A case study of critical success factors for the implementation a digital learning ecology in a national transport body from a stakeholder perspective.

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List of abbreviations and acronyms

A.I.	Artificial Intelligence
CAI	Computer aided instruction
CSF	Critical success factor
GDPR	General Data Protection Regulations
GST	General systems theory
HR	Human resources
ICT	Information & communications technology
I.T.	Information technology
KPI	Key performance indicator
LMS	Learning management system
MOOC	Massive open online course
NGDLE	Next generation digital learning environment
STS	Sociotechnical systems (theory)
TEL	Technology enhanced learning
UK	United Kingdom
USA	United states of America

Abstract

This Interpretive organisational case study examines the critical success factors for the development of a digital learning ecology in a national transport body. Data collected through semi structured interviews and focus groups with 26 participants was used to discern the views of different stakeholder groups, managers, instructors and end-users regarding e-learning and development of a digital learning ecology, to determine what roles these groups can play and identify their requirements in the development of a digital learning ecology. Five themes affecting the development of the digital learning ecology were extracted from the research data using Braun and Clarke's thematic analysis; Learner-related factors, Instructor-related factors, Organisation factors, Technology-related factors, and Design for digital learning. This study confirms existing research regarding factors among stakeholders critical to the successful implementation of e-learning and a digital learning ecology, such as social presence as the concern for learners, learner motivation as a critical factor for instructors, and for the organisation perhaps the most critical factor of all, to ensure the right technology is put in place in an environment that supports learning. Research shows that limited instructor utilisation of LMS as negatively impacting learners' use and identifies comprehensive training for instructors and learners as key to overcoming barriers of resistance to the acceptance and use of a system. Users identified interoperability with other systems as a critical factor in this national transport body much like a next generation digital learning environment, a loosely coupled collection of applications, software, and tools, this would appear to be an attractive application of more advanced cloud-based tools and applications for the variety of requirements reported by study participants.

Chapter 1: Introduction

1.1 Introduction

This chapter describes this research study, what it is about, why this topic was chosen and what is hoped to be achieved. It also outlines the layout of the overall dissertation. This study is situated within an adult education workplace environment of a national transport body.

1.2 Background and Rationale

Technology continues to rapidly change the ways in which we facilitate learning, interaction and communication and, more recently, the Covid-19 global pandemic has created the necessity to further seek new ways to teach and learn which ensure the safety of all involved.

This national transport body comprises a diverse workforce, across a wide age range, countrywide geographic locations, with varied educational backgrounds, unique abilities, challenges and preferences regarding how they learn and participate. Training resources, course materials and assessment strategies are fragmented, with individual trainers creating and storing some materials, while others are stored on an under-utilised SharePoint document system.

My research focus began by wondering if I could establish if the integration of technology such as a learning management system or e-learning platform would be fit for purpose in relation to learning and professional development in a national transport body. The introduction of a Learning Management System (LMS) could allow learners to engage in e-learning in their own time, at their own speed while still being connected to a community of learners. It would also greatly reduce the need for people to travel to Dublin to undertake many of the current training requirements in place.

The concept of e-learning is subject to constant modification, it can be referred to as either web-based learning or technology-enhanced learning (TEL) and the delivery of anytime, anywhere training courses over the web to anyone who has access to the internet using electronic devices as tools to participate. Its history is relatively brief and typified by rapid growth and change in technological advancement (Tynjala & Hakkinen, 2005). This rapid advancement is also one of its'

biggest challenges as illustrated by its' many terms and acronyms such as online learning, remote learning, virtual learning, blended learning etc.

Many studies have been carried out regarding the use of learning management systems to manage learning and e-learning and many studies focus on technical aspects like evaluating usefulness or ease of use of such systems (Garavan et. Al, 2010, Chugh et al, 2018 and Farid et al, 2018), many studies focus on the user experiences of teachers, learners or ICT professionals in educational settings such as universities (Almarashdeh, Sahari, Zin, & Alsmadi, 2011, Choudhury & Pattnaik, 2020, Bhuasiri et al., 2012), however fewer studies exist about the user experiences of workers in an organisational environment and this study will contribute further to this area.

Research shows that there are substantial barriers to the implementation of E-learning (Mungania, 2003). These barriers are diverse and can be classified as personal, situational, instructional, organizational and technological.

Khan (2003) states "I have come to understand that e-learning represents a paradigm shift not only for learners, but also for instructors, trainers, administrators, technical and other support services staff, and the institution". Khan's e-learning framework provides details of important issues which may impact an e-learning implementation process and is composed of eight dimensions: institutional, management, pedagogical, technological, interface design, ethical, evaluation, and resource support.

1.3 Purpose of this study

This research will identify the critical success factors for the development of a digital learning ecology along with the requirements of stakeholders across the organisation and focusses on the perspectives of managers, instructors and staff. I believe that identifying requirements specific to varied stakeholders ie. senior management and organisational objectives, training team requirements and common end user issues such as ease of use and accessibility can help to source a solution that achieves the most cohesive fit between technology, the organisation and all stakeholders.

1.4 Research question

What are the critical success factors for the development of a digital learning ecology in a national transport body?

Sub questions

- What are the attitudes of different stakeholder groups toward e-learning and the development of a digital learning ecology?
- What are the potential roles of different stakeholder groups in the development of a digital learning ecology?
- What are the requirements of different stakeholder groups in the development of a digital learning ecology?

1.5 Aim and objectives

The aim of this research study is to explore factors critical to the successful implementation of a digitally driven learning and development ecology from the perspective of its' stakeholders. Identifying these factors in advance of an implementation will manage risk and increase probability of a successful outcome.

The objectives of this research study are:

- To determine the attitudes of management, instructors and staff towards e-learning and the development of a digital learning ecology through the thematic analysis of data collected through semi-structured interviews and focus groups.
- To determine the potential role of management, instructors and staff in the successful implementation of a digital learning ecology through the thematic analysis of data collected through semi-structured interviews and focus groups.
- To determine the requirements of management, instructors and staff for the development of a digital learning ecology through the thematic analysis of data collected through semi-structured interviews and focus groups.

1.6 Overview of methodology

This is a qualitative inductive case study to discover the critical factors that may influence the successful implementation of a digital learning eco-system in a national transport body workplace setting. Ewings et al. (2003) believe that qualitative research is usually richer, more complete, and more revealing than that which can be obtained through quantitative questionnaires. This research adopts a constructivist / Interpretive approach, with a relativist and subjectivist ontology and epistemology. As perceptions are intangible and unconscious, I believe a qualitative, inductive approach is needed to obtain rich descriptive data from participants and an interpretative approach is needed to analyse those descriptions to determine perceptions.

This Interpretive organisational case study uses data collected through the use of three semi-structured interviews and three focus groups with employees using non-probability purposive voluntary sampling and thematic analysis. Bryman (2012, p. 66) states that a case study is the "detailed and intensive analysis of a single case". As my research aims to explore how individuals across all levels of an organisation view the use of technology and their experiences of interaction with technology for the purpose of learning and development, a single case study was determined to be appropriate to obtain relevant insights. This approach also allowed me to examine a broader range of views within research participants by triangulating data sources, ensuring that issues and factors examined are supported by more than a single source of evidence. (Yin, 2009).

This study followed a step-by-step guide for researchers by Rashid, Rashid, Warraich, Sabir, & Waseem, (2019) which detailed a checklist of four phases which helped to provide a map for this study, it begins with identification of the researchers' philosophical paradigm through the examination of ones' worldview based on ontological and epistemological beliefs, next decide upon either a quantitative or qualitative inquiry technique, then finalise case study protocols through an ethical review application process, next is the fieldwork phase where the researcher must establish contact and rapport with participants and utilise tools such as semi structured interviews to collect data and lastly the reporting phase which should detail both case and participant descriptions, protocols, interpretation and analysis of findings and any conclusions drawn.

1.7 Significance of the study

The term LMS is fast becoming defunct and being replaced by next generation digital learning environments (NGDLEs) not a single application like Moodle or Blackboard (although these could be included components) but an ecology or eco-system. Brown, Dehoney, & Millichap, (2015) believe these environments will be characterised by a confederation of IT Systems including content libraries, engines and varied applications with high degrees of interoperability, supported by standards for managing data and content. It will support a high degree of personalisation for learners and institutions whom by using different cloud based I.T. systems and self-selected applications will build to their own requirements using a 'lego' approach similar to a smartphone user installing apps on a device.

The future for NGDLEs is immense, with the potential to move traditional LMS toward an ever-more learner-centric environment that focusses on the needs of the learner and their experience first and foremost. These could facilitate learning, training and development not just within an organisation but globally, and instructors and system designers should be collaborating now in order to fulfil this future potential and help create these environments. I hope that this study is my first step towards such a collaboration.

This study identifies the culture of a large, unionised organisation as a critical factor in successful integration of technology, as issues of lack of trust between management and staff can play a significant role in the successful deployment of technology and technologically advanced learning tools such as smart devices. This suggests opportunities for further research.

1.8 Limitations of the study

Qualitative research has its' limitations; It is time consuming with higher researcher interaction; it can be difficult to generalise; smaller sample sizes may not be a true representation of the population when not randomly selected; reliability and validity of results depend on the researchers' skill, experience and biases and may have less credibility (Askarzai & Unhelkar, 2017).

As this research study is based on a single case study it could be argued that it will be more difficult to generalise, although a case study reveals richer, deeper data relating to the understanding of individuals. Not all aspects of this case study can be applied to other contexts however the results are likely to apply to other large national organisations considering the transformation of a learning and development function through the adoption of a digital learning technology or platform. O'Leary (2017) discusses how few studies are conducted in an ideal environment, there are always limitations, i.e., time, financial resources, recruitment of participants, researcher bias.

1.9 Role of the researcher

The author of this research is a trainer within the environment where this research takes place, in this respect this researcher has a dual role both as interviewer and insider. This insider role provided the accessibility to interview participants however it was necessary to ensure therefore that participants did not feel pressured to participate due to my role. As a qualitative researcher, I also influence the research process through social interaction with study participants, which is required to build rapport and trust during interviews and focus groups, but also requires that I must be transparent and honest about my own perspective and acknowledge my subjectivity. Again, as an employee of the organisation involved in this case study, I was mindful that my professional role as a trainer could be perceived by some perhaps as an authoritative role. Two approaches were taken to counteract these issues. Firstly, participants were clearly informed that participation was entirely voluntary and that they could choose to withdraw at any time without being required to give a reason and secondly, I identified myself as a learner rather than an instructor during my interactions within interviews and focus groups, and described how, in my role as a student, I valued their knowledge and experience and hoped to use that knowledge and experience to create a greater understanding of my research area.

Prior to participation and in order to obtain voluntary informed consent to take part in either interviews or focus groups, each participant received a plain language statement (Appendix 1 & 2)

and an informed consent form (Appendix 3 & 4) to sign, to ensure potential participants were clearly aware of the nature of my research, what would happen with their responses and all steps taken to ensure data security and confidentiality.

All interview and focus group recordings were transcribed as soon as possible and all participation data anonymised during transcription and prior to analysis. Recordings were then deleted. Consent forms and transcripts are accessible only by me and held in accordance with data protection legislation until the completion of this project

Conflict can and did arise for this researcher who has a keen professional interest in the research topic. This researcher intends this research as a step toward the adoption of a digital learning ecology for the organisation and therefore needed to be mindful of my role as a researcher in this study, to gather information from the perspective and experience of participants without allowing my perspective and experience to muddy the waters. As discussed further in chapter 3, I used a reflective diary to help maintain my focus on the research purpose and resulting data.

1.10 Organisation of the dissertation

This dissertation is presented in five chapters. Chapter 1, the introduction outlines this research study, what it is about, why this topic was chosen, what is hoped to be achieved and overall layout.

Chapter 2, the literature Review presents an overview of the fields of e-learning and learning management systems and explores central themes that arise from the research questions

Chapter 3, Methodology details how I conducted my research study. It includes research design, research philosophy and methodology, data collection methods and instruments used, the recruitment process for participants, the approach to data analysis, a discussion on the role of the researcher along with a discussion of ethical and quality considerations.

Chapter 4, Findings and Discussion outlines the results following the completion of thematic analysis of three semi structured interviews and three focus groups. Five main themes were extracted from the research data using Braun and Clarke's (2013) six phases of thematic analysis.

These are Learner-related factors affecting development of a digital learning ecology, Instructor-related factors affecting development of a digital learning technology, Organisation factors affecting development of a digital learning ecology, Technology-related factors affecting development of a digital learning ecology and Design for digital learning. Quotations from research participants are included to narrate and illustrate these themes along with sub themes extracted.

Chapter 5, The conclusion revisits the research questions and discusses the conclusions of this study, discusses research limitations, and provides recommendations for future research. References and Appendices are also included at the end of the study.

Chapter 2: Literature review

2.1 Introduction

This chapter details the theoretical lens that guides my research, presents an overview of the fields of e-learning and learning management systems and explores central themes that arise from the research question what the critical success factors for development of a digital learning ecology in a national transport body?

And sub research questions

- What are the attitudes of different stakeholder groups toward e-learning and the development of a digital learning ecology?
- What are the potential roles of different stakeholder groups in the development of a digital learning ecology?
- What are the requirements of different stakeholder groups in the development of a digital learning ecology?

This thematic approach includes how the evolution of the world wide web has influenced e-learning, current and future LMS technologies and Critical Success Factors (CSFs) for the successful implementation of these technologies.

