.298	0.456	0.565	0.427	0.555	0.357	0.408	0.401	0.391	0.165	0.402	0.454
PEDG_1	0.290	**0.707**	0.409	0.401	0.562	0.401	0.483	0.413	0.371	0.541	0.398	0.428	0.473	0.31	0.538	0.517	0.544	0.557	0.458	0.381	0.443	0.397	0.125	0.445	0.573
PEDG_10	0.199	0.515	0.318	0.309	0.503	0.185	0.488	0.429	0.386	0.327	0.25	**0.908**	0.360	0.203	0.545	0.429	0.573	0.504	0.269	0.455	0.381	0.409	0.189	0.468	0.495
PEDG_2	0.240	**0.737**	0.393	0.364	0.497	0.324	0.500	0.429	0.304	0.358	0.326	0.373	0.511	0.279	0.452	0.556	0.626	0.533	0.400	0.353	0.411	0.402	0.194	0.508	0.459
PEDG_3	0.160	0.587	0.379	0.240	0.541	0.222	0.445	0.515	0.393	0.410	0.268	0.362	0.503	0.251	0.418	0.562	**0.713**	0.513	0.289	0.362	0.297	0.350	0.198	0.491	0.442

Figure C.2

CL-MIM ELES Effectiveness model Indicator Item Cross Loading – Part 2

PEDG_4	0.191	0.631	0.411	0.311	0.653	0.310	0.514	0.500	0.520	0.419	0.306	0.455	0.457	0.321	0.535	0.560	**0.773**	0.505	0.320	0.458	0.347	0.470	0.190	0.517	0.577
PEDG_5	0.193	0.515	0.453	0.288	0.552	0.414	0.484	0.448	0.340	0.424	0.280	0.335	0.364	0.322	0.533	0.503	**0.710**	0.444	0.301	0.371	0.306	0.424	0.195	0.419	0.457
PEDG_6	0.287	0.588	0.427	0.250	0.646	0.366	0.519	0.484	0.402	0.385	0.301	0.358	0.564	0.219	0.471	0.629	**0.779**	0.535	0.296	0.419	0.311	0.371	0.162	0.525	0.479
PEDG_7	0.397	0.566	0.507	0.416	0.600	0.426	0.576	0.535	0.411	0.387	0.330	0.554	0.458	0.434	**0.877**	0.545	0.632	0.506	0.414	0.575	0.454	0.569	0.135	0.476	0.530
PEDG_8	0.219	0.575	0.393	0.228	0.575	0.286	0.554	0.600	0.334	0.473	0.287	0.382	0.500	0.259	0.481	0.562	**0.724**	0.492	0.304	0.416	0.363	0.452	0.206	0.531	0.461
PEDG_9	0.226	0.516	0.436	0.400	0.589	0.231	0.528	0.447	0.426	0.415	0.233	**0.931**	0.393	0.311	0.584	0.462	0.657	0.463	0.440	0.443	0.465	0.503	0.188	0.456	0.580
TRANSS_1	0.364	0.593	0.347	0.387	0.514	0.448	0.469	0.403	0.350	0.328	0.342	0.424	0.598	0.388	0.466	0.513	0.493	**0.780**	0.424	0.346	0.422	0.386	0.098	0.580	0.556
TRANSS_10	0.305	0.6	0.398	0.353	0.611	0.447	0.508	0.495	0.489	0.252	0.326	0.356	0.553	0.388	0.497	0.559	0.538	0.639	0.473	0.464	0.438	0.389	0.133	0.472	0.723
TRANSS_2	0.196	0.484	0.351	0.265	0.458	0.269	0.486	0.351	0.223	0.424	0.308	0.303	0.494	0.244	0.309	0.487	0.490	**0.683**	0.344	0.228	0.297	0.189	0.192	0.524	0.442
TRANSS_3	0.220	0.646	0.441	0.418	0.62	0.343	0.595	0.463	0.384	0.513	0.286	0.502	0.513	0.431	0.488	0.542	0.617	0.608	0.561	0.448	0.508	0.439	0.173	0.574	**0.805**
TRANSS_4	0.192	0.516	0.336	0.295	0.521	0.350	0.545	0.352	0.411	0.385	0.354	0.478	0.287	0.29	0.531	0.413	0.460	0.436	0.351	0.425	0.362	0.497	0.130	0.446	**0.747**
TRANSS_5	0.263	0.569	0.400	0.358	0.659	0.301	0.657	0.367	0.544	0.445	0.309	0.526	0.397	0.426	0.483	0.480	0.588	0.463	0.406	0.523	0.368	0.586	0.011	0.531	**0.819**
TRANSS_6	0.295	0.508	0.396	0.325	0.555	0.310	**0.699**	0.230	0.410	0.492	0.315	0.440	0.384	0.482	0.419	0.437	0.444	0.481	0.365	0.428	0.439	0.436	0.021	0.490	0.658
TRANSS_7	0.253	0.494	0.425	0.305	0.570	0.233	**0.784**	0.412	0.299	0.450	0.267	0.385	0.376	0.459	0.462	0.451	0.500	0.525	0.368	0.399	0.357	0.385	0.083	0.523	0.636
TRANSS_8	0.307	0.497	0.459	0.345	0.556	0.296	0.639	0.239	0.395	0.374	0.293	0.402	0.412	0.435	0.364	0.449	0.451	0.525	0.361	0.472	0.364	0.412	-0.010	0.533	**0.746**
TRANSS_9	0.341	0.486	0.372	0.428	0.491	0.298	0.529	0.324	0.23	0.273	0.225	0.283	0.447	**1.000**	0.423	0.457	0.416	0.414	0.483	0.364	0.411	0.322	0.032	0.445	0.517
UCPR_1	0.316	0.442	0.360	0.513	0.447	0.320	0.396	0.349	0.211	0.237	0.222	0.329	0.375	0.443	0.399	0.376	0.400	0.452	**0.879**	0.376	0.509	0.342	0.009	0.425	0.518
UCPR_2	0.383	0.427	0.404	0.485	0.469	0.294	0.405	0.347	0.287	0.335	0.274	0.349	0.416	0.389	0.410	0.416	0.397	0.449	**0.846**	0.347	0.432	0.386	0.080	0.447	0.463
UCPR_3	0.303	0.530	0.510	0.564	0.476	0.401	0.529	0.387	0.308	0.363	0.292	0.463	0.526	0.411	0.516	0.510	0.499	0.526	0.547	0.460	**1.000**	0.435	0.150	0.529	0.537
UCPR_5	0.450	0.492	0.373	**1.000**	0.438	0.338	0.442	0.327	0.298	0.346	0.302	0.389	0.436	0.428	0.478	0.410	0.414	0.513	0.579	0.469	0.564	0.431	0.005	0.540	0.465
UCPR_6	**1.000**	0.407	0.359	0.450	0.411	0.265	0.403	0.246	0.238	0.158	0.368	0.232	0.355	0.341	0.347	0.408	0.320	0.424	0.402	0.443	0.303	0.353	0.063	0.497	0.337
UCPR_7	0.471	0.401	0.293	0.449	0.417	0.290	0.411	0.304	0.325	0.187	0.301	0.307	0.289	0.250	0.367	0.365	0.315	0.326	0.393	**0.723**	0.326	0.372	-0.006	0.423	0.458

Figure C.3

CL-MIM ELES Effectiveness model Indicator Item Cross Loading – Part 3

CL-MIM enabled ELES Effectiveness model Discriminant Validity (Fornell and Larcker Criterion) presented in Table C.1

Table C.1

Discriminant Validity (Fornell and Larcker Criterion)

	Active Participation Need	Choice and Planning Facilitator	Continuity of progression & Contributions Importance	Cultural Understanding Importance	Design	Diversity Importance	ELES Effectiveness	Importance of Awareness for Design Rationale	Importance of Ease of Access and Flexibility	Importance of Language Constructs	Importance of Social Media based Services within ELES	Instructor Pedagogical Efficacy Need Perception	Interaction Enabler	Learner Satisfaction	Learning Context Importance and Requirement	Networking & Collaboration	Pedagogy	Perception of Collaboration Enhancement	Perception of Emotional Intelligence Enhancing Engagement	Perception of Enhancement of Self-direction/Independent-Learner	Perception of Improved Learner Experience	Perception of Organisational Capability Development	Perception of Privacy Importance	Socially Driven Learning Enhancement	Transformation, Scope and Scale
Active Participation Need	**1**																								
Choice and Planning Facilitator	0.418	**0.786**																							
Continuity of progression & Contributions Importance	0.359	0.557	**1**																						
Cultural Understanding Importance	0.45	0.499	0.373	**1**																					
Design	0.406	0.75	0.58	0.441	**0.754**																				
Diversity Importance	0.265	0.448	0.404	0.338	0.	**1**																			

					0.490											
ELES Effectiveness	0.417	0.688	0.556	0.416	0.685	0.403	**0.767**									
Importance of Awareness for Design Rationale	0.246	0.590	0.457	0.327	0.639	0.333	0.529	**0.815**								
Importance of Ease of Access and Flexibility	0.238	0.505	0.347	0.298	0.601	0.370	0.456	0.385	**1**							
Importance of Language Constructs	0.158	0.559	0.374	0.346	0.517	0.275	0.554	0.45	0.411	**0.847**						
Importance of Social Media based Services within ELES	0.368	0.478	0.310	0.302	0.412	0.416	0.419	0.263	0.226	0.283	**1**					
Instructor Pedagogical Efficacy Need Perception	0.232	0.542	0.411	0.386	0.589	0.227	0.542	0.478	0.442	0.404	0.262	**0.92**				
Interaction Enabler	0.355	0.653	0.482	0.436	0.681	0.502	0.552	0.581	0.370	0.484	0.371	0.410	**0.914**			
Learner Satisfaction	0.341	0.477	0.372	0.428	0.489	0.298	0.540	0.324	0.23	0.273	0.225	0.28	0.447	**1**		
Learning Context Importance and Requirement	0.344	0.663	0.556	0.478	0.660	0.455	0.607	0.648	0.485	0.505	0.346	0.614	0.536	0.421	**0.873**	
Networking & Collaboration	0.401	0.688	0.496	0.395	0.730	0.558	0.617	0.596	0.379	0.398	0.466	0.469	0.745	0.427	0.575	**0.815**
Pedagogy	0.271	0.740	0.531	0.341	0.749	0.411	0.601	0.656	0.517	0.543	0.373	0.49	0.616	0.354	0.629	0.686	**0.776**

Perception of Collaboration Enhancement	0.424	0.721	0.562	0.513	0.702	0.555	0.663	0.632	0.439	0.561	0.473	0.525	0.718	0.416	0.632	0.693	0.641	**0.733**						
Perception of Emotional Intelligence Enhancing Engagement	0.401	0.496	0.44	0.579	0.542	0.357	0.444	0.404	0.285	0.327	0.284	0.386	0.455	0.484	0.467	0.419	0.399	0.521	**0.863**					
Perception of Enhancement of Self-direction/Independent-Learner	0.440	0.608	0.481	0.468	0.591	0.408	0.641	0.523	0.446	0.416	0.360	0.489	0.462	0.365	0.618	0.566	0.526	0.524	0.418	**0.808**				
Perception of Improved Learner Experience	0.303	0.527	0.51	0.564	0.467	0.401	0.494	0.388	0.308	0.364	0.292	0.46	0.526	0.411	0.516	0.479	0.442	0.525	0.548	0.46	**1**			
Perception of Organisational Capability Development	0.355	0.644	0.451	0.43	0.601	0.391	0.596	0.455	0.487	0.448	0.437	0.495	0.42	0.321	0.651	0.511	0.535	0.516	0.418	0.646	0.435	**0.882**		
Perception of Privacy Importance	0.063	0.163	0.179	0.005	0.105	0.165	0.149	0.256	0.013	0.148	0.152	0.205	0.191	0.032	0.181	0.271	0.245	0.207	0.048	0.051	0.15	0.082	**1**	
Socially Driven Learning Enhancement	0.461	0.608	0.437	0.546	0.632	0.371	0.625	0.418	0.38	0.527	0.475	0.493	0.603	0.397	0.51	0.593	0.508	0.732	0.499	0.527	0.457	0.54	0.117	**0.863**	
Transformation, Scope and Scale	0.347	0.731	0.54	0.472	0.762	0.446	0.783	0.507	0.576	0.505	0.387	0.567	0.603	0.534	0.588	0.619	0.635	0.718	0.582	0.605	0.54	0.578	0.105	0.611	**0.785**

Items remove where indicator items are below 0.5: UCPR_4, NETCC_7, DGNTS_3, CNCTL_1, CNCTL_13, CNCTL_3, CNCTL_4, CNCTL_21, TRANSS_11

Cross Loading check items removed: PEDG_9, DGNTS_11, CNCTL_2, NETCC_4,

Fornell-Larcker criterion items removed: CNCTL_10, CNCTL_16, CNCTL_23, DGNTS_12, DGNTS_4, DGNTS_9, EEFEC_4, TRANSS_4

Normality Tests presented in Table C.3.

Sample size: 202

Number of Variables: 25

Table C.2

ELES CL-MIM Skewness and Kurtosis

Constructs	Skewness	Kurtosis
Active Participation Need	-0.670	0.325
Choice and Planning Facilitator	-0.870	2.141
Continuity of progression Contributions Importance	-0.639	0.650
Cultural Understanding Importance	-0.944	1.227
Design	-1.115	3.186
Diversity Importance	-0.973	1.415
ELES Effectiveness	-0.823	2.072
Importance of Awareness for Design Rationale	-0.602	1.054
Importance of Ease of Access and Flexibility	-1.069	2.756
Importance of Language Constructs	-0.957	1.413
Importance of Social Media based Services within ELES	-0.687	0.616
Instructor Pedagogical Efficacy Need Perception	-0.690	1.840
Interaction Enabler	-0.531	0.224
Learner Satisfaction	-0.706	0.959

Learning Context Importance and Requirement	-1.026	2.917
Networking Collaboration	-0.454	0.692
Pedagogy	-0.767	2.266
Perception of Collaboration Enhancement	-0.411	0.613
Perception of Emotional Intelligence Enhancing Engagement	-0.692	1.030
Perception of Enhancement of Self direction Independent Learner	-1.122	2.319
Perception of Improved Learner Experience	-0.835	0.667
Perception of Organisational Capability Development	-1.020	2.329
Perception of Privacy Importance	-0.073	-0.929
Socially Driven Learning Enhancement	-1.072	1.414
Transformation Scope and Scale	-0.747	1.537

Latent Variables Standardised Scores used to calculate Normality tests.

Table C.3 ELES CL-MIM Latent Variables Standardised Scores I

Active Participation Need	Choice and Planning Facilitator	Continuity of progression & Contributions Importance	Cultural Understanding Importance	Design	Diversity Importance	ELES Effectiveness	Importance of Awareness for Design Rationale	Importance of Ease of Access and Flexibility	Importance of Language Constructs	Importance of Social Media based Services within ELES
0.475	0.850	0.360	0.329	0.023	0.252	0.439	0.216	1.234	0.799	0.390
1.516	-1.187	0.360	1.417	0.410	1.437	-0.234	-0.347	1.234	-3.308	1.486
0.475	-0.199	0.360	0.329	0.455	0.252	-0.215	0.601	-0.085	-1.024	0.390
0.475	0.099	0.360	0.329	0.076	0.252	0.112	0.601	-0.085	0.162	0.390
-0.567	-0.654	-0.795	0.329	-0.595	-0.933	-1.016	-0.780	-0.085	0.250	0.390
0.475	-0.207	-0.795	0.329	0.022	-0.933	0.412	0.601	-1.404	-0.387	-0.705
-2.651	-1.248	-0.795	-2.936	-0.153	-0.933	0.112	-0.258	-0.085	0.339	0.390
0.475	0.495	0.360	0.329	0.076	0.252	-0.598	0.601	-0.085	-0.936	-0.705
0.475	-0.258	0.360	0.329	0.057	0.252	0.011	-0.258	-0.085	-0.298	0.390

1.516	0.791	0.360	0.329	0.073	0.252	0.803	-0.258	1.234	0.250	1.486
0.475	0.842	1.516	0.329	0.042	-2.118	1.531	1.507	-1.404	0.888	0.390
-0.567	0.495	0.360	1.417	0.053	0.252	-0.626	0.601	1.234	0.250	-0.705
-0.567	0.148	0.360	-0.760	-0.116	0.252	-0.598	0.601	-0.085	0.339	-0.705
0.475	0.495	0.360	-0.760	0.660	-0.933	0.102	0.601	-0.085	0.250	0.390
0.475	1.298	1.516	1.417	0.758	0.252	0.884	-1.500	1.234	-0.387	1.486
0.475	0.495	-1.950	0.329	-0.107	0.252	0.247	0.937	-0.085	-3.308	1.486
0.475	0.089	-0.795	0.329	0.262	0.252	0.075	0.601	-0.085	0.799	-1.800
0.475	0.495	-0.795	-0.760	-0.169	-0.933	0.011	-0.258	-1.404	-1.573	0.390
-0.567	-0.248	0.360	0.329	0.262	0.252	0.112	-0.258	-1.404	0.162	0.390
-0.567	0.495	0.360	0.329	0.262	0.252	0.439	-0.258	-0.085	-0.298	0.390
0.475	-0.544	-0.795	0.329	-0.845	0.252	-0.616	0.216	-0.085	-0.476	0.390
-2.651	-2.792	-3.105	-2.936	-2.750	-2.118	-3.499	-2.160	-2.722	-2.759	-2.896
0.475	-0.248	-0.795	0.329	-0.611	0.252	-0.234	0.601	-0.085	0.888	0.390
0.475	1.941	1.516	0.329	1.768	1.437	1.895	1.981	1.234	1.436	1.486
-0.567	0.495	-0.795	-0.760	-0.191	0.252	-0.252	-1.116	-1.404	-0.936	0.390
-1.609	0.495	0.360	1.417	0.262	0.252	0.439	0.601	-0.085	0.250	1.486
0.475	-0.197	-0.795	0.329	-0.217	0.252	-1.016	-0.395	-0.085	-0.936	-0.705
-1.609	-0.544	-0.795	-1.848	0.023	-0.933	-0.652	0.216	-0.085	-1.573	-0.705
0.475	0.495	0.360	-0.760	0.023	0.252	-0.598	-1.116	-0.085	-0.387	0.390
-2.651	-3.249	-0.795	-2.936	-4.256	1.437	-2.771	-1.205	-4.041	-1.750	0.390
0.475	-1.001	1.516	0.329	0.284	0.252	1.531	-0.168	-0.085	0.799	0.390
0.475	0.097	-1.950	-1.848	-0.573	0.252	-1.289	-2.071	1.234	0.888	0.390
1.516	1.941	0.360	-0.760	1.097	1.437	1.895	0.985	1.234	0.888	1.486
0.475	0.495	0.360	0.329	0.503	0.252	0.439	0.601	-0.085	0.250	0.390
1.516	1.941	1.516	1.417	1.768	1.437	1.895	1.596	1.234	0.888	1.486
0.475	-0.950	-0.795	-0.760	-1.244	-0.933	0.002	-0.780	-1.404	-0.298	0.390
0.475	0.495	0.360	0.329	0.262	0.252	0.439	0.601	-0.085	0.250	0.390
0.475	0.495	0.360	0.329	-1.244	-0.933	0.102	0.601	-1.404	0.250	0.390
0.475	-0.258	0.360	0.329	-1.247	0.252	-0.215	-1.164	-0.085	0.799	-0.705

-1.609	-0.407	0.360	-0.760	0.862	0.252	-1.353	-1.164	1.234	-1.024	-0.705
0.475	-1.347	-0.795	0.329	-0.186	0.252	-0.316	-0.780	-0.085	-0.387	0.390
0.475	0.791	0.360	0.329	1.069	0.252	0.776	0.601	-0.085	1.436	0.390
-0.567	-0.950	-0.795	-0.760	-0.352	-0.933	-0.588	0.601	-0.085	0.339	-0.705
-0.567	-1.533	-1.950	-2.936	-1.028	-2.118	0.002	0.738	-0.085	-0.936	-0.705
0.475	-2.100	0.360	-0.760	-0.560	0.252	-1.343	-0.731	-0.085	-0.476	-0.705
0.475	-0.495	0.360	0.329	1.548	0.252	0.449	-0.642	1.234	0.250	1.486
-0.567	-0.148	0.360	-0.760	-0.163	0.252	0.102	0.601	-0.085	-0.298	-0.705
-1.609	-1.347	-0.795	-0.760	-0.602	-2.118	-2.044	-1.075	1.234	-1.573	-0.705
0.475	0.495	0.360	0.329	-0.359	-2.118	-0.325	0.601	-1.404	1.436	0.390
-1.609	-0.544	0.360	-1.848	-0.645	-0.933	-1.380	-0.780	-0.085	-2.759	-1.800
-0.567	-0.258	-0.795	-0.760	0.262	0.252	0.075	0.127	-0.085	0.888	-0.705
-0.567	-0.148	0.360	0.329	0.022	0.252	0.112	-1.116	-0.085	-0.936	0.390
0.475	-0.950	0.360	0.329	-1.055	-0.933	-1.016	-0.780	-0.085	-1.573	-0.705
0.475	0.842	0.360	1.417	0.317	0.252	0.439	1.074	1.234	0.162	0.390
0.475	1.188	0.360	0.329	1.170	1.437	0.776	0.649	-0.085	1.436	1.486
0.475	0.495	0.360	0.329	0.262	0.252	0.439	0.601	-0.085	0.250	0.390
0.475	-0.239	-0.795	0.329	0.236	-2.118	-0.316	1.596	-0.085	1.436	-0.705
-0.567	0.791	0.360	-0.760	0.851	-0.933	0.712	-1.391	-0.085	0.799	-1.800
0.475	-0.495	-1.950	0.329	-0.330	-0.933	-1.680	-1.775	-0.085	1.436	-1.800
1.516	0.495	0.360	1.417	0.262	0.252	0.439	0.601	-0.085	0.250	0.390
-0.567	-0.148	-0.795	0.329	-0.211	1.437	0.176	0.127	-0.085	-0.936	0.390
1.516	0.495	0.360	0.329	1.125	0.252	0.776	0.601	1.234	1.436	0.390
-1.609	1.941	1.516	1.417	1.768	0.252	1.103	1.123	1.234	1.436	-0.705
-0.567	-0.307	0.360	0.329	0.262	0.252	0.439	-1.164	-0.085	0.799	0.390
-1.609	0.495	-0.795	0.329	0.042	0.252	0.075	-0.258	1.234	1.436	0.390
1.516	1.941	1.516	1.417	1.768	1.437	1.895	1.596	1.234	0.799	1.486
0.475	-0.316	0.360	-0.760	0.742	0.252	0.075	0.601	-0.085	0.339	0.390
-0.567	0.099	0.360	0.329	0.051	0.252	0.439	0.601	-0.085	0.799	-0.705
0.475	-2.652	0.360	-2.936	-0.373	0.252	-1.552	-0.966	-0.085	-2.582	0.390

-0.567	-0.704	1.516	0.329	-0.577	0.252	-1.744	-1.026	-0.085	1.436	0.390
-2.651	-1.109	-1.950	-2.936	0.262	0.252	-1.798	-0.168	-0.085	-0.476	-1.800
0.475	0.089	0.360	0.329	-0.330	0.252	-0.234	-0.780	-0.085	-0.936	0.390
0.475	0.139	0.360	-0.760	0.265	-0.933	0.439	0.738	1.234	-0.936	-0.705
0.475	0.495	0.360	0.329	0.262	0.252	0.439	0.601	-0.085	-0.387	0.390
0.475	0.495	-0.795	0.329	-0.135	-0.933	-0.680	-1.164	-0.085	0.250	0.390
-0.567	-0.950	-0.795	-0.760	0.426	1.437	-1.016	-0.780	1.234	-1.485	-0.705
-1.609	-0.199	-0.795	1.417	0.881	0.252	-0.824	0.601	-0.085	0.888	-1.800
-0.567	0.148	0.360	0.329	0.254	-0.933	-0.262	1.123	-0.085	-0.936	0.390
0.475	1.139	0.360	0.329	0.891	1.437	0.439	0.601	1.234	-0.387	0.390
1.516	0.495	0.360	0.329	0.690	1.437	1.140	0.216	-0.085	-0.387	0.390
-0.567	0.554	0.360	-0.760	0.065	0.252	0.867	0.601	-0.085	-0.387	0.390
0.475	0.495	0.360	-0.760	0.501	0.252	0.075	0.601	1.234	0.162	0.390
0.475	0.892	-0.795	0.329	0.885	1.437	1.140	-0.168	-0.085	-0.387	0.390
-0.567	0.199	0.360	0.329	0.713	0.252	0.857	0.079	-0.085	-0.387	-0.705
0.475	0.495	0.360	0.329	0.262	0.252	0.439	0.601	-0.085	0.250	0.390
1.516	1.535	1.516	1.417	1.176	1.437	0.803	1.596	1.234	0.888	1.486
0.475	-1.356	1.516	0.329	-0.216	0.252	-0.680	-0.258	-1.404	-2.210	0.390
0.475	0.089	0.360	1.417	-0.217	0.252	-0.234	0.216	-0.085	-1.024	0.390
-0.567	-0.654	0.360	1.417	-0.178	0.252	0.075	0.079	-1.404	0.888	-0.705
0.475	0.495	0.360	-1.848	0.470	0.252	-0.416	-0.168	1.234	1.436	0.390
-0.567	-1.000	-1.950	-0.760	-0.831	-0.933	-0.215	-1.253	-1.404	-0.387	0.390
0.475	0.199	0.360	-0.760	0.262	0.252	0.075	-1.116	-0.085	-0.936	-0.705
-0.567	-0.654	-0.795	0.329	-1.024	1.437	0.049	-0.258	-0.085	0.339	0.390
1.516	-2.100	-1.950	-0.760	-0.197	1.437	-1.771	0.216	-0.085	-1.113	-0.705
-0.567	0.495	0.360	0.329	-2.098	0.252	0.439	0.601	-0.085	0.250	0.390
0.475	0.148	0.360	-0.760	0.023	0.252	0.439	0.127	-1.404	0.250	0.390
-0.567	1.941	1.516	0.329	1.768	1.437	1.895	1.981	1.234	1.436	-0.705
-0.567	-0.207	0.360	-0.760	0.910	1.437	1.467	0.601	-0.085	0.250	-0.705
0.475	-0.258	0.360	0.329	0.262	0.252	0.075	0.601	-0.085	-0.298	1.486