2.2 Theoretical framework

Technology adoption in organisations has been the subject of much research however implementing technology successfully is not without challenges. Researchers have approached the question of what are the key factors that determine an organisation's successful adoption of technology from varying points of view, learner perspectives, instructor perspectives, perspectives from the I.T. professional, technical factors, organisational factors and technology-organisational fit. Significant progress has been made in investigating and theorising user acceptance of information technology (IT), however, I would argue that none of these perspectives should be considered in isolation.

General systems theory (GST) and sociotechnical systems (STS) theory form the framework for this study. Cummings (1978) posits that GST applies to almost any system, i.e. the human body, society and software systems. Researchers use this theory to explore complex software systems and the ways they affect different aspects of an organization, its stakeholders and the environment. The tenet of general systems theory is that individuals who interact with any technology are the key to a successful outcome, they must be considered in terms of critical success factors (CSFs) in order to manage risk during any system implementation and any technology design should include societal aspects of work groups. STS theory examines how people interact with technology. Upadhyaya and Mallik (2013) describe STS theory as being comprised of two independent, but interrelated systems, the social system and the technical system. The social system examines the attributes of people such as attitudes and the technical system examines the technology required to transform inputs into outputs. STS theory "seeks to improve productivity and human enrichment through a design process that focuses on the interdependencies between and among people, technology and environment" (Cummings, 1978). Researchers using STS theory examine how human beings interact with and use IT for their own benefit, the benefit of their organisations and ultimately society itself.

Baxter and Sommerville (2011) demonstrate that when developing or implementing IT systems, the incorporation of STS theory can have improved results which include stakeholder value.

Understanding CSFs supports the performance of the end user, the department and the organisation which together form a general system. The participants in this study are therefore the key to the successful implementation of any digital learning ecology and the critical success factors they identify must be key considerations when designing or procuring a suitable digital learning ecology. The reasoning for the inclusion of both GST and STS was because CSFs include many human factors which could have been overlooked by using GST theory only.

The purpose of my research is to gain an understanding of the CSFs for the successful implementation of e-learning and a digital learning ecology. My research will uncover these CSFs in two ways, firstly by analysing literature addressing CSFs for pre-existing LMS implementations and

incorporating those results into my interview and focus group questions. Literature analysis through the lens of studies of similar purpose can help to focus CSFs to the most important ones (Denolf, Trienekens, Wognum, van der Vorst & Omta, 2015). Those results will then be further verified or expanded using an interpretivist qualitative case study consisting of semi-structured interviews and focus groups with employees of a national transport body using non-probability purposive sampling and thematic analysis. This study is designed to address the research questions by including perspectives of the prime stakeholders of E-learning in organisations: learners, instructors and management.

Literature reviewed for this research includes the history and development of E-learning and learning management systems. I also review research conducted on the use of E-learning and LMS in organisational and higher education contexts. Finally, I focus on previous studies of factors which have affected the successful implementation of E-learning.

2.3 The development and evolution of e-learning

This study will investigate the attitudes of different stakeholders throughout the organisation toward the adoption and use of digital learning technology and begins by exploring their perceptions and experiences of e-learning. Although the concept of e-learning is subject to constant modification, it can be referred to as either web-based learning or technology-enhanced learning (TEL) and the delivery of anytime, anywhere training courses over the web to anyone who has access to the internet, using electronic devices as tools to participate.

Many institutions, businesses, organisations etc. use E-learning tools to provide training and instruction to individuals. The history of e-learning is relatively brief and typified by rapid growth and change in technological advancement (Tynjala and Hakkinen, 2005). This rapid advancement is also one of its' biggest challenges as illustrated by its' many terms and acronyms such as online learning, remote learning, internet learning, virtual learning, blended learning, mobile learning, distance learning and CAI (Computer Aided Instruction). Although the technology may evolve rapidly the basic processes of learning remain constant.

The concept of e-learning was introduced with the read only web or Web 0, and the users' role was limited to reading the information presented to them. The evolution of the second-generation Web brought corresponding evolution in e-learning and increasingly allowed near real time interaction between end users and Blog platforms, social media and video streaming (i.e. twitter, Facebook, YouTube etc.) and the use of web applications or Apps. This provided students with opportunities to interact with peers, other learners, instructors to collaborate and share knowledge.

Web 3.0 or third generation Web users' experience is more connected and intuitive thanks to semantic metadata which allows for intelligent interaction. Web 3.0 is constructed with artificial intelligence (AI) which is able to search, filter and provide data it thinks specific users will find most appropriate (I.e., Siri, Alexa, interactive maps etc). Technologies like cloud computing, linked data, 3D visualisation, augmented reality etc. have the potential to make passive learners into active learners. "In e-learning 3.0 meaning will be socially constructed and contextually reinvented, and teaching will be done in a co-constructivist manner. The focus of learning will shift from 'what to learn' to 'how to learn'. The technology will play a central role, however it will do so in the background and become invisible" (Hussein, 2014, p. 8.)

Web 4.0 technology, the intelligent web (Nedeva & Dineva, 2015) will have the ability to learn and reason, it will be about ultra-intelligent electronic devices, which will recognise and tailor information specifically to you. Web 4.0 is about the internet of things (IOT), it will have the facility to assist in real or virtual classroom environments with sophisticated interactivity, intuitive learner experiences and an individual approach, in short, a more advanced form of blended e-learning 3.0.

E-learning 4.0 is even more student-centered and looks at embedding emerging technologies within the physical learning environment. it is paving the way to developing enhanced education for creative universities and instructors (Nedeva & Dineva, 2012).

Of course, with Web 4.0 in existence, Web 5.0 is already right behind it. Web 5.0 will be sensory and emotive; it has the potential for computers that interact with human beings and

recognise how we are feeling. Nedeva & Dineva (2015) link the development of soft skills such as critical thinking and collaboration with the application of Web 4.0 and Web 5.0 activities.

For my research, the integration of information and communication technology (ICT) has a significant role to play in the future of learning in the workplace, our rapidly evolving, technology oriented, knowledge intensive existence presupposes the facilitation of life-long learning and the continuous development of competencies will be available throughout different phases of life.

Tynjala & Hakkinen, (2005) suggest that the successful integration of e-learning in the workplace requires the application of knowledge, central design principles and theory-based guidelines from a variety of sources: organisational learning theories; sociocultural learning theory and cognitive theories of learning for the pedagogical design of e-learning environments. e-learning in organisations needs to be constructed in a way that makes it possible to combine practical, experiential knowledge of participants with theoretical conceptual knowledge. The active involvement of Human Resource development personnel and organisational management is key to linking employees' personal development with organisational learning and development.

2.4 Benefits

Flexibility (time/pace/place/mode) is one of the most cited advantages of e-learning. Others are the facility of customized learning, accessibility, no barriers of socioeconomic status, quicker training, increased learner control over learning process, widespread distribution of knowledge and minimized travel requirements. (Choudhury & Pattnaik, 2020)

Learners have greater flexibility to customise learning objectives and content. Multimedia presentation of content; videos, simulations and realistic and interactive exercises increase motivation. The availability of varied content through links and online library resources as well as the use of interactive scenarios to maximise communication and cooperation between instructors and learners promote active learning. Costs such as travel and accommodation are eliminated. Organisations and institutions can produce and update content quickly and independently, e-

learning allows for larger numbers of participants from geographically distant locations. (Belaya, 2018).

In addition, the use of LMS allows learners to engage with and develop a community of learners with other learners, control their own learning and develop deep thinking skills (Al-Busaidi, 2010).

2.5 Disadvantages/Limitations

e-learning requires increased self-management and concentration from learners. Instructors cannot control interruptions or distractions in the e-learning environment. Digital literacy, computer and internet self-efficacy is necessary for learners to access and use resources, which may vary individually and put some learners at a disadvantage. Excessive use of devices can lead to addictive behaviour or mental health issues. Learners communicate online without the mutual presence of others, this can affect the development of social skills, lessen the benefits of group dynamics and adversely affect motivation for learning. e-learners may experience feelings of isolation and anonymisation due to this lack of personal social interaction. There can be substantial costs involved in establishing suitable spaces for e-learning, either at home or in an office environment, including connectivity, layout costs for laptops, tablets etc., investment in elements to promote peer communication, additional costs of I.T. support for learning platforms which can often offset savings achieved in travel and accommodation costs. As new technology and media Increasingly dominates our lives, whether it fascinates or irritates us, there is no way to avoid it and, therefore, e-learning will continue to play an important role in educational learning and development. However, only when the all requirements are met, can e-learning truly develop its potential (Belaya, 2018)

2.6 Learning management systems (LMS)

This research explores the experiences and perceptions of stakeholders regarding LMS. Advancements in ICT have led to the growth of LMS. Almarashdeh, Sahari, Zin & Alsmadi (2011) describe LMS is a scalable configured system integrating the course and learner database, providing

a foundation for all features of e-learning; support, communication, evaluation of learning activities, management of resources, and creation of learning content that can be used by stakeholders, administrators, instructors and students alike. LMS features tend to be developed according to requirements in order to control and manage the delivery of self-managed or tutor led courses. The LMS platform permits instructors and administrators to upload, modify and manage course content, learning activities, assessments, discussion forums, calendars; manage schedules and communicate with learners. Learners can access the platform with any browser, select their courses, download content, interact with their peers or instructors. The LMS Platform tracks activities, progress, assignments and assessments.

Pikhart & Kilmová (2020) suggest one problem for instructors creating e-learning courses and content is that often these platforms become mere repositories for texts and videos etc. (e-learning 1.0) and assume that this is enough for learners accustomed to interacting with AI and engaging in deep learning. Some learners want to participate in creating content, collaborating and interacting in ways they are used to with other platforms. Instructors' failure to adequately utilise any future digital learning ecology could result in lack of engagement and uptake by learners. The success of a digital learning ecology lies in the learners' use of and engagement with it therefore my research seeks to explore the attitudes of instructors to establish what roles they may potentially play in the successful adoption of it.

With the increased application of IT in education, a hoard of start-up companies has developed offering their services, such as: Blackboard, Moodle, Canvas, Desire2Learn Brightspace and eCollege to name just a few. They offer web-based development tools and services for the learning environment, while Tool-BookII (asymetrix.com), Authorware (macromedia.com), IconAuthor 7.0 (aimtech.com), Quest 6.0 (allencomm.com), and Designer's Edge (allencomm.com) provide content representation tools. My research identifies the critical success factors and requirements from the perspective of different stakeholders which affect the successful

development of a digital learning eco-system, thus allowing for the alignment of available technology with organisational, instructor and individual learner requirements.

LMS systems include numerous tools that can be utilised to support distance learning or complement traditional instruction. For example, Moodle offers tools that enable the development of course activities such as assignments, surveys, choices, discussion forums chats, resources (files, websites), quizzes, survey, journals, glossaries and workshops (Al-Busaidi, 2010).

There are both commercial and open source LMS products available. The advantage of a commercial or licensing LMS is that it is supplied by a third party, and fully supported i.e., training and technical support. The key advantage of open source or deployment LMS products are no licensing costs, the system is deployed and managed within the organisation. There are also a number of LMS products available as apps or plug-ins which can bring LMS features to an existing organisational website such as SharePoint, which integrate the functions of the LMS seamlessly within the site, therefore learners do not have to navigate away from the organisations' site to participate (Foreman, 2018).

A new approach is needed to maximise the potential of such platforms, to harness the possibilities of AI, deep learning, machine learning by implementing self-defined learning objectives and tasks automatically chosen based on learners' previous performance, histories, activities etc. to drive e-learning from first generation to e-learning 3.0, 4.0 and beyond and evolve into a better tool for modern education. Extending the functionality of existing LMS to allow individual personalisation would likely increase the complexity of existing monolithic systems. This casts doubt on whether LMS in their current form will survive. They may just become a tool among many others when functionality can better be achieved through a microservices architecture with cloud-based independent services, lightly connected through application integration. An e-learning ecosystem that builds on content and app sharing and relies on newer technology could shift the current focus of e-learning infrastructures from technology-centered to learner-centered. This could create personalised learning environments that adapt to individual learners' current needs.

2.7 The future – The digital learning ecology

Sangrá, Raffaghelli, & Guitert (2019) outline a learning ecology as an environment whereby learners engage in self-managed learning activities in a hybrid environment both in terms of medium (both in-classroom and e-learning) and type of learning (combining formal, non-formal and informal learning).

Brown et al. (2015) adopted the term next generation digital learning environment (NGDLE) to describe a style of ecosystem. They advocate what they refer to as a 'lego' approach, where learners create individualised learning environments using different cloud based fully interoperable I.T. systems and self-selected applications similar to a smartphone user installing apps on a device.

The foundations of an e-learning ecosystem consist of a community of teachers and learners, content (text, video, audio), teaching principles and methods (active, adaptive), systems (semantic Wed and the use of technology to support e-learning pedagogy) and the management of learning resources. It is critical that these components work hand in hand in order to create sustainable and viable e-learning (Sridharan, Deng & Corbitt, 2010).

The technology and tools are geared toward developing knowledge and skill for every learner within the e-learning setting, Papas (2015) states that to achieve optimal benefits, each and every individual must engage, contribute, participate and make use of the resources.

This architecture could pave the way to cross-institution collaboration in education and enables an extensible, custom-designed learning support environment (Krämer, Hupfer & Zobel, 2015). The future for NGDLEs is immense, with the potential to move traditional LMS toward an ever-more learner-centric environment that focusses on the needs of the learner and their experience first and foremost.