-1.609	-0.554	-0.795	-0.760	0.262	-0.933	-0.781	-0.780	-0.085	0.799	0.390
-0.567	-0.950	-0.795	-0.760	-1.244	-0.933	-1.016	-0.780	-1.404	-0.936	-0.705
-0.567	-2.642	1.516	-2.936	-2.586	-3.303	-0.909	-3.018	-2.722	-2.210	-2.896
0.475	0.199	1.516	0.329	0.051	0.252	0.439	0.601	-0.085	-0.936	0.390
0.475	-0.307	1.516	0.329	-0.025	-0.933	0.412	0.601	1.234	0.250	-0.705
-0.567	-0.544	0.360	0.329	0.073	0.252	0.476	0.127	-0.085	0.250	0.390
-0.567	0.148	-0.795	0.329	-0.198	0.252	0.075	0.601	-0.085	0.250	0.390
0.475	0.148	0.360	0.329	0.660	0.252	1.140	0.216	-0.085	-0.936	0.390
-0.567	-0.207	-0.795	0.329	-0.802	-0.933	0.102	0.079	-0.085	0.250	0.390
1.516	0.199	-0.795	0.329	0.480	0.252	0.439	-0.395	-1.404	-0.387	0.390
-0.567	-0.554	-0.795	-0.760	-1.003	0.252	-1.380	-0.780	-0.085	0.250	-0.705
0.475	0.742	0.360	0.329	0.015	0.252	-0.689	-0.011	-1.404	-1.573	-0.705
1.516	-0.309	1.516	1.417	1.552	0.252	1.531	1.459	1.234	1.436	-0.705
-0.567	0.454	1.516	0.329	1.390	1.437	1.194	1.981	-0.085	0.799	0.390
0.475	0.089	0.360	0.329	-0.144	0.252	-0.224	0.601	-0.085	0.250	0.390
-0.567	0.505	1.516	-0.760	0.262	0.252	0.503	0.560	-1.404	0.250	1.486
0.475	0.013	1.516	0.329	1.328	1.437	1.039	0.601	1.234	0.799	-0.705
0.475	-0.950	-0.795	0.329	-0.596	0.252	0.439	0.079	-0.085	0.250	-0.705
0.475	-0.307	1.516	-0.760	-0.144	-0.933	0.112	0.265	-0.085	0.799	-0.705
-0.567	-0.654	-0.795	-0.760	0.234	0.252	0.439	-0.258	-0.085	0.250	0.390
-0.567	0.495	0.360	0.329	0.660	0.252	0.739	0.079	-0.085	1.436	1.486
1.516	1.941	1.516	1.417	1.768	1.437	1.467	0.127	1.234	1.436	0.390
0.475	0.258	-0.795	0.329	1.069	0.252	0.803	-0.168	-0.085	0.250	1.486
-2.651	-1.603	-3.105	0.329	-1.382	-2.118	-0.717	0.738	1.234	0.250	-1.800
0.475	0.791	0.360	0.329	0.042	0.252	0.439	0.216	-0.085	0.250	0.390
0.475	0.495	1.516	0.329	1.072	0.252	-0.215	0.265	1.234	-0.387	-0.705
0.475	0.951	0.360	1.417	0.084	-2.118	-0.343	-0.917	-0.085	0.250	1.486
0.475	0.495	0.360	0.329	0.262	0.252	0.439	-0.258	-0.085	0.250	0.390
-0.567	-1.246	-1.950	-0.760	0.246	-2.118	-1.016	-0.780	-1.404	-0.298	-0.705
1.516	1.247	1.516	0.329	1.768	1.437	1.895	1.981	1.234	1.436	1.486

-0.567	0.495	0.360	0.329	0.235	0.252	0.439	0.216	-0.085	0.250	0.390
0.475	0.048	0.360	0.329	0.883	-0.933	0.011	0.985	-0.085	0.888	1.486
0.475	0.495	0.360	0.329	0.262	0.252	0.439	0.601	-0.085	0.250	0.390
0.475	0.495	0.360	-0.760	0.262	0.252	-0.626	0.601	-0.085	-0.936	-0.705
-0.567	0.148	0.360	-0.760	0.262	-0.933	-0.353	-0.395	-0.085	0.250	-0.705
-0.567	-0.950	-0.795	-0.760	-1.051	-0.933	-0.680	-0.780	-1.404	-0.936	-0.705
-0.567	0.495	0.360	0.329	0.262	-0.933	0.439	0.601	-0.085	-1.024	-0.705
-2.651	-1.186	0.360	0.329	-1.504	0.252	0.766	-0.869	-0.085	-0.298	-2.896
0.475	1.197	1.516	0.329	1.576	1.437	1.194	1.981	-0.085	1.436	0.390
-0.567	-0.148	1.516	0.329	1.309	0.252	0.550	1.074	1.234	1.436	0.390
0.475	1.298	0.360	1.417	-0.661	1.437	1.103	0.511	-0.085	0.250	0.390
1.516	0.892	0.360	-0.760	0.026	0.252	0.766	0.601	-0.085	0.799	0.390
-0.567	1.002	0.360	-0.760	0.474	0.252	-1.026	-0.168	-1.404	-0.387	0.390
-1.609	-2.405	-1.950	-0.760	-1.950	0.252	-0.642	-1.213	-0.085	-0.387	-0.705
1.516	0.546	0.360	1.417	1.360	1.437	1.231	0.079	1.234	0.799	0.390
-0.567	0.495	1.516	0.329	0.262	0.252	0.439	0.601	-0.085	0.250	-0.705
-1.609	-0.654	-0.795	-0.760	-0.783	0.252	-0.325	-0.306	-0.085	-0.936	-0.705
-1.609	-0.466	-0.795	-0.760	-1.646	-0.933	-0.915	-1.638	-0.085	1.436	1.486
-1.609	0.336	-0.795	0.329	-0.930	-0.933	-3.163	-1.026	-0.085	0.250	-0.705
-1.609	-0.207	-0.795	0.329	0.042	0.252	0.075	-0.780	-1.404	0.250	1.486
-0.567	0.495	0.360	-0.760	-0.170	0.252	0.102	0.601	-0.085	0.250	-0.705
0.475	-0.207	-0.795	-0.760	0.047	0.252	-0.588	-0.395	-0.085	-0.387	-0.705
0.475	1.002	0.360	1.417	0.294	0.252	0.065	-0.395	1.234	-1.396	0.390
1.516	0.892	-0.795	0.329	-0.196	0.252	0.348	-0.731	-0.085	-0.847	0.390
0.475	0.444	0.360	0.329	-0.235	0.252	-0.696	-3.155	-0.085	0.250	1.486
-1.609	-0.950	0.360	0.329	0.265	0.252	-0.652	0.216	1.234	0.250	0.390
0.475	-0.554	1.516	0.329	-0.358	0.252	0.776	-0.780	-0.085	0.799	0.390
-2.651	-3.841	-3.105	-2.936	-4.256	-3.303	-3.591	-3.066	-4.041	-3.308	-2.896
-0.567	-0.654	-0.795	1.417	-0.811	0.252	-1.016	-0.780	-1.404	0.799	1.486
-1.609	-0.713	-0.795	0.329	-1.233	-2.118	-0.252	-0.642	1.234	-0.387	-2.896

1.516	-3.841	-3.105	1.417	-3.651	-3.303	-3.927	-3.540	-4.041	-3.308	-2.896
-0.567	-0.258	-0.795	0.329	-0.753	0.252	-0.353	-1.775	-1.404	0.250	-0.705
0.475	1.298	0.360	0.329	0.934	0.252	1.140	0.601	-0.085	1.436	1.486
0.475	-0.258	0.360	0.329	0.042	0.252	0.439	0.127	-0.085	0.250	0.390
1.516	0.336	0.360	0.329	-0.361	1.437	-1.279	-0.869	-0.085	-0.476	-1.800
0.475	-0.950	-0.795	0.329	0.046	-0.933	0.011	0.216	-0.085	-0.936	0.390
0.475	0.148	0.360	-0.760	-0.170	-0.933	0.102	-0.395	-0.085	0.250	-1.800
0.475	0.495	0.360	-0.760	0.262	0.252	0.439	0.601	-0.085	-0.387	0.390
-0.567	-0.554	0.360	-0.760	-0.608	0.252	-0.252	-0.828	1.234	-0.387	-0.705
0.475	0.495	0.360	1.417	-0.193	-0.933	-0.353	0.079	-0.085	0.250	0.390
0.475	1.594	1.516	1.417	1.122	1.437	1.130	1.981	1.234	1.436	0.390
-0.567	0.199	0.360	0.329	0.262	0.252	0.439	0.601	-0.085	0.250	0.390
-0.567	-1.001	-0.795	0.329	-1.694	0.252	-1.016	-0.780	-1.404	-1.024	-0.705
-0.567	-0.950	-0.795	-0.760	-1.429	-3.303	-1.026	0.216	-1.404	-0.387	-0.705
0.475	0.791	0.360	0.329	0.262	0.252	0.439	0.601	-0.085	0.799	0.390
1.516	0.199	-0.795	-0.760	-0.352	-0.933	0.102	-0.780	-0.085	-0.387	0.390
1.516	1.941	1.516	1.417	1.768	1.437	1.895	1.981	1.234	1.436	1.486
0.475	0.901	0.360	0.329	0.722	0.252	0.439	0.601	1.234	0.799	0.390
0.475	1.941	0.360	1.417	1.768	1.437	1.467	0.601	1.234	0.799	1.486
-0.567	0.148	0.360	-0.760	0.501	0.252	0.112	0.601	1.234	0.250	0.390
0.475	-0.950	-0.795	-0.760	-1.244	-0.933	-1.016	-0.780	-1.404	-0.936	-0.705
1.516	0.604	-0.795	1.417	0.588	-2.118	1.568	1.212	1.234	0.799	-1.800
0.475	0.791	-0.795	0.329	0.079	0.252	-0.598	0.601	1.234	0.250	0.390
-0.567	0.148	0.360	1.417	1.150	0.252	0.776	0.216	1.234	0.799	-1.800
-1.609	-0.544	-0.795	0.329	-1.455	1.437	-0.170	0.216	-1.404	0.162	-0.705
-2.651	0.099	-1.950	-1.848	0.028	-0.933	0.439	1.074	1.234	0.250	-0.705
-0.567	0.148	0.360	0.329	-0.135	0.252	-0.652	-2.160	1.234	0.250	-0.705
1.516	-1.060	-1.950	1.417	-1.231	0.252	-0.989	-2.496	1.234	-0.936	1.486
-1.609	0.495	-1.950	-1.848	0.053	0.252	-1.818	0.216	-0.085	0.250	0.390
-0.567	-0.554	-0.795	-0.760	-1.027	-0.933	-0.325	-0.306	-0.085	-0.298	0.390

0.475	0.199	0.360	-0.760	0.719	-2.118	1.194	1.981	-0.085	0.250	-0.705
1.516	0.604	0.360	1.417	0.804	1.437	1.895	1.212	1.234	1.436	-1.800
0.475	0.892	1.516	0.329	1.146	0.252	0.766	1.074	-0.085	0.250	0.390
-0.567	-0.950	-0.795	-1.848	-2.045	-0.933	-1.380	-0.395	1.234	-0.936	-1.800
0.475	0.249	-0.795	-1.848	-1.257	-0.933	0.385	-1.164	1.234	0.888	1.486
0.475	0.099	0.360	0.329	0.262	0.252	-0.262	0.601	-0.085	0.250	-0.705
0.475	1.139	-0.795	1.417	1.069	0.252	0.867	0.601	-1.404	0.250	0.390
0.475	0.495	0.360	0.329	0.480	0.252	0.075	-0.168	1.234	-0.387	1.486
1.516	1.941	1.516	1.417	1.768	1.437	1.895	1.981	1.234	1.436	1.486
1.516	0.545	0.360	0.329	0.944	-0.933	-0.262	-0.258	1.234	0.799	0.390
0.475	-0.950	-0.795	0.329	-1.244	0.252	-0.652	-0.780	-1.404	-0.936	0.390
-0.567	-1.694	-0.795	-1.848	-2.107	0.252	-0.588	-1.727	-0.085	-0.298	-0.705
-0.567	0.148	0.360	0.329	-0.374	0.252	-0.316	-0.731	-0.085	0.250	-0.705

Latent Variables Standardised Scores

Table C.4

ELES CL-MIM Latent Variables Standardised Scores II

Instructor Pedagogical Efficacy Need Perception	Interaction Enabler	Learner Satisfaction	Learning Context Importance and Requirement	Networking & Collaboration	Pedagogy -	Perception of Collaboration Enhancement	Perception of Emotional Intelligence Enhancing Engagement	Perception of Enhancement of Self-direction /Independent-Learner	Perception of Improved Learner Experience	Perception of Organisational Capability Development	Perception of Privacy Importance	Socially Driven Learning Enhancement	Transformation, Scope and Scale
0.280	1.126	0.319	0.931	0.518	0.046	0.007	0.558	0.116	0.284	0.761	0.745	1.225	0.226