Korner, 2021 suggests that the future of learning will include study BOTs (A.I. generated course recommendations, activities and bespoke peer groups for learners), Micromasters or nano degrees (MOOCs linked to formal university credit and bundles into more comprehensive micro degrees), ubiquitous individualised learning (a variety of spaces virtual and real with content

available in different formats according to learner preferences), Virtual learning groups which allow learners access from varied places and at varied times and blockchain technology as a means of combining certification of competencies between 3rd level institutions and work organisations. Future challenges involve increasing interoperability between technologies as a single system will no longer provide solutions to all requirements and learners seek to create personal learning environments based of their individual preferences and needs.

Future users will have seamless control in creating tailored e-learning platforms utilising and layering a range of services, combined in ways that best meet their individual requirements (Dagger et al., 2007). This has exciting implications for this research as many of the participants described such features of a digital learning ecology as desirable to meet their requirements.

2.8 Critical Success Factors

The concept of critical success factors (CSFs), a term coined by Freund (1988), originates from organisational strategy literature. When some organisations seemed to be experiencing more success than others, researchers began investigating components contributing to that success. CSFs are elements that must be effectively managed in order to maximise the chances of project success and literature identifies a number of factors which affect the success of e-learning and e-learning systems. Selim, (2007) categorised these factors according to the focus of various research, instructor, learner, Information technology and organisational support.

Bhuasiri et al., (2012) found that the levels of use by instructors and learners of LMS is often quite low despite the growth in investment in e-learning systems. The successful implementation of a digital learning ecology will depend entirely on its' use by instructors and learners and consideration must be given to factors that may impact those levels of use in order overcome them.

Prior studies conducted within a range of different contexts have sought to identify e-learning CSF's. Some have been based in schools and 3rd level institutions (Fathema & Sutton, 2013 and Fathema & Akanda, 2020) while others are undertaken from an organisational perspective (Garavan et. Al., 2010 and Liu et al., 2012). This researcher is cognisant that the context within

which studies are situated may influence participants perceptions and therefore the findings of this research may hold different outcomes in this setting.

Countries across which studies have been conducted also vary. For example, (Selim, 2007), Alhomod & Shafi, 2013 and Alhabeeb & Rowley, 2018) studied e-learning CSFs in the United Arab Emirates, Sridharan et al. (2010), based their study in Australia, Liu & Wang, (2009) conducted a comparative study on eastern and western use of technology and Bhuasiri et al. (2012) studied perspectives of e-learning experts across twenty-five developing countries. Again, this researcher is cognisant that findings may vary in an Irish case study.

While much literature focuses on student perspectives (Selim 2007, Sridharan et al., 2010 and Naveh, Tubin, & Pliskin, 2012), others examine the viewpoints of academic staff and faculty (Almarashdeh, Sahari, Zin, & Alsmadi, 2011, Fathema & Sutton, 2013, Fathema & Akanda, 2020 and Oyefolahan & Abdallah, 2014) or from an administrative perspective, (Alqahtani & Rajkhan, 2020) and Naveh, Tubin, & Pliskin, 2010). In addition, there are studies that examine the views of multiple groups. For example, Alhabeeb & Rowley, (2018), investigated the perspectives of students, as well as academic staff, Bhuasiri et al. (2012) focused on ICT experts and faculty members, Alhomod & Shafi, (2013) studied the perceptions of engineers and technicians and Choudhury & Pattnaik, (2020) used learners, instructors, designers and implementers.

Almarashdeh et al., (2011) state that LMS must satisfy the needs of all users. Many instructors limit themselves to utilising a LMS as a content distribution tool for reading materials, lesson slides etc. and fail to engage with other interactive features such as chat features or discussion groups. Learners also express dissatisfaction with instructors who do utilise discussion boards to initiate group discussions and communications with instructors, but delay providing feedback to learners on matters discussed. The capacity for LMS use by instructors and students may be affected by the perceived commitment demands of use of such technology. For LMS to be fully utilised, acceptance of technology by instructors and students must be present at the outset and my

research explores the levels of acceptance felt by instructors and learners within this organisation at present.

We need to embrace the use of technological innovations for scaffolding learner-centred learning, especially staff involved in training and development. Comprehensive training is required for learners and teachers in the use and management of technologies to overcome the barriers of resistance to change and inability to manage a new digital generation of learners (Sridharan et al., 2010).

Alsabawy et al., (2013) also identify insufficient use of e-learning systems by academic faculty as a critical factor and highlight that this is often the result of lack of competence in the use of system functions and lack of awareness of their purpose. There are benefits to be gained for faculty through familiarisation with and experience of such systems. Lack of training for many instructors participating in this research study in the use of technology to provide online training since the beginning of the Covid_19 pandemic has already contributed to the establishment of barriers to the adoption of any new technologies and an increase in negative feelings towards online or remote learning.

Some particular characteristics in an e-learning context are ease of use, the availability of technical and personal support, the availability of the relevant technology, and the perceived utility of the technology (Garavan et. Al., 2010).

McGill et al (2014), in a review of 74 studies, from developed nations (USA, UK, Greece, Australia and Spain) to examine the persistence of e-learning in educational institutes showed that the aspects that influence the sustainability of e-learning system functioning were: maturity, appropriateness and stability of technology, the availability of ongoing financial support, sufficient training to staff members, and skills. Additionally, the research highlighted the significance of applicants in local e-learning initiatives developing a plan to cover the needs of learners and teachers. The initial factors for a successful execution of e-learning are quality of content, quality of service, user satisfaction and effectiveness of technology, factors my research explores.

Chugh et al., (2018) highlight the importance of user training for LMS which should be learner focussed, “intuitive, easy to learn, reduce ambiguity… have a low learning curve and offer functionality and features that can be used to engage learners”. They also found that other factors affecting the successful implementation of an LMS, include, efficiency, effectiveness, user satisfaction, user-centred design, cost effectiveness, functionality, customisability, poor planning and preparation, under-utilisation, managerial intervention, organisational support, load anxiety and motivation.

Asalla et al., (2017) demonstrate that the CSF that appears most frequently is the LMS technology or system in use, while the least frequently discussed element is delivery method. It draws the conclusion that this provides evidence of a paradigm shift underway from traditional learning processes i.e., face to face towards e-learning technology infrastructure and systems. So, while careful consideration must be given at the implementation stage to the technology and systems to be used, Institutions also need to build a learning culture to motivate learners, other findings such as the high importance of technical knowledge and user perception indicate that training for both instructor and student as users of a system are key factors in successful e-learning implementation.

Bhuasiri et al., (2012) identified multiple factors that influence the success of e-learning systems. They also compared the perceived importance of those factors among two stakeholder groups, ICT experts and faculty members. Their findings identified twenty critical success factors categorised into six dimensions namely characteristics of learners, characteristics of instructors, quality of the institution and the service, quality of the system infrastructure, quality of course information and lastly extrinsic motivation. Their findings highlight awareness of technology, learner motivation and changing learner’s behaviour as critical factors for the successful implementation of e-learning.

Farid et al. (2018) extracted CSFs impacting e-learning and the quality of e-learning systems through literature review of over 60 research publications followed by a questionnaire to one

hundred and thirty respondents requesting them to critically rate each CSF using five-point Likert scale. Perceived usefulness is shown to be the most significant factor, the remaining factors, in order of decreasing ranked importance are lack of learning outcomes, lack of instructional designer, lack of instructional design process, information quality, lack of software quality assurance process, service quality, navigation, lack of formal implementation process, well-structured functionality, interaction between students and students, student satisfaction, robust data protection system, ease of access of software, establishing suitable learning models, interactions of students with instructors, perceived ease of use, perceived playfulness, customization / adaption, student interface, good testing and piloting before release and quality of interface (Farid et al. 2018, p. 11).

Choudhury & Pattnaik, (2020) classified 92 different factors that impact e-learning and identified four major stakeholders namely learners, instructors, designers and implementers. The most discussed factors for ensuring success for learners were social presence and computer literacy. Innovation with I.T. and perception of the learning environment are critical factors for 4.0 web users. For instructors it's motivation and learners' autonomy. Interactivity is identified as the single largest factors which designers are accountable for with other contributing factors such as customisation, interoperability and interface design. The key responsibility of the implementer, or organisation is to adopt the correct, reliable technology in a culture that values and promotes learning. Nearly 40% of responsibility for the 91 success factors identified are shared across stakeholders. Their research finds that issues such as technophobia and lack of management support have major impacts for the learner; learner motivation is one of the biggest concerns for instructors; constant technology innovation and growth drive issues for designers and participation and completion rates are one of the biggest issues for implementers or organisations in addition to costs. My research will explore if similar factors impact similar stakeholders in this instance.

Key success factors which should be considered to ensure effective employment of e-learning are Organisational factors (culture, policies), Technology (reliability, accessibility and

usability) and Human resources (knowledge, skills, attitude). Research concludes that the dominant factor requiring attention is the organisation, (Priatna et al., 2020).

2.9 Stakeholder engagement

A successful LMS enriches instruction, communication and resulting learning outcomes. LMS success or failure can be ascribed to how it is designed, organised, managed and adopted. The aspiration of every LMS is to maximise use of the system by instructors and learners and without this engagement the systems is useless. It is vital to connect with and involve stakeholders. Stakeholders across an organisation will determine every aspect of LMS success from senior management who determine organisational requirements, level of financial investment and resource allocation, Instructors who navigate the system to design courses, upload content and engage learners to end users who participate in the learning.

There are many varied dimensions to stakeholder perception and therefore resulting acceptance and success of LMS environments. Wagner et al, (2008) asserted that the term stakeholder applies to anyone who is a component of an organisation. This underpins the necessity of my research to maximise the comprehensiveness of data gathered by including perspective of all stakeholders within the organisation.

Stakeholder engagement can foster support for a project and promote use and participation. Mutakyahwa & Marnewick (2021) maintain that stakeholder management is key for the successful delivery of an IT project. Stakeholders include individuals, groups or organisations that could impact or be impacted by a project. The development of a thorough plan that details the level and mechanism of stakeholder engagement will assist organisations to understand the requirements of various stakeholders, garner their interest and participation, gain increased support and reduce levels of resistance to an I.T. project.

Sandhya et al., (2020) advocate the use of google forms for surveys, feedback questionnaires, quizzes etc. to enhance collaborative stakeholder engagement, their research

experienced a significantly higher stakeholder response rate using google forms to collect and analysis data in comparison to more traditional methods of stakeholder engagement.

Lowenthal, (2021) advocates that in order to appreciate the role learning is expected to play in supporting business outcomes it is vital to gather deep, rich data from an assortment of key stakeholders using the interview approach. One to one interviews or small focus groups allow you to gather indispensable data which can help to align the goals of the organisation, instructors and learners with the development of a LMS.

Stakeholder management studies for IT in education are limited, however Holt, D., Palmer, S., & Dracup, M. (2011) undertook a study exploring a 2012 project undertaken as part of an Australian learning and teaching council project to investigate the evidence required to maximise the quality management of an online learning environment. The study focused on evidence-based, multi-level and multi-stakeholder approach when evaluating the initial transition of a university to a new LMS during a pilot program. This study discusses various methods used to engage stakeholders including surveys examining faculty and student perceptions of the importance, levels of satisfaction and functionality of the new LMS; system usage data across institutional, faculty and course level; individual development support for faculty and forums, interviews and focus groups to ascertain developer and instructor experiences of the new system. This reinforces the value of engaging stakeholders in a pilot of any new system as well as offering methods to be utilised.

2.10 Conclusion

This literature review has explored the history and evolution of e-learning and e-learning systems in organisational and higher educational contexts. I've examined the critical success factors identified as affecting the successful implementation of e-learning and learning management systems as well as some suggested approaches to stakeholder engagement. There is agreement with respect to CSF's, even if various researchers use somewhat different language. Conversely, there is a substantial disparity in the amount and variation of individual factors identified by the various

authors. Consequently, there is scope for researchers to further investigate CSF's relating to e-learning.

In addition, studies that have shown that perceptions of success differ according to the groups participating in research. Bhuasiri et al. (2012) whose participants consisted of ICT experts and faculty members noted that ICT experts' ranked learner characteristics as a priority for the success of an e-learning system while faculty members ranked Infrastructure and system quality as dominant elements evidencing that participants rank factors differently according to their role.

In terms of actual factors, ICT experts ranked computer training, perceived usefulness, attitude toward e-learning, computer self-efficacy, and program flexibility as the most important factors for the success of the system. On the other hand, perceived usefulness, attitude toward e-learning, program flexibility, clear direction, and course quality are the most important factors from faculty members' point

There is a wide range of CSFs that can be considered when planning and implementing Learning and Development eco-systems or LMS. With hundreds of learning platforms available, the mapping out of well-defined criteria using a collaborative process is essential. My interview and focus group questions will be grounded in the literature analysis of CSFs and key themes will be further developed in my findings and discussion. I believe that identifying and analysing specific requirements from various stakeholders ie. senior management and organisational objectives, training team pedagogical requirements, Instructor requirements and end-user requirements such as ease of use and accessibility could develop a conceptual framework that will inform the future requirements of such a system in a national transport body and aid the decision-making process of future technology adoption.

Chapter 3: Methodology

3.1 Introduction

This chapter details how I conducted my research study. It includes research design, research philosophy and methodology, data collection methods and instruments used, the recruitment process for participants, the approach to data analysis, a discussion on the role of the researcher along with a discussion of ethical and quality considerations. My methodology was based on the purpose of my research which was to identify the critical success factors for development of a digital learning ecology in a national transport body.

3.2 The research question

What are the critical success factors for development of the digital learning ecology in a national transport body?