1.613	0.548	0.319	0.931	0.221	-1.453	0.148	1.139	0.116	1.344	0.048	-0.115	1.225	0.657
1.613	0.548	0.319	0.931	0.518	-0.336	-0.564	0.558	0.116	1.344	0.048	0.745	0.120	-0.299
0.280	0.548	0.319	0.250	0.174	0.230	0.577	-0.691	0.116	-0.777	0.048	-0.115	0.120	0.226
0.310	-1.150	-0.832	-0.488	-0.175	-0.706	0.577	-0.022	-1.060	-0.777	-1.340	-0.974	0.120	-0.252
0.280	0.548	0.319	0.250	0.174	-0.341	-0.705	0.558	-1.060	0.284	0.048	1.604	0.120	0.226
-1.052	0.567	0.319	-1.794	-1.097	-0.996	-0.705	-3.191	-1.060	-0.777	-1.340	-0.115	0.120	-0.299
-1.052	0.548	0.319	0.250	0.518	0.217	0.007	-0.022	0.116	0.284	0.048	-0.974	0.120	-0.299
0.280	-1.728	-0.832	0.250	-0.184	0.230	1.860	-1.272	0.116	-0.777	0.048	0.745	1.225	-0.731
1.613	-0.590	0.319	0.931	0.871	0.512	0.007	0.648	1.293	0.284	1.437	1.604	0.120	0.657
0.280	1.107	1.470	0.250	-0.184	0.507	-0.135	0.558	1.293	0.284	0.012	0.745	0.120	0.657
-1.052	0.548	0.319	0.987	0.518	0.507	-0.705	0.558	1.293	1.344	1.437	-0.974	0.120	-0.204
-0.401	0.548	-0.832	-0.431	0.174	-0.996	0.577	-0.691	-1.060	-0.777	-0.628	-0.115	-0.984	-0.635
0.280	1.107	0.319	0.250	0.518	0.507	0.577	0.558	0.116	0.284	0.048	0.745	0.120	0.226
0.932	-1.728	1.470	0.987	-1.480	-0.625	-1.988	-0.602	1.293	1.344	1.437	-0.974	1.225	0.178
0.280	-0.571	0.319	-1.169	0.518	-1.669	-0.564	-0.022	0.116	0.284	0.048	1.604	-3.193	1.135
0.280	-0.590	0.319	0.250	0.518	0.507	0.577	-1.941	0.116	-0.777	-0.664	0.745	-0.984	0.226
-0.401	-0.590	0.319	0.250	0.165	-0.065	-0.705	-0.691	0.116	0.284	0.048	-0.974	0.120	0.226
-1.052	-0.590	0.319	0.250	-0.834	0.507	0.007	1.228	0.116	0.284	0.048	-0.974	0.120	0.657
0.280	-0.012	0.319	0.250	0.212	0.230	0.577	-0.022	0.116	0.284	0.048	-0.115	0.120	-0.252
-0.371	-0.590	0.319	0.250	-0.520	-1.940	-0.705	-0.691	0.116	0.284	0.048	-0.974	0.120	-1.733
-2.385	-2.866	-1.983	-3.325	-2.539	-2.499	-1.988	-3.191	-3.412	-2.898	-3.405	-1.834	-3.193	-3.073

					-								
0.280	0.548	0.319	-0.431	-0.481	0.148	-0.705	-0.022	0.116	0.284	0.048	0.745	0.120	-0.778
1.613	1.685	1.470	1.668	1.870	2.009	1.860	1.808	1.293	1.344	1.437	1.604	1.225	1.661
					-								
0.280	0.548	0.319	0.250	0.862	0.046	0.719	0.558	0.116	0.284	0.048	-0.974	0.120	-0.252
0.280	0.548	0.319	0.250	0.871	0.507	0.577	0.558	0.116	1.344	0.761	-0.115	1.225	1.182
-0.401	0.548	0.319	-1.169	0.169	0.230	0.577	-0.111	-1.060	-1.838	-1.340	-0.974	-0.984	-0.204
0.280	0.528	0.319	0.250	-0.825	0.507	0.007	-0.602	-1.060	-1.838	-1.340	-0.974	-2.089	-0.204
					-								
0.280	-0.031	0.319	0.250	-0.171	0.046	-0.564	-0.111	0.116	0.284	0.048	-0.974	0.120	0.226
					-								
-3.717	-2.866	-3.134	0.250	-2.577	3.437	-3.270	-2.030	-2.236	-2.898	-1.376	1.604	-3.193	-3.598
1.613	-0.012	0.319	0.931	0.952	1.349	-1.417	0.558	1.293	1.344	0.725	-0.974	1.225	0.131
					-								
-1.052	0.548	-3.134	-0.488	0.169	0.340	-0.705	-1.941	0.116	-1.838	1.437	-0.974	0.120	0.178
0.250	1.107	1.470	0.931	1.177	1.451	1.860	0.648	1.293	0.284	1.437	-0.974	0.120	1.661
0.280	0.548	0.319	0.250	0.518	0.507	0.577	0.558	0.116	0.284	0.048	0.745	0.120	0.752
-1.052	1.685	1.470	1.668	1.870	1.733	1.860	1.808	1.293	1.344	1.437	-1.834	1.225	1.661
					-								
-1.052	-0.590	-0.832	-1.169	-0.834	0.996	-0.705	-1.361	-1.060	-1.838	-1.340	-0.115	0.120	-1.208
0.280	0.548	0.319	0.250	0.518	0.507	0.577	-0.022	0.116	0.284	0.048	-0.974	0.120	0.226
0.280	-0.590	-0.832	0.250	-0.834	0.507	-0.705	0.558	0.116	0.284	0.048	-0.115	0.120	-1.208
					-								
-1.052	-0.012	1.470	0.250	-0.137	0.330	1.289	-0.691	0.116	0.284	-0.664	-0.115	1.225	1.182
					-								
0.962	-1.150	-0.832	-0.431	0.169	0.612	-0.847	0.558	0.116	-0.777	0.048	-0.115	0.120	0.178
					-								
0.280	-0.012	-0.832	-0.488	-0.137	0.706	0.007	0.558	0.116	0.284	-0.664	-1.834	0.120	-0.730
0.280	0.548	0.319	0.250	1.220	0.507	0.577	0.558	0.116	1.344	0.048	-0.974	0.120	0.657
					-								
-1.052	-0.012	-0.832	-1.169	-1.536	0.989	-0.705	-0.691	-1.060	-0.777	-1.340	-0.115	-0.984	-1.208

-1.052	-1.169	-0.832	-1.906	-0.179	-0.443	-1.988	-1.361	-1.060	-1.838	1.437	0.745	-0.984	-1.687
0.280	-1.150	0.319	0.931	-0.524	-1.645	-1.988	-0.111	0.116	-0.777	-0.628	-0.974	0.120	-1.781
0.280	0.528	1.470	0.250	1.525	-0.725	1.860	0.558	0.116	-0.777	1.437	-0.974	1.225	1.135
1.613	-0.012	-1.983	0.250	0.518	0.507	-0.564	-0.691	0.116	-0.777	0.048	-0.115	0.120	-1.208
-1.052	-1.728	-1.983	0.250	-2.186	-0.336	-1.988	-0.781	-2.236	-1.838	-1.304	-0.974	0.120	-0.635
0.280	-1.169	-0.832	0.250	-0.873	-0.443	0.577	-1.361	0.116	-0.777	0.048	1.604	1.225	-1.592
-1.052	-1.728	-0.832	-1.169	-1.183	-0.996	0.577	-0.691	-1.060	-1.838	-0.628	-0.115	-2.089	-0.778
-0.401	0.548	0.319	0.250	0.174	-0.052	0.577	-0.691	-1.060	-0.777	-1.340	0.745	-0.984	0.226
-1.052	0.548	0.319	-0.431	-0.141	-0.895	-0.705	-0.022	0.116	0.284	0.048	-0.115	0.120	0.226
-1.052	-0.031	0.319	-1.169	-0.834	-0.996	-0.564	0.558	-1.060	0.284	-0.628	-0.974	-0.984	-0.730
0.280	1.685	0.319	0.931	1.172	0.507	0.577	1.139	0.116	1.344	0.725	-0.115	-0.984	1.135
-0.401	1.685	1.470	0.987	1.870	-0.046	0.577	0.558	1.293	0.284	0.725	-0.974	1.225	0.657
0.280	0.548	0.319	0.250	0.518	0.507	0.577	-0.111	0.116	0.284	0.048	0.745	0.120	0.226
0.280	1.126	-1.983	-0.431	0.561	1.073	0.577	1.139	0.116	0.284	0.725	-0.115	1.225	0.273
1.613	1.685	1.470	0.250	0.914	0.796	0.436	-0.022	0.116	0.284	-0.664	1.604	1.225	1.661
0.280	-0.571	0.319	-1.112	-0.524	-1.556	-1.276	-0.111	0.116	-0.777	0.048	-0.115	0.120	-0.731
0.280	0.548	0.319	0.250	0.518	0.507	0.577	-0.111	0.116	1.344	0.048	0.745	0.120	0.226
0.932	-0.590	-0.832	0.987	-0.188	-0.714	0.577	0.558	0.116	0.284	1.437	-0.974	-0.984	-0.204
0.280	1.107	0.319	0.250	0.518	0.783	0.577	-0.200	0.116	0.284	0.725	0.745	1.225	1.230
1.613	1.126	1.470	1.668	-0.132	2.009	-0.135	1.808	1.293	1.344	0.761	-1.834	0.120	1.661

-1.052	0.548	0.319	0.250	0.518	0.230	0.577	0.558	0.116	0.284	-0.664	-0.115	0.120	0.226
0.280	-0.012	-0.832	-0.431	0.165	-0.148	-0.135	-0.022	0.116	0.284	-0.628	-0.115	0.120	0.704
1.613	1.685	1.470	1.668	1.870	2.009	1.860	1.808	1.293	1.344	1.437	1.604	1.225	1.661
-0.371	0.548	0.319	0.250	-0.094	0.225	1.148	0.558	0.116	0.284	0.048	0.745	0.120	0.657
-0.371	0.548	0.319	0.250	0.518	0.507	0.577	0.558	0.116	0.284	0.048	0.745	0.120	0.226
-3.717	-1.188	-3.134	-4.006	-0.748	-0.323	-3.270	-3.191	0.116	-2.898	-2.089	0.745	-3.193	-1.350
-0.371	0.548	0.319	0.250	-0.175	0.072	0.577	-0.022	-1.060	0.284	-0.628	0.745	0.120	-0.252
0.280	-1.728	0.319	-1.112	-0.180	0.507	0.577	-0.691	-1.060	-1.838	-2.729	0.745	-2.089	0.226
0.280	-0.590	0.319	0.250	0.174	0.507	-0.705	0.558	1.293	0.284	0.048	-0.115	0.120	0.226
1.613	-1.728	-0.832	0.987	0.565	0.042	-0.705	-0.691	-1.060	-0.777	0.048	1.604	0.120	0.131
0.280	0.548	1.470	0.250	0.518	0.507	0.577	1.228	0.116	0.284	1.437	-0.974	1.225	0.752
-1.052	-0.590	-0.832	0.250	-0.481	0.230	0.577	-0.022	0.116	-0.777	0.048	0.745	0.120	-0.204
-1.052	-0.590	-0.832	-1.169	-0.834	0.903	0.148	-0.691	-1.060	-0.777	0.085	-0.974	0.120	-0.251
0.962	1.107	0.319	0.250	0.259	0.343	-0.564	1.139	1.293	0.284	0.725	-1.834	1.225	1.182
0.280	0.548	0.319	0.987	0.126	0.230	0.007	0.648	0.116	0.284	1.437	-0.974	0.120	0.705
0.932	1.685	-0.832	0.931	1.870	1.451	0.577	-0.111	0.116	-0.777	0.048	1.604	0.120	0.226
-1.052	0.548	1.470	0.250	1.168	0.507	0.577	1.808	0.116	1.344	0.761	0.745	1.225	1.135
-0.401	0.528	-0.832	-0.431	0.514	0.230	0.007	-1.182	0.116	0.284	-2.089	-0.974	0.120	1.135
-1.052	-0.031	1.470	0.250	-0.175	0.507	1.289	0.558	0.116	-0.777	0.048	-0.115	0.120	0.752
0.280	1.126	0.319	0.250	0.824	0.148	1.289	0.558	0.116	0.284	0.048	-0.974	1.225	0.226
0.280	0.548	0.319	0.250	0.212	0.520	0.577	-0.022	0.116	0.284	0.048	1.604	1.225	0.752
0.280	0.548	0.319	0.250	0.518	0.507	0.577	0.558	0.116	0.284	0.048	0.745	0.120	0.226
0.280	0.548	0.319	0.250	1.870	0.219	1.148	1.808	1.293	0.284	0.725	-0.974	1.225	1.230
1.613	-0.590	-0.832	0.931	-0.477	0.612	-1.135	0.648	-1.060	1.344	0.761	0.745	-0.984	-0.204
0.280	0.548	0.319	0.250	0.165	0.872	-0.564	1.228	1.293	1.344	0.725	0.745	0.120	0.226