Sub-questions

- What are the attitudes of different stakeholder groups toward e-learning and the development of a digital learning ecology?
- What are the potential roles of different stakeholder groups in the development of a digital learning ecology?
- What are the requirements of different stakeholder groups in the development of a digital learning ecology?

3.3 Research design

This was a qualitative inductive case study to discover the critical factors that may influence the successful implementation of a learning and development eco-system in a national transport body workplace setting. This research adopted a constructivist / Interpretive approach, with a relativist and subjectivist ontology and epistemology. This study examined one national transport operating body and therefore this research was an Interpretive organisational case study consisting of three semi-structured interviews and three focus groups with employees using non-probability

purposive voluntary sampling and thematic analysis to produce themes structured into a conceptual framework that will inform the requirements of and aid in the decision-making process when evaluating the future adoption of any technological learning and development eco-system.

3.4 Methodology

The selection of a research methodology is crucial as a roadmap for the research and it has an impact on the quality and the accuracy of results (Creswell, 2009). The aim of my research study revolves around revealing factors critical to the successful implementation of e-learning through a digitally driven learning and development eco-system from the perspective and perceptions of its' stakeholders. Identifying these factors in advance of an implementation will manage risk and increase probability of a successful outcome. However, as perceptions are intangible and unconscious, I believe a qualitative, inductive approach is needed to obtain rich descriptive data from participants and an interpretative approach is needed to analyse those descriptions to determine perceptions.

Many of the main themes this study examined have been the focus of previous research albeit within different contexts and there is a large quantity of literature already published which could have supported the development of hypotheses and a deductive approach, and indeed my interview and focus group questions were grounded in the literature analysis of critical success factors (CSFs), I chose an inductive approach to allow the data to speak for itself and for themes to emerge from interview and focus group stages by eliciting and interpreting the distinctive understanding and perceptions of participants.

Qualitative research is most commonly associated with Constructivism / interpretivism which holds that there are multiple interpretations of reality (Bryman, A., 2012). Ontology is concerned with the nature of reality. Constructivist researchers understand that phenomena cannot be separated from subjective social contexts, human experiences and perceptions. From an epistemological perspective, constructivism is concerned with the relationship between the research participants and the researcher, interpersonal contact is necessary and key to capturing rich

descriptive data about the participants experiences. From an axiological perspective, constructivism is concerned with the values of the researcher. As it would be naïve to belief that the experiences. values and bias of the researcher can be completely detached from the process, it is imperative that researchers acknowledge their own subjectivity and be open and honest about their own perspectives (Jamal & Shanaah, 2011).

Instead of testing hypotheses, interpretivism describes whether factors are related to or independent of each other, in a social context. We interpret how people, individually and in groups, subjectively perceive the world around them, socially construct meanings and create values in order to understand how we make sense of our perceived world and how those perceptions vary in different settings (Cohen, Manion & Morrison, 2007).

Qualitative research examines the natural context in which individuals and groups function. Through the collection of rich narrative data, we gain an in-depth understanding of real-world phenomena. Because reality is constructed through social, cultural, historical and individual contexts, qualitative researchers seek wide variety in their sample population to paint a broad picture (Korstjens & Moser, 2017).

Data collected through the use of semi-structured Interviews and focus groups was chosen to provide rich qualitative data given that the participants had opportunities to offer any information they viewed as important or related to the research topic while I as the interviewer had opportunities to explain any ambiguities and correct any misunderstandings related to the interview questions.

Quantitative research approaches involving numerical data and testing hypotheses were inappropriate for a number of reasons, firstly, because this study needed an inductive approach to explore unknown factors critical to the successful implementation of e-learning and the development of a learning and development eco-systems. Secondly, with regard to the quantitative methods, study samples can deteriorate through non-participation, lower response rates result in less representative data, so although surveys and questionnaires are quick, convenient and

inexpensive, I had concerns about being able to gather enough responses to ensure the validity and reliability of the data. Lastly, upon reviewing time constraints for data collection and analysis, given the duration of my study three interviews and three focus groups seemed the most viable option that also allowed sufficient time for analysis and reporting.

Qualitative case study research explores "a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in depth data collection … and reports a case description and case themes" (Creswell, 2013, p. 97). Bryman (2012, p. 66) states that a case study is the "detailed and intensive analysis of a single case". As my research aims to explore how individuals across all levels of an organisation view the use of technology and their experiences of interaction with technology for the purpose of learning and development, a single case study was determined to be appropriate to obtain relevant insights. This approach also allowed me to examine a broader range of views within research participants by triangulating data sources, ensuring that issues and factors examined are supported by more than a single source of evidence. (Yin, 2009).

Rashid et al., (2019) offer a step-by-step guide for researchers including a checklist of four phases which helped to provide a map for this study. The first stage begins by suggesting that researchers examine their worldview based on ontological and epistemological views. From an ontological viewpoint, a case study is in keeping with the relativist ontology described in 3.3 research design, as this research believes that human beings construct their own reality and truth is a subjective experience for individuals and from the epistemological viewpoint that this world is interpreted by individuals' ways that makes sense to them. These views support the chosen interpretivist paradigm. Next researchers must decide whether to use a quantitative or qualitative inquiry technique and consider research logic. As described in 3.4 methodology this researcher believes that as perceptions are intangible and unconscious, qualitative approach is needed to collect rich descriptive data from participants along with an inductive approach to reach conclusions based on study participants accounts of their experiences.

Stage 2 relates to pre-fieldwork; the researcher must decide whether case study is a suitable choice and then finalise case study protocols. As case study allows the researcher to carryout intensive research on a specific case like an individual, a group or an organisation, I decided to use this method to gather in depth details from the viewpoint of employees of a national transport body using multiple sources of data, three interviews with a purposive voluntary sampling of senior managers across the organisation and three focus group, one consisting of a non-probability purposive voluntary sampling of training and development professionals with relevant experience of pedagogical and staff training needs. The other two focus groups consisting of a non-probability purposive voluntary sampling of front-line staff, Craft-workers, Administration/office staff and Managers. Case study protocols were formalised through the ethical review application process which described and received approval of the research question, method, ethical considerations etc.

Stage 3 outlines the fieldwork phase where the researcher must establish contact and rapport with participants and utilise tools such as semi structured interviews to collect data the process of which is outlined in the section to follow.

Finally stage 4 is the reporting phase and this guide recommends incorporating details such as case and participant descriptions, protocols, interpretation and analysis of findings and any conclusions drawn.

"Purposive sampling is a nonprobability sampling procedure in which elements are selected from the target population on the basis of their fit with the purposes of the study, … the researcher purposely selects the elements because they satisfy specific inclusion criteria for participation in the study" (Daniel, J. 2012 p. 87-88). Upon verification that sources selected satisfy the criteria, their participation is solicited. I based my criteria on variability to cover a wide range of diversity within the population.

As stated, my research aimed to explore how individuals across all levels of a national transport organisation view the use of technology and their experiences of interaction with technology for the purpose of learning and development. I chose to include members of the senior

management team for their organisational perspectives and their understanding of future organisational strategic aims and objectives as well as their personal perspectives on use and understanding of digital technology in learning and development. I chose to include members of the HR team, specifically training instructors and talent management/career development professionals for their experience and expertise of pedagogical and training needs within the organisation. I chose to invite end-users of an e-learning product or system by viewing the organisational outlook address list and soliciting participants based firstly on varied role descriptors (i.e., front-line staff, craft-worker, administration/office staff and front-line manager) and secondly geographical location (i.e., greater Dublin area, Waterford, Cork, Limerick and Galway districts as well as the northern district Drogheda/Dundalk) to ensure a diverse sampling.

3.5 The recruitment process

Five members of the senior management team received an invitation via e-mail (including a plain language statement (Appendix 1) and consent form (Appendix 3) asking them to participate in a short interview to obtain their views. Four responses were received, along with completed consent forms indicating agreement to participate. A further e-mail was then sent to those who had responded with a selection of possible dates and time which resulted in dates and times being agreed with three senior managers based on availability within my timeframe.

Sixty-five Individuals among varied staff grades/roles and geographic areas identified received an e-mail (including a plain language statement (Appendix 2) and consent form (Appendix 4) asking them to participate in a focus group. Forty-eight responses were received, with completed consent forms, indicating agreement to participate. Several further e-mails over a number of weeks with a selection of possible dates and times were required to coordinate dates and times for enough available individuals to participate to achieve one focus group of 7 individuals and two focus groups of 8 individuals each. For reporting purposes and to maintain their anonymity, 26 individuals, Participants 1 through 26 were randomly assigned names from A through Z.

3.6 Data collection methods

Two data collection methods were used in this research, semi-structure interviews and focus groups. Use of multiple sources, often described as triangulation, helps to deepen understanding of issues relating to technology use and can add rigour, breadth, depth and richness to an investigation. Furthermore, multiple sources of evidence can assist in addressing issues around construct validity and reliability in case study research (Yin, 2009). One-to-one interviews for members of the senior management team were most suitable due to interviewee availability and scheduling constraints. Focus groups were suitable for in-depth rich discussion of topics of interest with Instructors, H.R. professionals and end-users of a digital learning ecology.

Interviews offer rich qualitative data as the participants have the opportunity to include any information they see as relevant to the questions, while the researcher can clarify any misunderstandings or uncertainties regarding the research topic. Data was collected from participants through the use of three semi-structured interviews. Semi-structured interviews typically involve the use of an interview guide prepared by the researcher with questions asked in a methodical order, but the researcher must delve further into answers to their prepared standardized questions (Talmage, 2012). This style of interview technique guides conversation while enabling participants to put forward any information they view as having importance which may not have been reflected in the initial question. Prior to the

interviews, a set of interview questions (Appendix 5) was used as a guide for the interview flow using open-ended questions to obtain meaningful detailed responses. All interviews took place remotely via Microsoft Teams to ensure the safety and comfort of participants due to the Covid_19 pandemic and each interview lasted between 30 and 45 minutes.

Ewings et al., (2003) characterise focus group discussion as a method used to gather individuals together for in-depth discussion regarding areas of interest for exploration.

Data gathered during focus groups is thought to be deeper, richer data than that which can be obtained through other methods such as questionnaires. In focus groups, according to Ewings et al., (2003), the researcher gathers a small number of individuals to talk about a particular topic, the

reason for a small group size is to allow the free discussion of views without participants feeling intimidated. A question guide (Appendix 6 & 7) was prepared before-hand and the researcher chaired the group, to ensure that a wide breadth of aspects for each subject discussed were explored. The discussion was recorded using both Microsoft Teams and Otter Ai software, then transcribed and analysed.

3.7 Approach to data analysis

As this study adopted an interpretivist approach, thematic analysis was identified as a appropriate method to identify key themes or patterns within the qualitative data and address the research questions. The researcher followed Braun and Clarke's (2013) six phases of thematic analysis which is a suitable framework for this type of analysis. The following worked example is presented in a linear fashion, however, the process itself was not linear and required moving back and forth several times between stages in order to satisfy requirements of rigour and trustworthiness in data analysis and findings of the research.

Thus, phase 1 began with reading transcribed data repeatedly to gain an overview. This was followed by phase 2 where I started organising and coding the data into many small chunks, generating over six hundred initial codes across the entire dataset.

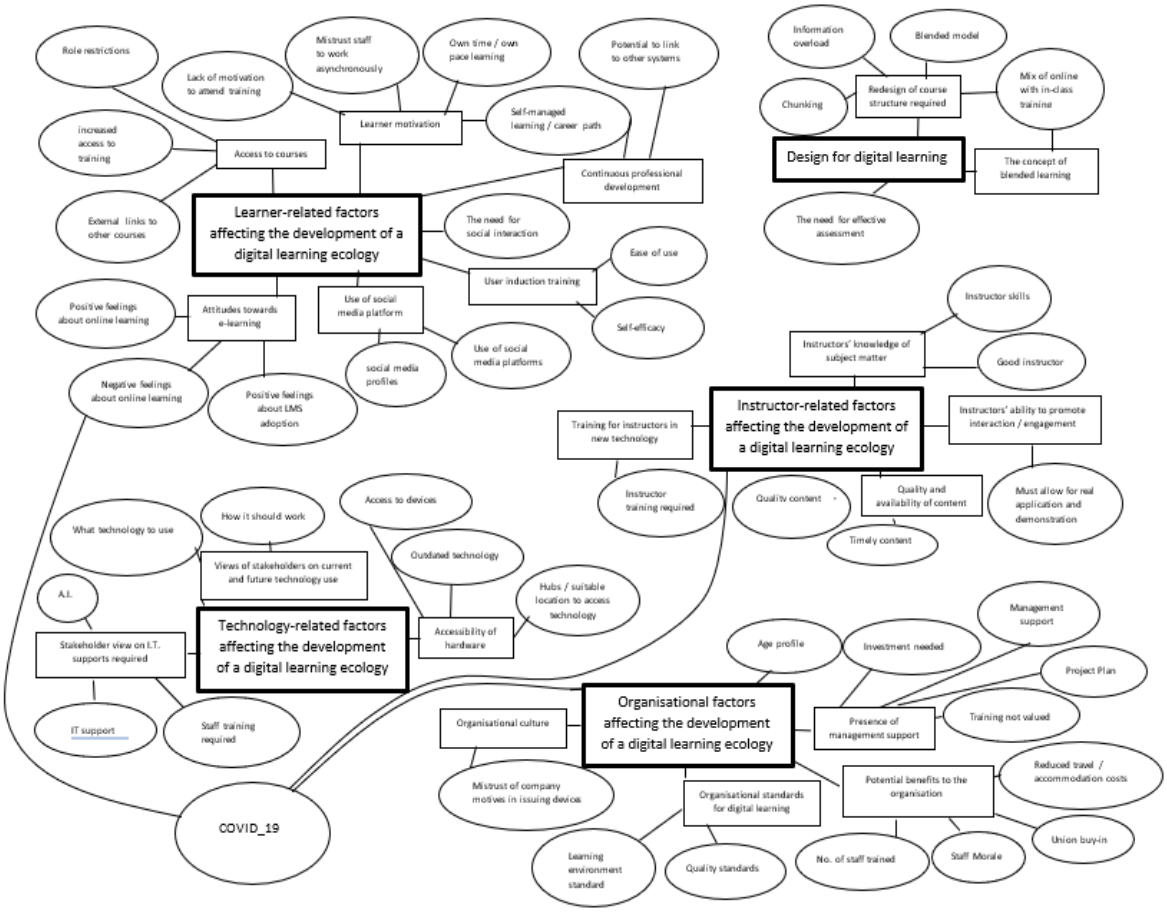
Phase 3 involved reviewing the 611 codes, grouping those that reflected closely related data and collating the initial list of codes generated into 48 potential sub-themes, which were role restrictions to participating in training, lack of motivation for staff to attend training, mistrust of staff to work asynchronously, a desire for own pace / own time learning management, a desire for self-managing a learning or career path, increased access to training, a desire for external links to training outside an organisational context, positive feelings about online learning, negative feelings about online learning, positive feelings about the adoption of a LMS, social media platforms, social media profiles for staff, ease of use, self-efficacy, chunking, blended model, mix of online with in-class training, information overload, qualities of a good instructor, required instructor skills, instructor training required, quality of content, timely content, allowance for real time application and

demonstration, management support, investment required, project plan, training not valued, reduced costs, union buy-in, staff morale, numbers of staff trained, organisational quality standards, learning environment standard, mistrust of company motives, technology to use, how technology should perform, access to devices, outdated technology in use, hubs, I.T. support, A.I., user / staff training required, Covid_19, social interaction, effective assessment, age profile, potential for CPD.

For example, I coded extracts where participants discussed their experiences of feeling tired at the end of a long, intensive online course as information overload, but I also coded several extracts where participants stated that training should be 'chunked' into smaller, easier to digest modules as chunking. During phase 4, Information overload and chunking were later amalgamated into one sub-theme named redesign of course structures required.

Phase 4 involved reviewing these 47 preliminary sub-themes, generating a thematic map (figure 1), combining and redefining several sub-themes that clearly fitted together to create 22 sub-themes which were; access to courses, learner motivation, the need for social interaction, continuous professional development, user induction training, use of social media, attitudes towards e-learning, redesign of course structure required, the concept of blended learning, the need for effective assessment, instructors' knowledge of subject matter, instructors' ability to promote interaction / engagement, quality and availability of content, training for instructors in new technology, views of stakeholder regarding current and future technology use, stakeholder views on I.T. support required, accessibility of hardware, age profile, presence of management support, potential benefits to the organisation, organisational culture and organisational standards for digital learning.

Figure 1 *: Thematic map illustrating Phase 4*



Phase 5 was the final refinement to examine the essence of each sub-theme to generate and name themes for inclusion in the report (Table 1).

Table 1 *: Themes*

Themes	List of sub themes generated
Learner-related factors affecting development of a digital learning ecology	Attitudes towards e-learning
	The need for social interaction
	Learner motivation
	User induction training
	Continuous professional development
	Access to courses
	Use of social media platform

Instructor-related factors affecting development of a digital learning ecology	Instructors' knowledge of subject matter
	Quality and availability of content
	Instructor's ability to promote Interaction / engagement
	Training for instructors in new technology
Organisational factors affecting development of a digital learning ecology	Presence of management support
	Organisational age profile
	Organisational culture
	Organisational standards for digital learning
	Potential benefits to the organisation
Technology-related factors affecting development of a digital learning ecology	Views of stakeholders on current and future technology use
	Accessibility of hardware
	Stakeholder views on I.T. supports required
Design for digital learning	Redesign of course structures required
	The concept of blended learning
	The necessity for effective assessment

and finally Phase 6 involved producing the report and selecting quotations to clearly evidence the themes within the data collected.

3.8 The role of the researcher

Collins & Collins (2014) state that many researchers, particularly novice researchers, can stumble over their feelings, which can impact how they interpret and report their data. It takes emotional maturity and interpersonal skills to listen to and understand the experiences of others,

empathy to understand how they perceive those experiences and most critically, self-awareness of how that empathy may affect your interpretation of the data. They encourage being mindful of emotions that arise during the data collection stage of the research process and reflecting thoroughly how those feelings may affect your data. Emotional intelligence is key for a researcher to improve the connection with participants, create rapport and build trust.

Conflict can also arise for the researcher who has a professional interest in their research topic. This researcher intends this research as a step toward the adoption of a digital learning ecology for my organisation and I needed to be mindful of my role as a researcher in this study, to gather information from the perspective and experience of participants without allowing my perspective and experience to muddy the waters. The use of a reflective diary helped me to maintain my focus on the investigation and resulting data, for example, a focus group I found difficult was with Instructors. Perceptions around e-learning and the implementation of a digital learning ecology among instructors were extremely negative which I found frustrating, I have a keen interest in this area both as a student and an instructor and I found myself wanting to defend e-learning and share its benefits. This also affected the familiarisation stage of my thematic analysis as I found the frustration returning on a number of occasions when I reread the data. Reflection allowed me to recognise and acknowledge that these are the unique perceptions of others, that my interest is heavily influenced by my life as a student and it allowed me to set aside my feelings of frustration and concentrate on examining the data for the insights it could provide to my study.

As a qualitative researcher, I influence the research process through social interaction with the study participants, which is required to build that rapport and trust during interviews and focus groups, but also requires that I must be transparent and honest about my own perspective and acknowledge my subjectivity. My position as an employee of the organisation involved in this case study provided accessibility to research participants, however, I was mindful that my professional role as a trainer could be perceived by some as an authoritative role. I identified myself as a learner rather than an instructor during my interactions within interviews and focus groups, and spoke

about how, in my role as a student, I valued their knowledge and experience and hope to use that knowledge and experience to create a greater understanding of my research area.

3.9 Ethical considerations

The researcher read, understood and adhered to the National College of Ireland's (2019) Ethical Code for Education Programmes Research and the British Educational Research Association (BERA), (2018), Ethical Guidelines for Educational Research. An Ethical Review Application was submitted, and ethical approval obtained for this study prior to any research being conducted.

A key ethical issue regarding workplace participation in research is ensuring that employees can make free, informed choices regarding participation. In order to ensure that participants did not feel any perceived pressure to participate because of my role and position as a trainer, participants were clearly informed that they could choose to withdraw at any time without having to give a reason and without prejudice. A detailed plain language statement (Appendix 1 & 2) along with a consent form (Appendix 3 & 4) was created and included with each invitation to participate to ensure potential participants were clearly aware of the nature of my research, what would happen with their responses, steps taken to ensure data security and privacy, along with the identity and contact details of the data controller.

All interview and focus group recordings were transcribed as soon as possible and all participation data anonymised during transcription and prior to analysis. Recordings were then deleted. Consent forms and transcripts were accessible only by me and are being held in accordance with data protection legislation until the completion of this project.

3.10 Quality considerations

Creswell (2009) recommends the utilisation of more than one strategy to ensure validity and in order to add to the trustworthiness of my research, I have incorporated triangulation; the use of rich, thick descriptions to convey findings and an account of the biases of the researcher because qualitative research always involves a human element in terms of interpretation, reflection and analysis.

Trustworthiness indicates that the researcher conducts their study with integrity. To ensure a trustworthiness, the researcher utilised Lincoln and Guba's (1985) criteria for evaluating trustworthiness, namely.

- Credibility, or the extent to which readers will judge the merit of a study. A credible study includes accurately interpreted and reported interview and focus group data. I suggest that credibility is achieved due to the rich, thick descriptive detail provided in the results and findings chapter, further supported by my use of multiple sources, often described as triangulation, which helps to deepen understanding of issues and can add rigour, breadth, depth and richness to an investigation.
- Transferability refers to the applicability of the findings in other contexts. I would argue that my findings are broadly in line with much of the literature reviewed and can be therefore used by others to support their understanding and knowledge regarding critical factors influencing the adoption and use of IT eco-systems within a national or semi-state body.
- Dependability refers to the reliability and replicability of the study in a similar context. I would argue that given the research question, selection of appropriate methodology, details of data collection methods along with description of the thematic data analysis and coding examples a similar study utilising the same methods could be replicated with similar results.
- Confirmability refers to the extent to which the findings of the study are shaped by the respondents and not researcher bias, motivation or interests. By listening attentively to participants, faithfully transcribing interview and focus group data and clearly detailing the rationale behind my interpretation of the data, I would argue that I have ensured confirmability. I also maintained the practice of keeping a reflective diary to review my decisions and interpretations during the data analysis process to ensure I wasn't allowing my biases to influence the findings.

3.11 Limitations of the study

As this research study is based on a single case study, I have considered that it may be more difficult to generalise, although I believe it will reveal richer, deeper data relating to individuals'

understandings. Not all aspects of this case study can be applied to other contexts however the results are likely to apply to other large national organisations who may be considering the transformation of a learning and development function through the adoption of a digital learning technology or platform.

O'Leary (2017) discusses how few studies are conducted in an ideal environment, there are always limitations, i.e., time, financial resources, recruitment of participants, researcher bias. She advises the best method to ensure the trustworthiness of results is to be open about the limitations faced while conducting the research, detail the strategies used to ensure credible data and trustworthy results and finally justify your findings.

Additional interviews or focus groups may have added quality and richness to the findings presented in this study unfortunately there was not enough time to do more

3.12 Conclusion

This chapter outlined how I conducted my research study. It detailed my research design and methodology, my approach to data collection, the recruitment process for participants, my framework for data analysis, a discussion on my role as a researcher, ethical considerations and how I ensured trustworthiness in my study as well as discussing the theoretical framework that guided the research. It outlined the rationale for choosing an Interpretive organisational case study along with thematic analysis, the results of which are discussed in the next chapter. These findings will help to inform the scope and requirements for the development of a digital learning ecology.

Chapter 4: Findings and Discussion

4.1 Introduction

This chapter outlines the results following the completion of thematic analysis of data collected through three semi structured interviews and three focus groups. The purpose of this study was to identify the critical success factors for development of a digital learning ecology in a national transport body. The experiences and viewpoints of participants provided insights into three key sub questions.

- What are the attitudes of different stakeholder groups to the development of e-learning and a digital learning ecology?
- What are the potential roles of different stakeholder groups in the development of a digital learning ecology?
- What are the requirements of different stakeholder groups in the development of a digital learning ecology?

Five main themes were extracted from the research data using Braun and Clarke's (2013) six phases of thematic analysis and are presented in the following order, Learner-related factors affecting development of a digital learning ecology, Instructor-related factors affecting development of a digital learning ecology, Organisational factors affecting development of a digital learning ecology, Technology-related factors affecting development of a digital learning ecology and Design for digital learning.

4.2 Learner-related factors affecting development of a digital learning ecology

This theme explores participants' feelings about e-learning and the adoption of digital learning technology, their views regarding its' role in their organisation, how they might participate in and contribute to that as well as what they view as critical to its' success. The success of a digital learning ecology depends entirely on its' use by instructors and learners and understanding the factors that may impact those levels of use are critical in the development of any such technology.

4.2.1 Attitudes towards e-learning

Many stakeholders believe in the potential of a learning management system, for example Aiden said, “I believe the future of training and development will be far more in a learning management system through technology and online tools”. Barry said of traditional learning “it has evolved into remote learning and using virtual learning, which are very good mediums.

End users with experience of platforms such as Blackboard and Moodle are in favour of a digital learning ecology, and as the technology is widely available, see no reason to prevent it being incorporated in the organisation. Lally accessed lecture recordings to support engagement with literature and said that the ability to “go back on a point that I maybe didn't understand … and listen to what the lecturer was saying” was helpful.

End users however were also keen to point out negative experiences when some learning transitioned online due to Covid_19. Aiden spoke about two days training delivered online, as too lengthy with too much one-way information to handle. Henry who has a lot of experience of online learning referred to a recent course initially designed for five days classroom work, which, due to Covid_19 ended up being delivered online over the course of two long days and described it as “two wasted days” and said, “two people dropped out by lunchtime on the first day, because of the pure rate we were being forced through it”.

Instructors on the whole expressed mostly negative feelings regarding online delivery of courses, for example Tam said “I do not think by every standard that I can think of it, is in no way anywhere near or better than delivering face to face in a classroom environment”. Una spoke of distractions that occur when a learner is working from home and their own experiences with not enabling cameras “some training I’ve done online ... it’s, as they say in the radio business, dead air ... they’ve disappeared out to load the dishwasher or cut the grass” and also questioned the suitability of online delivery “e-learning systems and tablets, especially for jobs that have some sort of tactile feedback to them, a bit like train driving are not always the best way to go”

4.2.2 The need for social interaction

The need for social interaction to support learning featured strongly across all stakeholders. From a managerial perspective Barry said:

> what the virtual world doesn't do, is, it doesn't have the conversation … debate gets different points of view and then suddenly there's a greater understanding by everybody ... so we have to be careful that that interaction, or that debate, or those strings that get pulled that give you other information happens, it's part of a learning process

From the end users' perspective lack of interaction left some participants feeling unengaged, Henry described an online experience as having "very little interaction, so you weren't part of your own learning experience" and Phoebe found their experience of online engagement "not as effective as being in the classroom" and doubted whether they would have participated had they known it was going to transition online

From an instructors' perspective Xavier felt that online training "does not work for courses with large practical content like rules and requiring understanding".