0.280	0.548	0.319	-1.169	-0.481	-0.996	1.860	1.228	0.116	1.344	-0.628	-0.974	1.225	1.182
0.280	0.548	-1.983	0.250	-2.186	0.507	0.577	0.558	0.116	0.284	0.048	-0.974	0.120	0.226
-0.401	-0.012	-0.832	-1.906	-1.837	-0.052	0.007	-0.691	-1.060	-1.838	-1.340	-0.115	-0.984	-0.299
0.280	0.548	0.319	0.250	0.518	-0.712	0.577	0.558	0.116	0.284	0.048	-0.115	1.225	0.226
-1.052	-0.012	-0.832	-1.169	0.522	-0.046	-0.705	-0.022	1.293	0.284	0.048	-1.834	0.120	0.178
-1.052	-0.590	-0.832	0.250	0.156	-0.046	0.007	-0.022	0.116	0.284	-0.664	0.745	-0.984	-1.160
0.280	0.548	0.319	0.250	-1.480	-0.210	0.577	-0.022	0.116	0.284	0.048	0.745	0.120	0.226
0.280	-0.590	0.319	0.250	-0.184	-0.148	-0.705	0.558	0.116	0.284	0.048	-0.115	0.120	-0.778
1.613	1.685	1.470	1.668	1.870	2.009	1.860	0.648	1.293	-0.777	1.437	1.604	1.225	1.661
-0.371	1.126	1.470	0.250	1.525	0.595	0.007	1.139	0.116	-1.838	0.725	0.745	1.225	-0.347
-1.052	-0.012	0.319	0.250	0.518	0.230	0.577	-0.691	-1.060	0.284	0.048	1.604	0.120	0.226
-0.371	-1.150	-0.832	0.250	-1.140	0.230	-1.276	-0.691	1.293	-0.777	1.437	-0.115	0.120	-1.208
-1.052	-0.590	-0.832	-1.169	-0.834	-0.719	-0.705	-0.691	-1.060	-0.777	-1.340	-0.115	-0.984	-1.208
-0.371	-2.287	-0.832	-1.906	-1.484	-2.499	-2.558	-2.611	0.116	-0.777	-0.664	0.745	-3.193	-1.304
0.280	0.548	0.319	0.250	0.518	0.507	0.577	-0.022	1.293	0.284	0.761	0.745	0.120	-0.252
-1.052	-0.012	-0.832	0.250	-0.830	0.501	0.577	0.558	-1.060	-0.777	-2.016	-0.974	1.225	0.131
0.280	-0.012	0.319	0.987	-0.145	-0.341	-0.705	-0.602	0.116	0.284	0.085	0.745	0.120	0.226
0.280	0.548	0.319	-0.488	0.212	0.507	0.007	-0.691	-1.060	0.284	0.048	0.745	-0.984	-0.204
-0.371	0.548	0.319	0.250	0.165	-0.719	0.577	0.558	0.116	0.284	0.048	-0.115	0.120	0.610
0.280	0.548	-0.832	-0.431	0.174	-0.046	0.007	-1.361	0.116	0.284	-0.664	1.604	0.120	-0.204
-0.401	-1.150	0.319	0.250	-0.179	-0.802	-0.135	-1.272	-1.060	-0.777	-1.340	-0.115	0.120	0.657

-1.052	-0.590	-0.832	-0.488	-0.184	-0.714	-0.705	-0.691	0.116	0.284	-0.664	0.745	-0.984	-2.212
-1.052	-0.590	-0.832	-0.488	1.220	0.230	-0.847	0.558	0.116	0.284	0.048	0.745	-2.089	0.274
0.310	0.007	1.470	1.668	-0.533	-0.533	0.577	1.808	0.116	1.344	0.012	-1.834	-2.089	1.661
-0.371	0.548	0.319	1.668	0.165	1.078	-0.705	1.228	1.293	1.344	0.761	-0.115	0.120	0.705
0.280	-0.012	0.319	0.250	0.169	0.230	-0.705	0.558	-1.060	0.284	0.048	1.604	0.120	-0.252
0.280	-0.012	0.319	0.250	0.212	0.507	0.007	-0.691	0.116	-0.777	1.437	0.745	0.120	-0.299
0.280	1.126	1.470	0.250	1.177	1.451	0.577	1.139	1.293	1.344	0.761	-0.974	0.120	1.182
-1.052	-0.590	-0.832	-1.169	-0.528	-1.291	-0.705	-0.691	0.116	-0.777	-0.664	-0.115	0.120	-0.778
0.932	-1.150	-0.832	-0.431	-0.524	-1.291	0.007	-0.022	1.293	0.284	1.437	-0.974	1.225	-0.204
0.280	-0.012	0.319	0.250	-0.132	-0.719	0.007	0.558	0.116	0.284	-0.664	-0.115	0.120	0.226
-0.371	-0.012	1.470	0.250	0.518	0.890	-0.564	-0.111	1.293	0.284	0.725	-1.834	0.120	0.704
1.613	1.685	1.470	0.931	1.870	2.009	1.860	1.808	1.293	1.344	1.437	-0.974	1.225	1.661
-0.401	1.685	-0.832	0.250	1.564	-0.347	0.577	-1.941	0.116	0.284	0.761	-1.834	1.225	-0.299
-1.052	-1.728	0.319	1.668	-2.186	-0.341	-1.988	-1.272	0.116	-1.838	1.437	-0.974	-2.089	-1.733
-1.733	-0.012	1.470	0.250	0.518	-0.046	0.577	0.558	1.293	0.284	0.761	0.745	0.120	0.226
1.613	0.548	0.319	1.668	0.518	0.243	0.577	-0.111	1.293	0.284	-0.628	-0.974	0.120	0.226
-1.052	-1.728	0.319	-0.431	0.871	1.167	-1.276	-0.111	-1.060	-0.777	0.725	-0.974	0.120	0.178
0.280	0.548	1.470	0.250	1.220	0.507	0.577	0.558	0.116	0.284	0.048	0.745	0.120	0.657
0.280	-0.590	-0.832	-1.169	-0.834	-0.895	-0.705	-0.691	-1.060	-1.838	0.048	-0.974	0.120	-2.690
1.613	1.685	0.319	1.668	1.870	1.078	1.860	1.808	1.293	0.284	1.437	1.604	1.225	1.661
1.613	0.548	0.319	0.250	0.518	0.507	1.289	-0.022	0.116	0.284	0.048	1.604	0.120	0.657

1.613	1.685	-0.832	-0.431	1.172	-0.430	0.577	-0.111	0.116	-0.777	0.048	-0.974	1.225	0.226
0.280	0.548	0.319	0.250	0.518	0.507	0.577	-0.022	0.116	0.284	0.048	0.745	0.120	0.226
0.250	0.548	-0.832	-0.431	0.165	0.225	0.577	0.558	0.116	0.284	0.048	0.745	-2.089	0.226
0.280	-0.012	-0.832	0.250	0.518	0.507	0.577	-1.272	0.116	0.284	-0.628	-0.115	0.120	-0.299
-1.052	-0.590	-0.832	-1.169	-0.834	-0.996	-0.705	0.558	-1.060	0.284	-1.340	-0.115	-0.984	-0.778
0.280	0.548	0.319	0.250	0.518	0.225	0.007	0.558	0.116	0.284	0.048	-0.974	0.120	-0.299
-0.401	-1.150	-3.134	-0.431	-0.485	0.129	-0.847	-1.941	1.293	0.284	0.048	0.745	0.120	-1.208
0.280	1.126	1.470	1.668	1.870	1.733	0.007	-0.111	1.293	1.344	0.761	1.604	0.120	1.135
1.613	-0.590	-0.832	-0.488	-0.098	0.877	-0.135	0.558	-1.060	0.284	0.048	-0.115	1.225	0.704
-0.401	1.107	0.319	0.987	0.914	0.595	1.289	-1.182	1.293	1.344	0.725	-0.115	0.120	1.182
0.932	0.548	0.319	1.668	0.824	1.066	0.577	-0.781	1.293	0.284	0.761	1.604	0.120	-0.252
-1.022	-0.031	0.319	-1.112	-0.184	-0.349	-0.705	0.648	1.293	-0.777	0.725	0.745	0.120	0.226
-0.371	-1.728	-0.832	-1.112	-1.480	-1.280	-1.417	-0.602	-2.236	-1.838	-1.304	-0.115	-2.089	-0.252
-1.022	1.685	-0.832	0.987	1.521	1.078	0.577	1.228	1.293	0.284	0.725	-0.115	1.225	0.657
0.280	0.548	0.319	0.250	0.174	-0.430	0.577	-0.111	0.116	0.284	0.048	-1.834	-0.984	-0.252
-1.052	-1.150	-0.832	-1.169	-0.881	-0.908	0.007	0.558	0.116	-0.777	0.048	-0.974	-0.984	0.226
0.932	-0.571	-1.983	0.306	-0.795	-0.618	1.860	0.558	-1.060	1.344	0.048	0.745	0.120	0.226
-0.401	-0.571	-3.134	-1.056	-1.226	-1.850	0.577	0.558	-3.412	0.284	-1.304	0.745	-2.089	-0.299
0.280	0.548	1.470	0.250	0.518	0.507	0.577	-0.111	0.116	0.284	0.761	0.745	-0.984	0.226
0.280	-0.012	-0.832	0.250	-0.481	0.507	-0.705	-0.691	0.116	0.284	0.048	-0.115	0.120	-0.204
-0.371	0.567	0.319	0.250	0.174	-0.618	0.577	-0.111	0.116	1.344	0.725	0.745	0.120	-0.251
0.280	-0.012	1.470	-0.431	0.131	0.520	1.860	-0.111	0.116	1.344	1.437	-1.834	0.120	0.610

0.280	-0.012	0.319	0.250	0.518	-1.818	-0.564	-0.111	0.116	-0.777	-0.628	-0.974	1.225	1.135
-1.022	-1.728	1.470	-1.962	-1.880	-1.461	-1.988	0.558	-3.412	0.284	0.048	-1.834	1.225	-0.300
0.280	-0.012	0.319	-0.431	0.212	-0.052	-0.564	-0.111	0.116	0.284	-0.628	1.604	-0.984	-0.683
-0.371	-0.590	0.319	-0.431	-0.184	-0.424	0.577	1.808	0.116	1.344	0.048	0.745	0.120	0.178
-3.066	-2.866	-0.832	-4.006	-3.185	-4.001	-1.417	-1.852	-3.412	-2.898	-4.117	-1.834	-0.984	-1.781
-1.052	-0.031	-0.832	-1.169	0.122	-0.341	-0.705	0.558	-1.060	1.344	-1.340	1.604	1.225	-1.208
0.280	-1.728	-0.832	-0.431	-1.841	-1.453	-1.988	-1.272	0.116	0.284	0.048	-1.834	0.120	-0.394
-3.717	-2.866	1.470	-4.006	-3.538	-4.001	-2.700	0.648	-3.412	-2.898	-4.117	-1.834	-0.984	-4.077
-1.733	-0.012	-0.832	-0.431	-1.536	-0.990	-0.564	-1.941	0.116	-1.838	0.048	-0.974	0.120	-1.781
1.613	0.548	0.319	0.250	0.518	0.507	1.860	0.558	0.116	1.344	1.437	0.745	1.225	1.661
0.280	-0.031	0.319	0.250	-0.184	-0.052	0.577	0.558	-1.060	0.284	0.048	0.745	0.120	0.226
-1.673	1.126	0.319	-0.431	-0.472	0.040	-0.423	0.067	-3.412	1.344	0.725	-0.974	-2.089	-0.347
-0.401	-0.012	0.319	-0.488	-0.490	-0.618	0.577	0.558	0.116	0.284	-1.340	-0.974	0.120	-0.299
-1.052	-0.590	-0.832	-0.431	-0.843	-0.230	-0.135	0.558	-1.060	0.284	-1.340	0.745	-0.984	-0.683
0.280	-0.590	0.319	0.250	0.212	0.507	0.577	0.558	0.116	0.284	0.048	0.745	0.120	0.226
-1.082	-0.590	0.319	-0.431	-1.135	0.225	-0.705	-0.022	-1.060	-0.777	-1.304	-0.115	-2.089	-0.299
0.280	-0.590	-0.832	-0.431	-0.834	0.507	1.860	0.558	0.116	0.284	0.048	-0.115	-0.984	0.752
0.962	1.685	1.470	0.931	1.177	1.733	0.577	1.139	0.116	1.344	0.048	1.604	0.120	1.661
0.280	0.548	0.319	0.250	0.518	0.507	0.577	-0.022	0.116	-0.777	0.048	0.745	0.120	-0.299
-0.401	-1.728	-0.832	-1.169	-0.184	-0.990	-0.705	-0.691	-1.060	-0.777	-0.664	-0.115	-0.984	-1.208