In keeping with review of literature these findings are not unexpected, Choudhury & Pattnaik, (2020) highlight Interactivity as a critical design factor for the successful implementation of e-learning.

4.2.3 Learner Motivation

From managerial and end users there are positive views regarding the potential to self-manage learning. Barry advocated "modules that people will be able to do remotely in their own time, at their own pace" and Kamal said "not everyone works Monday through Friday, say nine to five ...so people working shift work could do it in … their own time".

However, instructors held some differing views on learner's self-managing their own time. Tam said

> it's different if you're talking about existing or new staff … someone only starting this week …going to be eager, and if I ask her to look at stuff at home in her own time, that's a given, she's gonna do that. I just finished a guards' course for four people and I can guarantee if I asked them to read anything at home, I won't use the language that I'd get back

Fabian discussed their recent frustration with longer serving staff who ignoring material they had been asked to read, powered computers off during training and failed to return post training documentation.

The theme of motivation also seems linked to age profile in terms of willingness of staff to self-manage learning. Stakeholders hold a viewpoint that only newer (or younger) staff or staff with future career ambitions are motivated to engage in learning, while older members of staff have little motivation to engage. For example, Aiden said "somebody who wants to be a railway professional over time ...they will be motivated ...because it means they are developing their career", while Qiao said "it's how you break that boundary of ...we have 10 years left and we're going out the door … this age bracket, ask anyone with 30 or 40 years' experience, what they're looking forward to and it's getting out"

End users highlighted a need for early adopters of technology to be incentivised to promote the participation of others, reward first adopters, use vouchers, promote them as champions. End users also highlighted the need for in-depth learner feedback at the implementation stage to detect issues and tweak it if it's not working well to ensure a successful adoption of any system. Again, these findings are reflective of literature review, Bhuasiri et al., (2012) also identified learner motivation and changing learners' behaviour as two of the critical success factors for the successful implementation of E-learning.

4.2.4 User induction training

From a managerial perspective ease of use was identified as a critical factor, Aiden said "most people's fear is how do I connect in the first instance, how do I navigate the way through it ...there may well be a need for a classroom start". Aiden compared the impact of a LMS on training to the impact of spreadsheet technology on the financial sector in the 80s and said of the needs of professionals involved,

> believe you me, we had to sit down in the classroom with trainers who knew what they were talking about ... it's no exception for people who haven't had that engagement, and there will be a number of them within our workforce for which this type of training will be

relevant, it's going to really be sit side by side, on a diverse number of occasions, to walk them through it in a classroom environment

From an end users' perspective, it was suggested that short instructional videos via a company social media platform such as WorkVivo would be sufficient, Evie said

"you can go onto YouTube and learn how to use school wise, you know, everything that's there, the homework that's there, how to download the homework, and upload your completed files …so it should be easy enough". Several end users felt that peer support is the key to new users' levels of participation, Henry said "it's human networking. It doesn't need to be formalized it needs to be colleague-wide ...I think the fact that we can help each other …that's more impressive to me than any corporate structure".

Chugh et al., (2018) also found that in order for a LMS to add value to an organisation and establish itself as learner focused it needs to have a low learning curve with easy functions and features that can be used to engage learners. Asalla et al., (2017) also identify user training as a critical factor in the successful implementation of e-learning.

4.2.5 Continuous Professional Development

Managers and end users want a system that creates a link between past training and experience with suggestions for future learning whether it's MOOCs, in-house training or 3rd level. A system that knows learners' history and interests, helps to identify potential career development paths and guide learners in a lifelong learning journey like the futuristic system described by Korner (2021).

From a managerial perspective, Caden spoke of the high value of "giving people, career development opportunities …online ...so that they can access material which might support them in a preferred career development pathway".

4.2.6 Access to courses

Participation in training is determined by role and competencies required, there are few opportunities at present to participate in courses outside of role requirements. From a managerial

perspective Caden talked about the transformative impact of online learning if it removed restrictions and allowed all staff access to courses.

End users agree, Darci felt that staff are often unaware of available courses if they are not deemed necessary by managers. Henry identified the potential to link with and promote MOOCs to bridge a knowledge gap and encourage people to examine their options without fear for example they said,

> e-learning Springboard courses ... some people might feel I'd never be able to step up to that, maybe some people haven't got the academic jump from where they are to that … we should be running small intermediate steps ...and give them a little bit of a nudge to see It's not the big bad wolf and I can actually do that …when I did my degree, there was a high drop-out rate, because people found …going from 10 years out of school to university standards a huge jump. So maybe …some baby steps ...in between where you are and where you want to be as part of a route map

Another popular idea with end users was incorporating virtual language classes with links to learning apps. This not only creates learning opportunities, but networking opportunities for staff, and as a national transport body, could provide customer service enrichment to the organisation.

4.2.7 Use of social media platform

Participants view social media platforms like WorkVivo critical for creating staff networking opportunities, peer support and opportunities for career development as well as to promote the use of any digital learning ecology.

From a managerial perspective, Caden advocated the promotion of any new learning ecology through social media platforms, and said,

> I'd look for some relatively easy quick wins, visible to a wide audience of people. …getting some available materials from the outside world and putting that up on whatever platform ...So this sort of gives, a trailer or a teaser of what e-learning can do

End user, Sally said "maybe there's somewhere where you could create your own profile, to say I've done this and that and I want to progress further … something like LinkedIn or something".

4.3 Instructor-related factors affecting development of a digital learning ecology

This theme explores the perceptions of stakeholders regarding the skills necessary for an instructor to engage with and provide effective training to individuals.

4.3.1 Instructor's knowledge of subject matter

Both from managerial and end user perspectives, instructors' knowledge is critical to the learning environment. Aiden, "we had to sit down in the classroom with, you know, trainers who knew what they were talking about"

Darci said "people who are giving courses, they're well rounded and know what they're talking about …when I'm stuck ...I go to a course tutor, and they're able to help me because ...they've come across the problem umpteen times"

4.3.2 Quality and availability of content

Both managers and end users felt that content used by instructors was a critical factor in a successful learning environment, both in terms of the quality and the speed it becomes available. Isobel described enjoying a particular course because "it was just so well put together". Phoebe expressed some dissatisfaction with their instructors use of Moodle "they recorded classes, but the problem was then, it could be a week or two before you get the recording if you wanted to go back over what you had done". Almarashdeh et al., (2011) found that instructors often use LMS as a distribution tool only and fail to engage with many other interactive features.

4.3.3 Instructor's ability to promote interaction / engagement

End users identified instructors' ability to engage learners as key Darci described a good instructor as "worth their weight in gold" and said, "they'll get you involved and interested and then they can make the course work" and Isobel, described past training as "extremely good ...basically videos … which shortened it down. Then there was a lot of interaction afterwards …not like most courses that you get now ...just rambling on and on"

4.3.4 Training for instructors in new technology

End users identified that different instructors should be equally proficient for example Henry said "a lot of the courses that I've attended over 40 years, they've been good or bad, depending on the instructor, and I don't think that's correct". Alsabawy et al., (2013) attribute variations in

instructors' use of a LMS to a lack of competence in the use of the system and identifies benefits of training for faculty.

Instructors in particular expressed very negative feelings about the training they received when suddenly transitioning to online learning, for example Una said "it was pushed on people around the world due to the COVID pandemic ...I've had no training on teams calls or putting classes together" and Will said "we've been left, it was either sink or swim. The whole lot of us are just, sink or swim". Although this researcher was initially frustrated by the negative perceptions of e-learning and reluctance to use digital learning technology among instructors, for example Tam said "I don't feel delivering online is practical in any way, full stop", upon reflection and throughout this process, it has become evident that these feelings are linked to experience and perceptions of lack of training, I.T. equipment and management support. This has created barriers to the adoption of a digital learning ecology which will take time and investment in training to overcome. Almarashdeh et al., (2011) identified lack of acceptance of technology by instructors at the outset as a risk to the utilisation of a LMS which could prove problematic for the development of a digital learning ecology if not managed.

4.4 Organisational factors affecting development of a digital learning ecology

This theme explores the perceptions of managers, end-users, and instructors regarding the organisations' role in the success of a digital learning ecology, from the supports needed to ensure success to the potential benefits that success could provide. Significant factors according to many appear to be culture and the age profile of the organisation.

4.4.1 Presence of management Support

From a managerial perspective this is viewed as a critical factor for example Aiden stated "I think as leaders and as senior managers, it's up to the likes of myself .... to be strongly supportive ...of the online training environment". That support will be evidenced by the development of a detailed plan, with a clearly articulated vision for a technology enhanced learning environment, realistic project timelines and a roadmap for future development. Barry suggested that staff

participation in a digital learning ecology could be tied to talent management and performance coaching key performance indicators (KPIs) for managers.

End users believe that management support for the benefits of training must be balanced with, not superseded by, financial concerns, Nick said,

> If top management doesn't see it as a valuable tool or asset ...it is going to be dropped fairly quickly. Whereas if they're promoting it and bigging it up ...It trickles down naturally ...I do think having champions at all different levels is key

Instructors perceive a lack of support for the organisational training function and believe that, for many, training is a tick box exercise with little concern for learning outcomes. Will said "it just strikes me that there's not much belief, in what we do at times". Choudhury & Pattnaik, (2020) and Liu et al., (2012) identified management support as a key to the successful implementation of e-learning and perhaps adding merit to the proposal to link training analytics to managers' KPIs.

4.4.2 Organisational age profile

All stakeholders referred to the organisational age profile and its impact on technology use. From a managerial perspective Caden said they had "always been sort of nervous about the application for our organization, given in particular our age profile ...which is tending towards older, and the hesitancy they would have about using technology, that's a barrier". Similar views were expressed by end users, for example Qiao stated "in fairness to them, you're asking a culture of pen pushers ...to go online ...it's a cultural thing."

Instructors' area of concern is with older existing staff, for example Zoe said,

> new trainee drivers are coming in off the street and they're going to be open to the new culture which you're proposing … but I think the problem we're going to have is with the existing staff, and changing the culture and we know how hard that is

4.4.3 Organisational culture

Managers believe that staff within the organisation hold a high degree of suspicion of motives for issuing equipment like smartphones. Staff believe that smart devices are covertly monitoring their work performance, for example, Caden said "I think, in overall terms, there's a

certain mistrust of using technology that the company provides … There's a fear that it's being used for other agendas".

End users believe these views are widespread, not only of smart devices, but software, which may contribute to the poor adoption of the social media WorkVivo platform. Lally said,

> When they don't have company devices, they're less likely to use company software ...someone who has their own iPhone …they'll think, No, I'm not putting company software on my personal phone. Again, the trust issue is now the company are in on my device

Instructors believe it is telling that several staff are rumoured to have turned down a €500 voucher as it had to be redeemed electronically on a personal device, Fabian said "they're willing to turn down 500 euro on their principles …there's a hidden message attached to that, having a device that they think is following them and reporting their movements to the business".

4.4.4 Organisational standards for digital learning

Managers and end users believe standards are required for quality assurance of materials used by instructors. From a managerial perspective the focus was on content quality, Barry said

> ownership of all training material in whatever format ...version control, and ...content control …a clearinghouse ...so all these bits come in and we say, well actually no, we can't use that, or you're going to have to change … so that it's cleared it and it's accepted as training material

Caden stated "it's particularly important for the likes of them (Instructors), that the content is at the highest standards potentially available so that they know …I'm going to the Bible" and for learners "it becomes the go to place for the right information". The introduction of a policy and administrator for the management of content and materials uploaded to a digital environment would meet these requirements.

For instructors, the focus is on the quality of the learning environment, for example, Aiden talked about the need for an environment layout where the instructor can clearly see all participants on screens instead of one laptop screen obscured by the PowerPoint presentation in use.

Instructors also strongly feel that there should be a set of protocols regarding attendance at online events for example Una said "I think they should try to have an interference free room where

they sequester themselves, and there should be a minimum of audio and visual (device capability) so that you can actually see what's going on". Zoe suggested that countrywide local hubs could be effective as long as they are not located around a public area like a canteen.

From a managerial perspective a standard should also address a requirement for consistent corporate branding. Barry said "a standard approach, now they wouldn't all have to look the same in videos etc., but you would be looking for a fairly standard approach, a kind of a corporate approach to it".

4.4.5 Potential benefits to the organisation

Managers felt that the implementation of a digital learning ecology would be a highly visible investment in staff development with potential to build morale and increase trust between management and staff. As this transport body is also unionised, Aiden said "This could be something that we could get our trade unions behind". Caden said "we could partner with our trade unions whereby if they were offering specific packages to their reps, let's say, it could be provided through our platform". Substantial cost savings are also achievable through decreased travel and hotel accommodation expenses. Other benefits as Aiden said "the cost saving from not needing to run as many in classroom courses ...the fact that your reach is greater, so you can get to a larger number of people in a shorter space of time".

Caden discussed the potential cost savings and other benefits of diverting some of the investment made in developing staff throughout a 40-year career towards e-learning and said it provides "a platform for delivering a higher quantum of learning, which will open up all the benefits for the individual, and the organisation ".

End users identified an opportunity to increase the perceived value of training by the addition of some form of qualification recognition. Many staff are deterred from applying to 3rd level institutions as they do not know if they meet entry requirements, as Darci said "where am I on the totem pole ...where can I go in, that I won't be overwhelmed ...and I'll just give up and throw in the

towel". Korner (2021) describes the use of blockchain technology to allow accreditation between organisations and universities which could provide a solution.

4.5 Technology-related factors affecting development of a digital learning ecology

This theme explores the perceptions of managers, end-users and instructors regarding the role and impact of technology, from current outdated technology to what could deliver the best learner experience in the future, the need for accessible technology for all and the I.T. supports needed such as help features. The organisation has an I.T. department and the functions of procurement, provision of equipment and I.T. support operate through that department.

4.5.1 Views of stakeholders on current and future technology use

All stakeholders share the perception that past investment in technology was lacking, as Aiden said "I think it's probably fair to say we're coming a little late to the party in terms of ...transformational technology".

Managers agree that this is changing, Barry said "we're putting a lot of technology into the system and rightly so". Opinions differ on suitable technology to adopt, for example Caden said "it could very well be feasible or efficient to give everybody let's say a smart device", Barry foresees the adoption of various hardware from android devices to laptops depending on learner and learning requirements, while Aiden said,

> I don't believe smartphones are appropriate for learning ...I think the size of the screen is limited ...a tablet …sometimes the pinching and tapping can be a little bit cumbersome, so my preference, personally, for a learning environment would be a laptop

Managers agree there is an abundance of already tried and tested technology available that would be suitable for use. Barry said "we're not at the cutting edge of this, this road is well travelled by others who have proven that it works".

From the perspective of end users many participants felt that we should be making the best use of the latest modern technology available, Nick said, "let's go with the latest developments ...be leaders in this area …I do think we should always try to push the latest technology, the latest advancements and use it"

Instructors' issues are laptops unequal to the demands of online learning, Xavier said "the issue is the equipment ...I am sitting here …with no camera on because every time I try to turn the camera on, the computer decides it wants to turn itself off". Tam spoke about the planned replacement of laptops this year and said,

> they're not fit for purpose … this lark is archaic to what we should be using … realistically, we should be finalizing a spec for an instructor's laptop that is practical and is capable of delivering the various formats that we want

One of the most critical factors identified by Choudhury & Pattnaik, (2020) as a key responsibility of the organisation is to procure the right, reliable technology within an organisational culture that values and promotes learning.

4.5.2 Accessibility of hardware

Another critical factor is access to devices for e-learning. From the managerial perspective, Aiden said

> one of the enablers of actually having a learning management system is that the availability needs to be there and there needs to be no restriction ...I think the business case to purchase the equipment required in the first instance …would be very easily justified on the cost saving from not needing to run as many in situ in classroom courses

End users described being required to attend online events such as meetings without access to a laptop, Phoebe said "I had to actually go around beg people for a laptop".

Instructors felt that standard issue laptops are unsuitable for online training delivery and hardware is required allowing the instructor to see and hear participants while still being able to use PowerPoint and share screens etc. Aiden discussed the difficulties of trying to engage eight online attendees while looking at and sharing content from a laptop and said,

> it should be delivered from a dedicated office in the training school …something like a 40-inch screen on a wall, that's just there to show you the people's faces, so that as I'm talking to you guys here (laptop), I can look up and see the reaction on their faces

4.5.3 Stakeholders views on I.T. supports required

Navigation roadblocks while a system is new and unfamiliar is a critical issue. Managers believe training is the intervention needed most to ensure ease of use (See section 4.1)

End users agree that difficulties logging on or registering are enough to put learners off, Oscar spoke about 3rd level certificate candidates who simply dropped out because unclear instructions meant they couldn't navigate Blackboard to register. A well-designed, clearly signposted graphical interface with clear instructions on first steps is a key support.

Managers felt that a robust I.T. helpdesk feature is a critical factor, either via phone, an instant messaging pop up window or alternatively, an artificial intelligence solution. Aiden said "up pops your little prompt, do you need to talk to somebody today?" Barry said "If we go to virtual training and people have too much trouble logging in, or, it's not working, or whatever, then everybody loses faith in it ...for our new kit, the I.T. team need to support it".

Instructors highlighted a lack of helpdesk engagement and available software while attempting to transition to online training during Covid_19, Una said "we need a point of contact …we get nowhere with it except banging your head against a brick wall". Will said "there's some excellent material out there … and yet, as a training centre, we've no authority to go out and purchase that application or that learning tool to assist trainers in delivery".

To mitigate those issues Will advocated for the I.T. department to manage the project "we need IT involved as a stakeholder in this from the very start ...we tell them what our requirements are and let them go out and get it". Given Tam's earlier statement about finalising a specification for an instructor laptop, perhaps the way forward is to put together a specification for training software and equipment for the I.T. department to supply.

4.6 Design for digital learning

This theme explores the perceptions of managers, end-users, and instructors regarding the factors necessary for effective online learning such as properly structured and timed courses, the blending of synchronous with asynchronous learning where necessary, full use of interactive features and media available and effective assessment.

4.6.1 Re-design of course structures required

Many felt that existing training transitioned unfavourably to online when transposed without modification and that online training is more effective in smaller chunks.

From a managerial perspective Barry talked about being able to impart the "salient message" and said,

> I suppose it comes back to not that a course has to be two weeks long, but what's the value of that course? ...I think we will be moving away from a course having to be a certain duration ...into the space of courses hitting key markers

Caden raised the issue of time in front of a screen "live webinars ...they're a two-hour block" and agreed that's about the duration learners can "endure online".

End users shared examples of courses that did not transition well online and described it as too much information coming at them too fast without a chance to participate and practice. Henry said "to deliver any course there has to be a proper timeframe ...if you're going to try and ram that down someone's throat, it's not gonna work". Oscar advocated chunking learning into smaller, manageable modules for novice learners that could then be linked to form a larger learning piece.

Instructors discussed the difficulties that would be encountered in transferring what is currently a 20 week in classroom train driver course to an online environment and Tam described it as "just not practical to deliver that amount". Instructors also discussed some online training during Covid_19. Una said "When we deliver training, we have clear output objectives ...based around protocols and standards ...but we don't seem to have anything like that involved here"

4.6.2 The concept of blended learning

Most participants were keen to clarify that the function of e-learning is to augment traditional in-classroom learning, not replace it, for example Caden said "I think there is a hybrid …. it doesn't remove the need on occasions to have the classroom environment for face to face". Discussions about blended and hybrid learning models arose across all stakeholders. The meaning of these terms seems to differ for individuals into two broad definitions, for some it means learning synchronously by mixing live sessions both in a classroom-based environment and an online, while

others see it as meaning learning online, again either synchronously or asynchronously, but using a wide variety of tools.

Managers believe that while the future of training and development is some form of learning management system and online learning, but this should not replace traditional classroom-based training entirely. Aiden talked about onboarding new staff and how they form an understanding of the culture of the organisation, and said,

> Culture is something that you can only get by being engaged with people who are already in the company …so I think there are some areas where an online intervention will have limitations and culture is probably the single largest example of that

Similarly, with safety related training, it was felt that while safety training could be provided in some form online, it is essential that real-time, live safety training happen in a face-to-face traditional setting as the learning cannot be truly appreciated as Aiden said "until you're on the ground or on the track … where there is a training intervention taking place, a live training intervention ...that's where the hybrid model, I think, will evolve"

End users focused on the need for synchronous and asynchronous sessions with a mix of materials incorporated, Henry said "I think any coursework should be done incorporating all those learning mechanisms, visual, touching, listening, interactive Q&A, continuous assessment, and also have the videos, or the lectures available for them to dip in and out of" and Oscar said "courses, they've changed big time, quizzes and every sort of thing built into courses which are engaging"

4.6.3 Necessity for effective assessment

Barry stressed the importance of ensuring clear understanding with learners "so do they understand the five principles of shunting? …can they demonstrate it?". Caden who discussed the possibility of issuing smart devices to staff included the function of assessing competencies through the device, so from a managerial perspective, it appears that the assessment of learners understanding is as important as training.

End users were more focussed on assessing understanding than pass or fail grades. Henry said “some kind of general assessment ...not to give you a mark out of 100, but just to actually test that you're absorbing what you’re supposed to be getting”

Instructors’ dislike of e-learning seems bound to their belief that effective assessment cannot happen remotely, Tam’s experience with online training assessment is “understanding and confirmation of understanding wasn't there because there was nobody there to police that understanding”. Una similarly said “even if you do get the right answer, how did you come to that answer, what's your understanding behind it”. I believe that this further supports the requirement for training for instructors in new technology (section 4.3.4) as a critical factor for the successful implementation of a digital learning ecology. Sridharan et al., (2010) found that comprehensive instructor training is required to overcome barriers of resistance and ensure instructors embrace the use of technological innovations for scaffolding learner-centred learning.

4.7 Conclusion

This chapter presented the findings and results of Interviews and focus groups with stakeholders across different levels of national transport body, Manager, instructor / HR, and end user. Findings are presented in sections that correspond to primary themes extracted from the data, sub themes within each are expanded upon to provide insights and context to each theme. In the next chapter the researcher expands upon the research questions posed and considers how this study has addressed them.

Chapter 5: Conclusion

5.1 Introduction

This chapter details the conclusions of this study based on the main research question, what are the critical success factors for development of the digital learning ecology in a national transport body? To achieve this the researcher explored the experiences and viewpoints of stakeholders across levels of the organisation through three semi structured interviews and three focus groups to glean insights into several key sub questions. This chapter discusses the attitudes of different stakeholder groups to e-learning and development of the digital learning ecology, it explores what roles different stakeholder groups can play in the development of the digital learning ecology, it describes the requirements of different stakeholder groups in the development of a digital learning ecology, the limitations of this study, recommendations for further research and the implications for policy and practice.

5.2 Research conclusion and contribution

This study confirms much of the existing research regarding factors among stakeholders which are critical to the successful implementation of e-learning and a digital learning ecology, factors for success such as creating awareness of technology, motivation and changing learners' behaviours (Bhuasiri et al., 2012), perceived usefulness, lack of instructional designer (Farid et al., 2018) and technology or system in use (Asalla et al., 2017). Almarashdeh et al., (2011) and Alsabawy et al., (2013) attribute limited instructor utilisation of LMS as negatively impacting learners' use, and both Asalla et al., (2017) and Sridharan et al., (2010) identify comprehensive training for instructors and learners as key to overcoming barriers of resistance to the acceptance and use of a system. Similar results are found in studies that focus on different stakeholders such as social presence as the main concern for learners, learner motivation the critical factor for instructors, Interactivity is the single largest factor for designers with other contributing factors such as customisation, interoperability and interface design and for the organisation, perhaps the most critical factor of all,

to ensure the right technology is put in place in an environment that supports learning (Choudhury & Pattnaik, 2020). It is obvious that the importance of these factors is dependent on the participants' perceptions and even role within the organisation. This study focussed on critical success factors from the viewpoints of manager, instructor, and end user.

The first sub-research question addressed by this study was what are the attitudes of different stakeholder groups to development of the digital learning ecology?

Participants made it clear that the majority view the implementation of e-learning through a digital learning ecology as a positive step. Managers believe that it can be a valuable resource with transformative potential for learning and development within the organisation. They believe that Covid_19 has proven this is a step that can be successful and has overcome many barriers to online participation. They highlight the value of a hybrid learning model as most managers recognise an ongoing requirement for in-class, in person training given the safety critical nature of the knowledge required for certain roles and the culture of the organisation.

End users are positive about the adoption of such technology provided that their feedback is considered and appropriate changes to duration, design and style of training are made. They believe that traditional 6 / 7-hour training sessions are incompatible with online and learning needs to be chunked into smaller, manageable sessions. They unanimously agree that a high level of social interaction is the key to ensure the success of online learning and a digital learning ecology. This is supported by the research of Farid et at., (2018) who identified lack of instructional designer and design process as a critical factor hindering the quality of digital learning systems.

Instructors hold very negative views of online learning and the potential effectiveness of a digital learning ecology for anything other than a library of supporting material like rules books or videos for example, Zoe said, "UK drivers are issued with tablets, as part of their equipment which has the rulebook, the appendix … it would save them carrying around a lot of their books". This is a potentially one of the most critical factors and aligns with the findings of Pikhart & Kilmová (2020)

who suggest that Instructors' failure to adequately utilise any digital learning ecology could result in lack of engagement and uptake by learners.

It is clear from the data that there is a widely held perception of lack of support for training, manifested in lack of training for instructors and lack of available technology and equipment necessary for the transition to online delivery of training. This has resulted for some in a perceived lack of effectiveness of online delivery which has created a barrier to the use and adoption of a digital learning ecology. A key finding of the research of Almarashdeh et al., (2011) reveals that lack of acceptance of technology by instructors at the outset poses significant risk to the effective utilisation of a digital learning ecology. Asalla et al., (2017) also identifies training for implementing e-learning as importance for instructors to facilitate effective use of a system.

Almost all stakeholders referenced the influence of the Covid_19 global pandemic in terms of the significant effect it has had on use of technology from organisations transitioning to remote working, online learning and teaching to individuals who in the past may not have adopted technology who have now come to terms with its use for working, interacting with people, learning, and participating in social events. From a managerial perspective Caden said,

> we've got a time now that we can use to leverage off … everybody now has become familiar with e-learning …video content and all that sort of stuff, working remotely, working online, so that provides a potential platform to leverage an E learning solution. So that's one positive that should support just getting the momentum for this type of journey

Instructors' experience regarding the influence of Covid_19 is not a positive one with many expressing that they felt ill-prepared, under-equipped and unsupported when the pandemic necessitated the transition to online delivery for training. Will states that

> we adapted very quickly in order to maintain output. There was no protocols, no kind of quality control on it, there was no I.T. support ...we've been firefighting for a year ...we've pieced together what we've delivered …using the tools, the equipment and the IT solutions that we have available to us

which does not compare favourably "versus where you'd want to take it with an online solution".