0.280	-0.012	0.319	-1.169	-0.830	-0.624	-0.847	-0.691	0.116	-0.777	-2.052	0.745	-0.984	-1.256
0.280	0.548	0.319	0.250	0.518	0.507	0.577	0.558	0.116	0.284	0.048	0.745	0.120	0.226
-0.401	-0.590	-0.832	-0.431	-0.834	0.230	0.577	-0.111	0.116	-0.777	0.725	-0.115	0.120	-0.252
1.613	1.685	1.470	1.668	1.870	2.009	1.148	0.558	1.293	0.284	1.437	0.745	1.225	1.661
0.280	0.548	0.319	0.987	0.871	0.507	0.577	-0.022	1.293	0.284	0.048	1.604	0.120	0.179
1.613	1.685	1.470	1.668	1.870	2.009	1.860	0.648	0.116	1.344	0.761	1.604	1.225	1.661
0.280	1.107	0.319	-0.431	0.518	0.507	0.577	-0.022	-1.060	0.284	-0.628	0.745	1.225	0.657
-1.052	-0.590	-0.832	-1.169	-0.834	-0.996	-0.705	0.648	-1.060	0.284	-1.340	-0.115	-0.984	-1.208
1.613	-0.609	1.470	1.668	-1.174	-0.530	-0.423	1.808	1.293	1.344	0.761	-0.115	1.225	1.661
0.280	0.548	0.319	0.250	0.518	0.507	-0.564	-1.361	0.116	-1.838	0.048	-0.974	0.120	-1.303
0.280	0.548	0.319	0.250	-0.175	0.230	0.007	-0.691	0.116	1.344	1.437	1.604	0.120	0.657
0.280	-0.590	-0.832	-0.488	-1.527	-1.265	-0.705	-0.691	1.293	0.284	-0.664	0.745	-0.984	-0.731
0.280	-1.728	-0.832	-0.488	-0.175	-1.438	-1.988	-0.022	0.116	0.284	-0.628	0.745	0.120	-0.110
0.280	-0.012	0.319	-1.225	-0.791	0.230	-0.705	-0.111	0.116	0.284	0.048	0.745	0.120	0.226
1.613	-1.728	-1.983	-1.169	-1.841	-1.272	-0.705	-0.691	-1.060	-0.777	0.761	-0.115	0.120	-1.303
0.280	-1.150	0.319	-0.431	0.169	0.217	-0.705	-0.602	0.116	0.284	0.048	-0.974	0.120	-1.687
-1.052	-0.590	-0.832	-0.431	-0.834	-0.341	-0.705	-0.691	0.116	-0.777	0.048	-0.115	0.120	-0.252
1.613	-0.590	-1.983	1.668	-0.094	1.733	-0.705	-1.852	1.293	-0.777	0.725	-1.834	0.120	-0.825
1.613	-0.609	1.470	1.668	-1.174	-0.530	-0.423	1.808	1.293	-0.777	1.437	-0.115	1.225	1.661
0.962	0.548	0.319	0.987	0.824	1.174	0.577	0.558	0.116	0.284	0.725	0.745	0.120	0.226
-1.052	-0.590	0.319	-1.169	-0.834	-0.996	-1.276	-1.941	-1.060	1.344	-1.340	-0.115	-2.089	-1.639
-1.052	-2.306	-0.832	-1.169	-1.226	-0.424	-0.705	-0.691	1.293	-2.898	1.437	-0.974	1.225	0.610

0.280	-0.012	-0.832	0.250	0.518	0.507	-0.705	-0.022	0.116	-0.777	0.048	-0.115	-0.984	-0.730
1.613	0.548	0.319	0.987	1.220	1.349	0.577	1.228	1.293	1.344	0.725	-0.115	0.120	1.230
0.280	-0.571	0.319	0.250	-0.800	0.507	0.007	-0.111	0.116	-0.777	0.048	-0.974	0.120	-1.255
1.613	1.685	1.470	1.668	1.870	2.009	1.860	1.808	1.293	1.344	1.437	1.604	1.225	1.661
0.280	-0.012	0.319	0.931	-0.175	0.507	-0.705	0.558	1.293	0.284	1.437	-0.115	1.225	0.657
-1.052	0.548	-0.832	-1.169	0.518	-0.996	-0.705	-0.691	-1.060	0.284	-1.340	0.745	0.120	-1.208
-0.401	-1.150	0.319	-1.225	-1.183	-1.479	0.007	-3.191	0.116	0.284	-2.052	-0.974	0.120	-1.303
0.280	-0.590	-0.832	-0.431	-0.834	-0.618	0.577	0.558	0.116	0.284	0.048	-0.974	0.120	0.226

CL-MIM Model

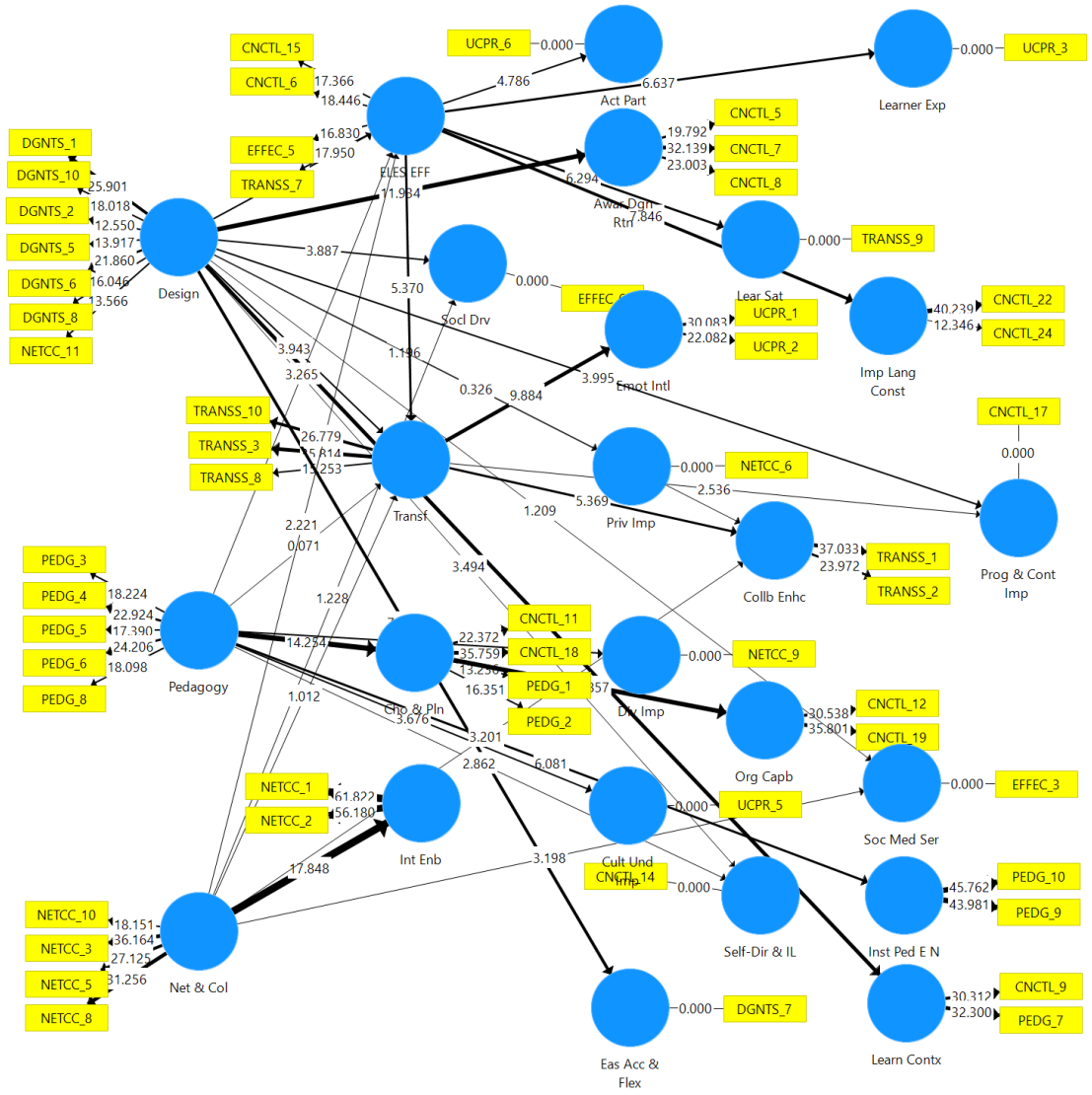

Figure C.4

CL-MIM ELES Effectiveness Structural Model with Significant Paths (t-values)

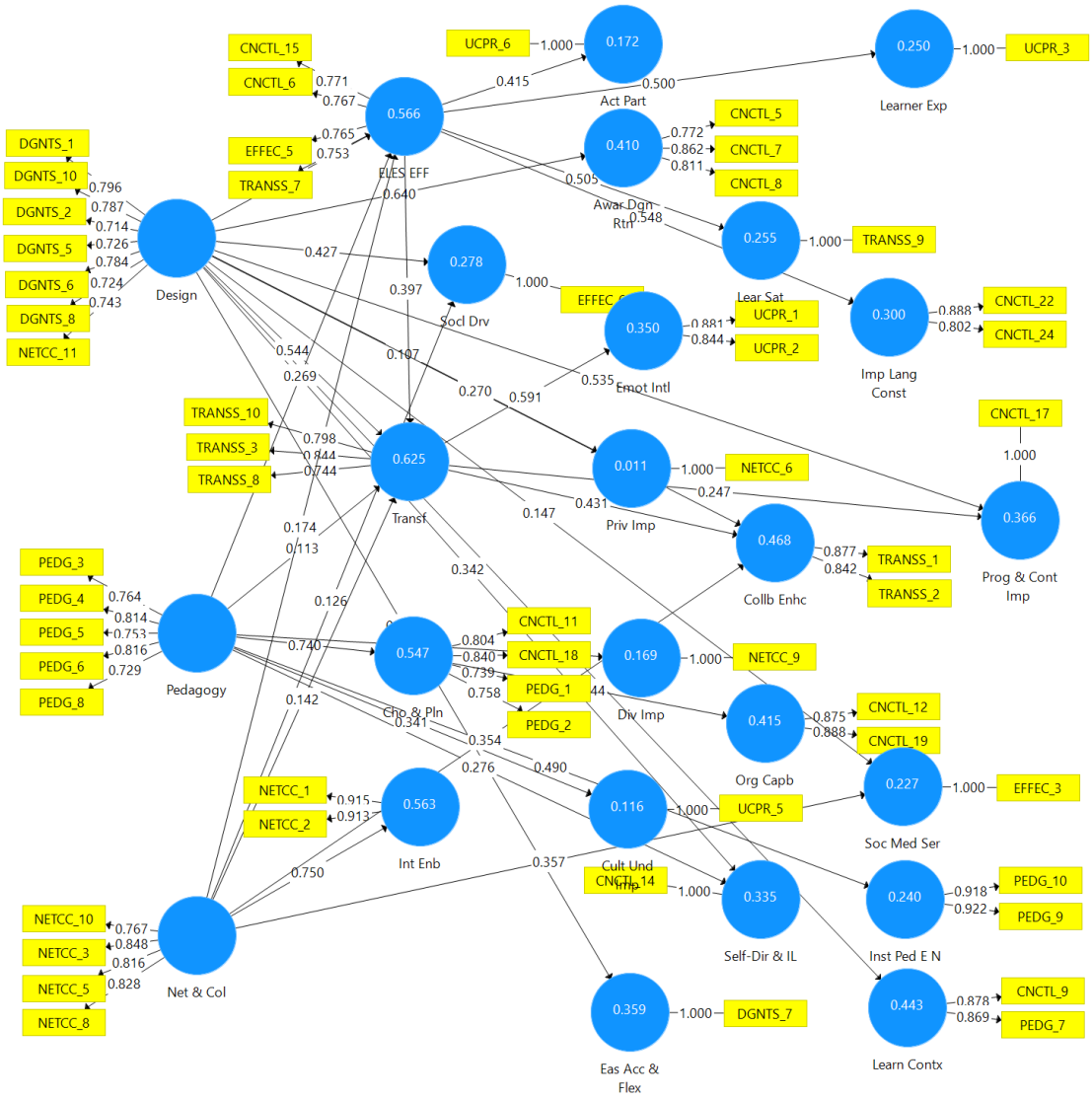

Figure C.2

ELES Effectiveness Structural Model with R^2 values

Appendix D: SmartPLS Usage

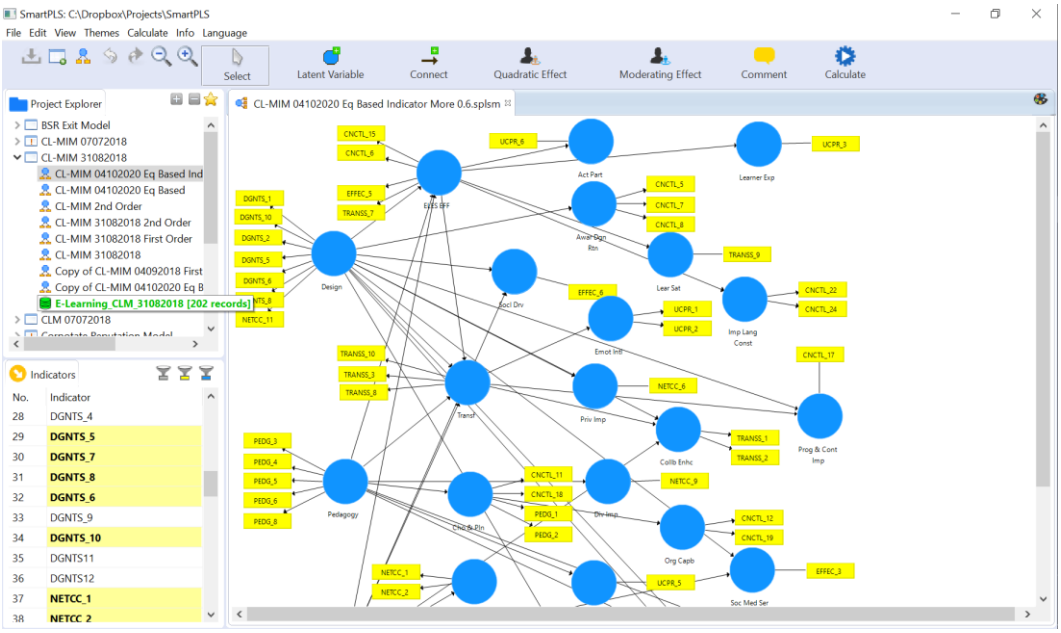

Figure D.1 SmartPLS Usage

Appendix E: Questionnaire, Codification and Consent Form

The questionnaire is divided into 5 sections. The questionnaire aims to address the following sections:

SECTIONS
Section A: xxx.
Section B: General Interviewee Information.
Section C: xxx.
Section D: xxx.
Section E: xxx.

QUESTIONNAIRE: E-LEARNING ENVIRONMENTS AND SERVICES EFFECTIVENESS

This questionnaire is one of the instruments used in a PhD project, carried out by Anwar ul Haq under the principal supervision of Prof George Magoulas at Birkbeck College, University of London.

The aim of the research is to identify the relations between E-Learning Environments and Services (ELES) effectiveness and users' perception towards the utility of these system. This research could potentially contribute towards better design models for ELES from users' perspective, resulting in improved learning process.

The research adheres to the College Ethics Framework and Code of Practice on Research Integrity- details are available online at http://www.bbk.ac.uk/committees/research-integrity - and has received institutional ethics clearance.

The information you provide will be treated in confidence and will only be used for research purposes. The research team aims to disseminate the outcomes of the data analysis in articles and presentations, but at no time you or your institution will be identified.

Please mark the appropriate box with a tick or fill the box.

Survey Start Time:

Survey Finish Time:

Full Name:

Gender/Sex: Male ☐ Female ☐

Age Group: 18 to 25 ☐ 26 to 35 ☐ 36 to 45 ☐ 46 to 55 ☐ 55 to 65 ☐ above 65 ☐

Specify Age (in years):

Email:

(It will help us to contact for the follow up to the response given. For example, if an answer is missed out for a question, then the researcher may contact the contributor to get the answer for that question.)

Education:

Less than high school ☐

High school ☐

Vocational School ☐

Bachelor's degree level ☐

Master's degree level ☐

Above Master's degree or PhD ☐

Other ☐

Occupation: (Select more than one Where applicable)	Student ☐ Academic ☐ Professional ☐ Executive ☐ Entrepreneur ☐ Other ☐
If Student:	Full Time Study ☐ Part Time Study ☐
Demographic Status:	UK/EU student ☐ International student (Non-UK/EU) ☐
UK Institution Name (e.g., university name) - If Student in UK:	
What level you are studying at:	Technical College ☐ Foundation Degree ☐ Bachelor's degree (2 years) ☐ Bachelor's degree (3 or 3+ years) ☐ Master's degree ☐ Above Master's degree or PhD ☐ Continuing Professional Development ☐ Other ☐ Specify (If Other):
At what stage you are in completing your study:	Beginning ☐ Between beginning and middle ☐ Middle ☐ Between middle and end ☐

	End ☐
	Not Applicable ☐
If currently not a student, have you studied in the UK Institution in the last:	1 Year ☐
	2 Years ☐
	3 -5 Years ☐
	6 – 10 Years ☐
	More than 10 Years ☐
	Never ☐
broadband/high-speed Internet access at Home:	Yes ☐
	No ☐
Do you have personal computer access at home:	Yes ☐
	No ☐
Do you have smart mobile phone:	Yes ☐
	No ☐
Experience with Elearning tools and services (For example, Moodle, Blackboard, Lynda, Khan's Academy, Udacity, Coursera):	Less than 6 months ☐
	6 months to one year ☐
	Between one and two years ☐
	Between two and five years ☐
	More than five years ☐
	Not at all ☐
How often do you use Elearning Tools and Services:	About once a day ☐
	Multiple times a day ☐
	About once a week ☐
	Multiple days a week ☐
	About once a month ☐

	About Two or Three times a month ☐
	A few times ☐
	Not at all ☐
Are you currently using institutional Elearning platforms:	Moodle ☐
	Blackboard ☐
	Other ☐
	Specify (If Other):
	Not at all ☐
If Yes above, total number of courses taken:	0 course ☐
	1 course ☐
	2 courses ☐
	3 courses ☐
	4 courses ☐
	5 courses ☐
	More than 5 courses ☐
Are you currently using Massively Open Online Course Platforms:	Coursera ☐
	EdX ☐
	iVersity ☐
	Udacity ☐
	Other ☐
	Specify (If Other):
	Not at all ☐
If Yes above, total number of courses taken:	0 course ☐
	1 course ☐
	2 courses ☐
	3 courses ☐
	4 courses ☐

	5 courses ☐
	More than 5 courses ☐
Are you currently using Online Learning Platforms:	Udemy ☐
	Lynda ☐
	Microsoft Virtual Academy ☐
	Other ☐
	Specify (If Other):
	Not at all ☐
If Yes above, total number of courses taken:	0 course ☐
	1 course ☐
	2 courses ☐
	3 courses ☐
	4 courses ☐
	5 courses ☐
	More than 5 courses ☐
Demographic Origin:	England ☐
	Wales ☐
	N Ireland ☐
	Scotland ☐
	EU ☐
	Europe (Other) ☐
	China ☐
	India ☐
	Asia (exec China and India) ☐
	Far East ☐
	Middle East ☐
	North America ☐
	South America ☐

Africa ☐

Australasia ☐

Specify Country:

In the context of Elearning Environment and Service, please respond by **circling** your agreement or disagreement using the scale given:

Strongly Disagree (1); Disagree (2); Neither Agree nor Disagree (3); Agree (4); Strongly Agree (5)

Appendix E

In this section, we are interested in finding out attitudes towards computers and technology.

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Q1.	I believe working with computers is very difficult.	1	2	3	4	5
Q2.	Working with a computer would make me very nervous.	1	2	3	4	5
Q3.	I feel confident using an application/app over the internet.	1	2	3	4	5
Q4.	I feel confident downloading necessary materials from the Internet.	1	2	3	4	5
Q5.	I feel confident in locating necessary information on the Internet for a specific topic.	1	2	3	4	5

In this section, we are interested in finding out expectations and impressions towards Elearning Environment and Services (*ELES*).

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Q1.	Understanding my own and others' emotional considerations (e.g., feeling shy, confused,	1	2	3	4	5

	eureka moment, happy, confident) in Elearning Environment and Services (*ELES*) will improve my engagement within the environment.					
Q2.	Emotional pictograms (e.g., Smiley, emotional cards) in ELES will improve to convey my feelings during performing an activity.	1	2	3	4	5
Q3.	Understanding Cultural Attitudes (e.g., way people approach each other, body language, choice of words, behaviour in a team environment) towards each other when working within Elearning Environment and Services (*ELES*) will improve my learning experience.	1	2	3	4	5
Q4.	I generally understand the local cultural terms (e.g. references to UK historic figures, social events, sports affiliations) and terminologies in the language used in ELES.	1	2	3	4	5
Q5.	Understanding local cultural terms and terminologies will help me in the effective use of ELES.	1	2	3	4	5
Q6.	Able to add my own content (e.g., as able to do in social media such as Facebook) within the ELES will help my engagement for learning within the environment.	1	2	3	4	5

Q7.	Being able to create order for tasks based on importance to my own learning needs, within ELES is important to me.	1	2	3	4	5

In this section, we are interested in finding out opinions, feelings and experiences regarding the capabilities of the Elearning Environment and Services (*ELES*).

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Q1.	My ELES enable me to collaborate with other learners on the course.	1	2	3	4	5
Q2.	Collaboration with other learners within ELES help me with my studies and learning.	1	2	3	4	5
Q3.	Availability of external social media services within my ELES (e.g., Social media discussion threads/posts, blogs, videos) will help me with my learning and studies.	1	2	3	4	5
Q4.	ELES enable me to choose different settings (e.g., Colour schemes, use of filters, reading aid, reviews) for my learning environment.	1	2	3	4	5
Q5.	Personalising (making changes based on own preferences) the content and environment within ELES helps me with my learning.	1	2	3	4	5

Q6.	More collaborative tools (e.g., discussion boards, notifications, sharing resources, sharing external media) within Elearning Environment will improve my engagement for learning.	1	2	3	4	5

In this section, we are interested in finding out whether Elearning Environment and System (*ELES*) is changing the learning patterns and to what extent.

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Q1.	ELES help me to share my knowledge and ideas within my organisation (e.g., within programme of study, department).	1	2	3	4	5
Q2.	ELES help me to share my knowledge and ideas outside my organisation (e.g., outside programme of study, department).	1	2	3	4	5
Q3.	Use of ELES has increased my capacity for technology use.	1	2	3	4	5
Q4.	I feel comfortable in using similar system to Elearning Systems.	1	2	3	4	5
Q5.	ELES support in teaching and learning.	1	2	3	4	5
Q6.	ELES enable me to track my own progress in terms of results (e.g., grades).	1	2	3	4	5

Q7.	ELES enable me to track my own progress in terms of learning (e.g., learning progress bars, percentage of a task completed).	1	2	3	4	5
Q8.	Being able to track my own progress will encourage me work harder to achieve my learning goals.	1	2	3	4	5
Q9.	I am satisfied with the feedback for assessment tools within my ELES.	1	2	3	4	5
Q10.	Having experience with Elearning Environment and Services will help me in my workplace or job settings.	1	2	3	4	5
Q11.	ELES provide opportunities for people with less formal qualifications to engage with the learning process.	1	2	3	4	5

In this section, we are interested in finding out the perceptions regarding the Elearning Environment and Services (ELES) designs.

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Q1.	ELES enable me to be part of a learning community.	1	2	3	4	5
Q2.	ELES enable me to share my opinions and thoughts on the subject.	1	2	3	4	5

Q3.	ELES enable me to carry forward conversations to other channels such as social media.	1	2	3	4	5
Q4.	ELES is a key instrument for me to get direction for my progress in learning.	1	2	3	4	5
Q5.	ELES enable me to access the course content with ease.	1	2	3	4	5
Q6.	It is important for me to use various tools available within the Elearning environment with ease.	1	2	3	4	5
Q7.	ELES has features to help in finding solutions of common problems/issues with ease when using Elearning environment.	1	2	3	4	5
Q8.	ELES enable me to get feedback on my work effectively.	1	2	3	4	5
Q9.	ELES inform me about organisational policies (e.g. dos and don’ts on saving files on the company/university system).	1	2	3	4	5
Q10.	ELES enable me to find the relevant information easily during the learning activities.	1	2	3	4	5
Q11.	ELES enable me to learn at my own pace (e.g., I can speed up or down the Videos provided).	1	2	3	4	5

Q12.	ELES enable me to learn flexibly (e.g., able to go back to the content any time for my learning).	1	2	3	4	5

In this section, we are interested in finding out your opinion, feelings and experience regarding the Elearning Environment and Services (ELES) Networking and Collaboration capabilities.

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Q1.	Engaging through ELES enable me to interact with more people.	1	2	3	4	5
Q2.	ELES contributes to start productive dialogue with instructor/s.	1	2	3	4	5
Q3.	Elearning Environment enable me to learn together with my peers.	1	2	3	4	5
Q4.	ELES enable me to have a meaningful dialogue with my peers.	1	2	3	4	5
Q5.	ELES provide me opportunity to interact beyond traditional class boundaries.	1	2	3	4	5
Q6.	I am concerned for the privacy when using ELES.	1	2	3	4	5
Q7.	ELES enable me to control the level of privacy when using the system.	1	2	3	4	5

Q8.	ELES enable me to hear/view diverse perspectives when learning together with other members through the Elearning environment.	1	2	3	4	5
Q9.	It is important for me to hear/view diverse perspectives when learning together with other members through the Elearning environment.	1	2	3	4	5
Q10.	ELES enable me to collaborate effectively with different types of people (e.g., different backgrounds, ages or opinions).	1	2	3	4	5
Q11.	ELES enable me to access the course content with ease.	1	2	3	4	5

In this section, we are interested in finding out your opinion, feelings and experience regarding the Elearning Environment and Services (ELES) Learning and Teaching methods.

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Q1.	ELES provide opportunities to make informed choices for my own learning.	1	2	3	4	5
Q2.	ELES provide opportunities to consider consequences of choices made.	1	2	3	4	5
Q3.	ELES inform me for the rationale of the arrangement	1	2	3	4	5

	of the content (e.g., why the content is arranged in a particular order or combination).					
Q4.	ELES inform me on the nature of the content.	1	2	3	4	5
Q5.	I know the purpose of different setting options available to me within Elearning System.	1	2	3	4	5
Q6.	ELES enable me to see the bigger picture on how various component of the content related to each other.	1	2	3	4	5
Q7.	Understanding the relations behind the various components of the content will improve my learning experience.	1	2	3	4	5
Q8.	The tutors/instructors in general use most of the ELES features effectively in the course.	1	2	3	4	5
Q9.	The tutors/instructors in general could improve the planning for the learning experience when using ELES features.	1	2	3	4	5
Q10.	The tutors/instructors in general could improve in explaining the rationale for the arrangement of the content within ELES (e.g., why the content is arranged in a particular order or combination).	1	2	3	4	5

In this section, we are interested in finding out your opinion, feelings and experience regarding the Elearning System functions, purpose and cohesion.

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Q1.	There is enough guidance on privacy issues when collaborating via ELES.	1	2	3	4	5
Q2.	ELES enable me to be an ethical member of the learning community.	1	2	3	4	5
Q3.	Understanding ethical issues when engaging in a learning community will help me with my progression.	1	2	3	4	5
Q4.	I like collaborative learning tools in my ELES space.	1	2	3	4	5
Q5.	There is enough guidance on how to use collaborative learning tools in my ELES space.	1	2	3	4	5
Q6.	Having adequate guidance on how to use the collaborative learning tools in my ELES space is important for my professional development.	1	2	3	4	5
Q7.	The purpose and rationale behind the design of course/s in my ELES is clear to me.	1	2	3	4	5
Q8.	Understanding the purpose and rationale behind the design of course/s in ELES is important for my learning experience.	1	2	3	4	5

Q9.	Providing contextual information for the content will help me with my learning.	1	2	3	4	5
Q10.	ELES provide suggestions on possible planning for learning directions.	1	2	3	4	5
Q11.	ELES provide opportunities to plan my own learning.	1	2	3	4	5
Q12.	Having opportunities to plan my own learning will motivate me to achieve the learning goals.	1	2	3	4	5
Q13.	ELES make me aware of the consequences of my actions in the learning process.	1	2	3	4	5
Q14.	It is important for me to understand the consequences of my actions in the learning process.	1	2	3	4	5
Q15.	ELES make me aware of techniques and methods to carry forward my experience and learning beyond the current course.	1	2	3	4	5
Q16.	ELES enable me to have ownership of my contributions to carry forward beyond the current course (e.g., to other Social Media platforms).	1	2	3	4	5
Q17.	It is important for me to be able to the carry forward my contributions in the ELES beyond the current course.	1	2	3	4	5

Q18.	ELES provide opportunities to become better organiser.	1	2	3	4	5
Q19.	Becoming better organiser is important for my progression.	1	2	3	4	5
Q20.	ELES helps me to be part of a larger learning community beyond my current course.	1	2	3	4	5
Q21.	It is important for me to be part of larger learning community.	1	2	3	4	5
Q22.	I generally understand the typical meanings behind language/terms used within ELES.	1	2	3	4	5
Q23.	I generally understand the hidden meanings behind language/terms used within ELES.	1	2	3	4	5
Q24.	It is important for me to understand the context of the language/terms used within ELES.	1	2	3	4	5

Any Other Comments:

Thank You for Completing the Survey, your contribution is highly valued and appreciated.

Please do the final check that all the questions are answered.

Codification of Questionnaire questions/items in SPSS and SMART PLS is done as follow:

Table E.1

Questionnaire Questions/Items Coding for SPSS and SmartPLS

Questionnaire Section Heading	Question Numbers (SmartPLS Codification)	Question Codes
In this section, we are interested in finding out attitudes towards computers and technology.	Q1 (Q3_1); Q2 (Q3_2); Q3 (Q3_3); Q4 ((Q3_14); Q5 (Q3_5)	Q3_1; Q3_2; Q3_3; Q3_4; Q3_5
In this section, we are interested in finding out expectations and impressions towards Elearning Environment and Services (*ELES*).	Q1 (UCPR_1); Q2 (UCPR_2); Q3 (UCPR_3); Q4 (UCPR_4); Q5 (UCPR_5); Q6 (UCPR_6); Q7 (UCPR_7)	UCPR1; UCPR2; UCPR3; UCPR4; UCPR5; UCPR6; UCPR7
In this section, we are interested in finding out opinions, feelings, and experiences regarding the capabilities of the Elearning Environment and Services (*ELES*).	Q1 (EFFEC_1); Q2 (EFFEC_2); Q3 (EFFEC_3); Q4 (EFFEC_4); Q5 (EFFEC_5); Q6 (EFFEC_6)	EFFEC1; EFFEC2; EFFEC3; EFFEC4; EFFEC5; EFFEC6
In this section, we are interested in finding out whether Elearning Environment and System (*ELES*) is changing the learning patterns and to what extent.	Q1 (TRANSS_1); Q2 (TRANSS_2); Q3 (TRANSS_3); Q4 (TRANSS_4); Q5 (TRANSS_5); Q6 (TRANSS_6); Q7 (TRANSS_7); Q8 (TRANSS_8); Q9 (TRANSS_9); Q10 (TRANSS_10); Q11 (TRANSS_11)	TRANSS_1; TRANSS_2; TRANSS_3; TRANSS_4; TRANSS_5; TRANSS_6; TRANSS_7; TRANSS_8; TRANSS_9; TRANSS_10; TRANSS_11

In this section, we are interested in finding out the perceptions regarding the Elearning Environment and Services (ELES) designs.	Q1 (DGNTS_1); Q2 (DGNTS_2); Q3 (DGNTS_3); Q4 (DGNTS_4); Q5 (DGNTS_5); Q6 (DGNTS_6); Q7 (DGNTS_7); Q8 (DGNTS_8); Q9 (DGNTS_9); Q10 (DGNTS_10); Q11 (DGNTS_11); Q12 (DGNTS_12)	DGNTS_1; DGNTS_2; DGNTS_3; DGNTS_4; DGNTS_5; DGNTS_7; DGNTS_8; DGNTS_6; DGNTS_9; DGNTS_110; DGNTS_11; DGNTS_12
In this section, we are interested in finding out your opinion, feelings and experience regarding the Elearning Environment and Services (ELES) Networking and Collaboration capabilities.	Q1 (NETCC_1); Q2 (NETCC_2); Q3 (NETCC_3); Q4 (NETCC_4); Q5 (NETCC_5); Q6 (NETCC_6); Q7 (NETCC_7); Q8 (NETCC_8); Q9 (NETCC_9); Q10 (NETCC_10); Q11(NETCC_11)	NETCC_1; NETCC_2; NETCC_3; NETCC_4; NETCC_5; NETCC_6; NETCC_7; NETCC_8; NETCC_9; NETCC_10; NETCC_11
In this section, we are interested in finding out your opinion, feelings and experience regarding the Elearning Environment and Services (ELES) Learning and Teaching methods.	Q1 (PEDG_1); Q2 (PEDG_2); Q3 (PEDG_3); Q4 (PEDG_4); Q5 (PEDG_5); Q6 (PEDG_6); Q7 (PEDG_7); Q8 (PEDG_8); Q9 (PEDG_9); Q10 (PEDG_10)	PEDG_1; PEDG_2; PEDG_3; PEDG_4; PEDG_5; PEDG_6; PEDG_7; PEDG_8; PEDG_9; PEDG_10
In this section, we are interested in finding out your opinion, feelings and experience regarding the Elearning System functions, purpose, and cohesion.	Q1 (CNCTL_1); Q2 (CNCTL_2); Q3 (CNCTL_3); Q4 (CNCTL_4); Q5 (CNCTL_5); Q6 (CNCTL_6); Q7 (CNCTL_7); Q8 (CNCTL_8); Q9 (CNCTL_9); Q10	CNCTL_1; CNCTL_2; CNCTL_3; CNCTL_4; CNCTL_5; CNCTL_6; CNCTL_7; CNCTL_8; CNCTL_9; CNCTL_10; CNCTL_11; CNCTL_12; CNCTL_13;

	(CNCTL_10); Q11 (CNCTL_11); Q12 (CNCTL_12); Q13 (CNCTL_13); Q14 (CNCTL_14); Q15 (CNCTL_15); Q16 (CNCTL_16); Q17 (CNCTL_17); Q18 (CNCTL_18); Q19 (CNCTL_19); Q20 (CNCTL_20); Q21 (CNCTL_21); Q22 (CNCTL_22); Q23 (CNCTL_23); Q24 (CNCTL_24)	CNCTL_14; CNCTL_15; CNCTL_16; CNCTL_17; CNCTL_18; CNCTL_19; CNCTL_20; CNCTL_21; CNCTL_22; CNCTL_23; CNCTL_24

CONSENT FORM

Title: An investigation of the success factors playing key role for the design and adoption of contemporary Elearning Environments and Services

The research investigates the success factors playing key role for the design and adoption of contemporary Elearning Environment and Services. As the result of the research study a framework for the better adoption of Elearning Environment and Services will be proposed and validated.

Researcher Name and position:

Anwar ul Haq, PhD Candidate, Department of Computer Science and Information Systems, Birkbeck College, University of London. Malet Street, London WC1E 7HX, 020 7631 6700

	Please put your initials in the box, for example DP will be written for David Price.
1. I have been informed about the nature of this study and willingly consent to take part in it.	
2. I understand that I may withdraw from the study at any time.	
3. I am over 16 years of age.	

	Please tick in the box	
	Yes	No
4. I agree, to participate willingly in this Interview/Focus Group/Survey.	☐	☐
5. I agree to the use of anonymised quotes (if required) in the published study.	☐	☐

Participant Name: Date: Signature:

Researcher Name: Date: Signature:

Appendix F: Ethics Approval

Proposal Form for Ethical Review

Name(s) of applicant	Anwar ul Haq
Status (e.g., Lecturer, PhD Student)	PhD Student
Supervisor(s)	Prof George Magoulas
Department	Department of Computer and Information Systems
Project status (e.g., doctorate, individual staff research)	Doctorate
Funding source	Self
Project Title	**An investigation of the success factors playing key role for the design and adoption of contemporary Elearning Environments and Services.**

Attachments:
Indicate the attachments enclosed with this form (please tick boxes):

Information sheet: ☐ Consent Form: ☐ Questionnaire: ☐ Data ☐ Management plan

Description and rationale of proposed project:

The research investigates the success factors playing key role for the design and adoption of contemporary Elearning Environment and Services. As the result of the research study a framework for the better adoption of VLE will be proposed and validated.

A part of the study involves conducting a survey with 800 participants using an appropriate questionnaire. Another part of the investigation involves use of secondary data from the open sources such as Financial Times MBA blogs and related blogs to the domain of the research study.

Participants (who: inclusion and exclusion criteria, how many, how identified and recruited?) & Methods (how will the data be analysed?):

Primary Data Collection: The participants will be chosen from UK universities with the age range from 18 to 65 years. The criteria for the selection of the participants is that they are currently using VLE as part of their study or have used the similar platform in the past. The data will be collected using both the paper format and online tools such as Qualtrics to gather survey data.

Secondary Data Collection: The user blogs will be used from the open access sources with no restriction imposed. In case of restrictions, necessary permissions will be obtained for the use of secondary data for the research purposes. All the user information will be anonymized in the published work.

Mixed method approach will be used.
The quantitative data generated using the questionnaire will be analysed used Confirmatory Factor Analysis (Structural Equation Modelling approach).
The qualitative data generated for the comments will be analysed using appropriate analytical techniques such as Content Analysis.

Summary of the Ethical Issues:

The research data will be used only for the research purpose indicated above.
The publication based on the collected data will not contain any information related to research participants to reveal the individual identity.

All the personal data will be safely and securely discarded after the research investigation according to the Data Protection Act 1998.

All electronic documents related to the research work will be put under secure code on researcher's computer and using password protected files. All data with identifying information will be kept in a locked cabinet.

The participants of the survey will be made aware of the purpose of the research study. Information in relation to the research will be provided in the header of the questionnaire.

A consent form will be provided to each participant of the survey.

Other Questions:

Does this include vulnerable individuals or groups? No
If yes, what extra safeguards will you introduce?

Are there any risks to participants or third parties? No
If yes, how will this risk be minimized?

Are there any risks to researchers? No
If yes, how will the researchers be supported?

Is feedback to participants part of the research design No
If yes, have you considered how this will be managed within your ethical framework?

If you have an advisory board do you have a process to identify and manage conflicts of interest? No
If yes, how?
N/A

Is there an international part to the research? No
If yes, does this raise any additional ethical issues?

NB there may be uncertainty associated with some of these answers. Please explain any such uncertainty here: e.g., Q1: participants online, cannot fully assess their vulnerability
N/A

Classification of project *(please circle)*:
SENSITIVE / EXTREMELY SENSITIVE / ROUTINE

Signed by:

The applicant: Anwar ul Haq…….. Date: 04/03/2018…….

Supervisor (if applicable): Prof George Magoulas…… Date: 05/03/2018…….

Departmental Research Ethics Officer: Dr Andrea Cali… Date: 20/03/2018…….