The second sub-research question addressed by this study was what role can different stakeholder groups play in the development of the digital learning ecology?

The organisational role must focus on support for and communication with all users. Priatna et al. (2020) identified organisational aspects such as creating a culture and setting necessary policies inducive to e-learning as the dominant factor in the effective implementation of a digital learning ecology.

Key aspects of the role of management are identified as supporting implementation through the development of a detailed project plan with realistic timelines, finalising investment in the development of a digital learning ecology and suitable hardware necessary to ensure staff access. If necessary, engage with rebuilding trust between management and staff, one potential suggestion for this is the development of a detailed acceptable use policy for company issued equipment which demonstrates trust in individuals, provides a commitment to personal privacy and clearly outlines what oversight the organisation may exercise of devices in terms of data protection, virus detection or potential illegal activity etc. Lastly managers have a role to publicly support a digital learning ecology or "talk it up" as one participant described it and it is suggested that training interventions and opportunities for development for staff could be aligned within KPIs for management.

Key aspects of the role for staff involve the growth and development of a digital learning ecology through its' continued use, early adopters will play a significant part in bringing others onboard. Users need to engage with methods of feedback to ensure continual improvement and lastly develop profiles and engage in the creation of learning and development plans.

Instructors have already been identified as a potential barrier to the successful integration of a digital learning ecology. An organisation which fails to address issues impacting instructors' perceptions and utilisation of such technology risks failure. Instructors must be afforded sufficient training in the use of new technology and in how to incorporate it into effective design and delivery of training. Instructors also have a consultancy role regarding the design specifications for appropriate technology, equipment and learning environments.

It may also be relevant to develop a specialist role that can link I.T. knowledge with a learner centric, pedagogically led approach to create an effective environment for technology enhanced learning.

The third sub-research question addressed by this study was what are the requirements of different stakeholder groups in the development of the digital learning ecology?

The data collected because of this question provided rich insights into the difficulties of implementation, and it is evident that there are many requirements for the development of a digital learning ecology. The participants in my study highlight many critical requirements for consideration, such as involving key stakeholders from the outset, people with relevant I.T. knowledge along with those with the pedagogical expertise to ensure any system meets organisational needs. They highlight the need to appoint a project manager and, if necessary, hire outside consultancy, dedicate adequate resources and take the time to create a good realistic plan with aspirational aims. Rebuilding trust between staff and management should be a high priority and should be achieved through clear communications and support by the development and issue of a fair usage policy for digital equipment written in plain language. High priority should be given to promoting the platform and showcasing early successes to create interest, using a company social media platform and other avenues like internal publications to give it as much attention as possible. In addition, the rewarding and recognition of early adopters will help to develop advocates and word of mouth promotion.

Stakeholders require the adoption of advanced technology that has been tried and tested and proven to provide value. They want a flexible platform that integrates the use of different devices according to desired learning outcomes and learner needs. They want that platform to eventually allow for the creation of personal profiles and personal development plans with integrated I.T. support (helpline, live chat window or A.I.), but recommend that the organisation begin slowly on a smaller scale so that learners can adjust to this new environment and build the bells and whistles later. It is critical that any platform is user friendly with a clear user interface and

instructions and that plenty of early feedback is sought from stakeholders, particularly instructors and end users, and acted upon to correct issues before they take hold. Stakeholders expressed a strong desire for a system that is as interoperable with as many other systems and applications as possible i.e., MOOCs, 3rd level and further education, applications like Babble for language learning etc. along with the adoption of an experiential learning recognition tool that allows novice learners to position themselves within the national framework of qualifications.

Stakeholders agree that the development of a quality standard for content control is critical and an administrator is needed to manage that content (fact checking, content compliance, uploads, version and document control, updates, usage tracking, targeted course advertisement etc.) as well as to create a digital library of resources for Instructors and learners.

A high degree of training for instructors around use of technology, course design and assessment is critical in order to integrate online with traditional in-class training as required to support learning outcomes and provide a combination of both in-class and remote training for users as appropriate. The development and equipment of a suitable training environment for the delivery of online training by instructors is also required. Instructors should ensure that online training utilises high levels of peer interaction and discussion opportunities.

As it's not possible to just transfer existing content and have it work, it is believed that we should focus on the content and learning outcomes needed, and make technology fit our needs rather than the other way around. Finally, all stakeholders believe that the organisations should extend access to available training beyond the current restrictions of role requirement and competencies.

Perhaps the suitable option is the use of a Next Generation Digital Learning Environment (NGDLE), similar to what is described by Kortner, (2021) which is a loosely coupled collection of applications, software, and tools, this would appear to be an attractive application of more advanced cloud-based tools and applications for the variety of requirements reported by study participants.

5.3 Limitations

This study, as with many qualitative research studies, has its' limitations. It is not extensive, although a reasonably sized sample was obtained given the time and scheduling constraints of participants, it could be argued that this makes it difficult to generalise as smaller sample sizes may not be a true representation of the population when not randomly selected. In such cases reliability and validity of results depend on the researchers' skill, experience and biases and may have less credibility (Askarzai & Unhelkar, 2017).

O'Leary (2017) discusses how few studies are conducted in an ideal environment, there are always limitations, i.e., time, financial resources, recruitment of participants, researcher bias. Additional interviews or focus groups may have added quality and richness to the findings presented in this study unfortunately there was not enough time to do more given the challenges faced while scheduling interviews and focus groups with participants due to busy schedules.

As this research study is based on a single case study and confined to a single national transport body with unusual demographics, I have considered that it may be more difficult to generalise, although I believe it will reveal richer, deeper data. Not all aspects of this case study can be applied to other contexts however the results are likely to apply to other large national organisations who are considering the adoption of a digital learning ecology.

5.4 Recommendations for further research

The results of this study are helpful for researchers in similar organisations planning the development of a digital learning ecology, however, greater validation might be achieved with further comparative case studies within organisations that share similar cultural characteristics. Creswell (2009) proposes that larger sample sizes significantly increase accuracy and while it may not be possible to include over four thousand people, future research could benefit from an increased sample size.

This study identified the age profile of the organisation as a contributing factor in the acceptance and use of e-learning platforms therefore future research may benefit from some assessment of the relationship between e-learning analytics and demographic factors such as age.

Data collected in this study from interviews and focus groups has provided rich data from which a follow up quantitative survey could be designed using the CSFs identified to distribute to a wider group and gain further insight into factors stakeholders view as critical and to verify and even expand on the findings of this study.

5.5 implications for policy and practice

This study would seem to suggest that the current concept of a LMS is not engaging enough to meet the requirements of all stakeholders. LMS may reduce costs in terms of costs of travel and accommodation, in terms amount of time away from the workplace and numbers of people participating, and while it is a favourable outcome for management, it fails to meet the needs of the learners who want talent and career development engagement and envision an opportunity for a digital ecology with levels of interoperability previously unknown.

There is an opportunity to provide digital learning solutions through an intelligent NGDLE platform. The future for NGDLEs is colossal, with the potential to move traditional LMS toward an ever-more learner-centric environment that focusses on the needs of the learner and their experience. These could facilitate learning, training, and development not just within organisations but globally, and instructors and system designers should be collaborating now to fulfil this future potential and help create these environments.

These findings will assist this national transport body to focus attention, resources and priorities on managing the CSFs identified for the successful implementation of a digital learning ecology thereby increasing the chances of a successful adoption of such a system.

Instructor resistance may be the biggest stumbling block and requires careful consideration, extensive communication and training for instructors to ensure the successful implementation of a digital learning ecology. An older staff profile would also seem to have considerable implications for digital literacy and self-efficacy when engaging in technology enhanced learning activities and highlights the importance of effective user training. As stakeholders highlight the importance of

early feedback and intervention to ensure successful adoption of a digital learning ecology, a period of user acceptance testing would be vital.

5.6 Conclusion

This chapter presented the conclusions draw within the context of the research questions asked, detailed the limitations of the study, recommendations for future research and implications for policy and practice. I believe that understanding the views, needs and requirements of all stakeholders within the organisation will achieve the best fit between future technology, the organisation, and its' members. This research was at times challenging and frustrating, but It has contributed to my personal development as a researcher as well as to my continuing professional development as an instructor, I began this process as a novice and have developed both a deeper understanding and critical abilities that will, I have no doubt, benefit me in future endeavours. This study will also significantly inform my professional practice as an instructor particularly in the delivery of online training and content.

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Appendix 1

PLAIN LANGUAGE STATEMENT FOR INTERVIEWEES

Plain Language Statement for Research Participants

Introduction to the Research Study

The research working title is "A needs analysis of stakeholder requirements for effective implementation of a learning management system (LMS) in a national rail body".

The research is being conducted by Aisling Whelan, a student on the MA in Educational Practice at the National College of Ireland. Aisling Whelan can be contacted at x19160275@student.ncirl.ie or aisling.whelan@irishrail.ie, or via her research supervisor, Dr. Yvonne Emmett at yvonne.emmett@ncirl.ie.

The many different technologies used for online learning make it difficult to develop a generic definition. Common terms include: Learning Management System, e-learning platform, online learning, remote learning, internet learning, virtual learning, Web-based learning and distance learning. The purpose of my research is to establish if the integration of technology such as an e-learning platform or learning management system is fit for purpose in the formation of a learning and professional development eco-system in a national rail body and if so, to identify the various stakeholder requirements of such a system.

Details of Involvement in the Study

Participants will be asked to be available for one remote interview via Microsoft Teams with the researcher. Interviews should last 30 – 45 minutes.

The researcher will request that interviews be digitally audio and video recorded in order to facilitate data gathering and subsequent data analysis. Participants retain the right to decline the researcher's request to record an interview and therefore withdraw from the study.

Interviews will take place during the end of March/beginning of April 2021.

Potential Risks to Participants arising from involvement in the Research Study

It is not envisaged that there are any risks to participants arising from involvement in the study.

Benefits (direct or indirect) to Participants

It is intended that the outcomes of this study will help inform functional and non-functional requirements and aid decision making when evaluating future technology adoption. Therefore, it is hoped that participants (employees) may indirectly benefit from participation in the study in the future.

Appendix A: Plain Language Statement

Procedures aimed at protecting confidentiality

Every effort will be made to respect participants' anonymity. The data collected will be analysed by the researcher alone. Participants will not be named in the research.
Mobile devices used for recording will have all recordings transferred to a secure server immediately following the event and the recordings deleted from the device. Recordings will be transcribed as soon as possible and all participation data will be anonymised during transcription and prior to analysis. All recordings will be deleted following transcription. Transcripts will be held only by the researcher and only until the completion of this project. Data will be stored in accordance with relevant Irish Data-Protection legislation. The data will be stored on an external hard drive accessible only by me and a personal NCIRL OneDrive account. All consent forms and transcripts will be securely stored. Access to anonymised raw data will be limited to the researcher and, potentially, examiners.

Data Destruction

Data will be retained until the completion of the study. Following this period, all electronic copies of the data will be deleted from all storage sites and all paper copies will be shredded.

Voluntary Participation

Participation in this research is entirely voluntary. Participants may withdraw from the Research Study at any point without having to give a reason and without prejudice. There will be no penalty for withdrawing before all stages of the Research Study have been completed. **T**here is no incentive offered for participating in the study.

Additional Information

It is hoped that a minimum of 3 individuals will be interviewed as one part of this study. All individuals will be employees.

If participants have concerns about this study and wish to contact an independent person, please contact:
National College of Ireland Research Ethics Committee,
EthicsSubCommittee@ncirl.ie

Appendix 2

PLAIN LANGUAGE STATEMENT FOR FOCUS GROUPS

Plain Language Statement for Research Participants

Introduction to the Research Study

The research working title is "A needs analysis of stakeholder requirements for effective implementation of a learning management system (LMS) in a national body".

The research is being conducted by Aisling Whelan, a student on the MA in Educational Practice at the National College of Ireland. Aisling Whelan can be contacted at x19160275@student.ncirl.ie or aisling.whelan@irishrail.ie, or via her research supervisor, Dr. Yvonne Emmett at yvonne.emmett@ncirl.ie.

The many different technologies used for online learning make it difficult to develop a generic definition. Common terms include: Learning Management System, e-learning platform, online learning, remote learning, internet learning, virtual learning, Web-based learning and distance learning. The purpose of my research is to establish if the integration of technology such as an e-learning platform or learning management system is fit for purpose in the formation of a learning and professional development eco-system in a national rail body and if so, to identify the various stakeholder requirements of such a system.

Details of Involvement in the Study

Participants will be asked to be available for one focus group via Microsoft Teams with the researcher. Focus groups should last 45 minutes – 1 hour.

The researcher will request that focus groups be digitally audio and video recorded in order to facilitate data gathering and subsequent data analysis. Participants retain the right to decline the researcher's request to record a focus group and therefore withdraw from the study. Focus groups will take place during the end of March/beginning of April 2021.

Potential Risks to Participants arising from involvement in the Research Study

It is not envisaged that there are any risks to participants arising from involvement in the study.

Benefits (direct or indirect) to Participants

It is intended that the outcomes of this study will help inform functional and non-functional requirements and aid decision making when evaluating future technology adoption. Therefore, it is hoped that participants (Iarnród Éireann employees) may indirectly benefit from participation in the study in the future.

Appendix B: Plain Language Statement

Procedures aimed at protecting confidentiality

Every effort will be made to respect participants' anonymity. The data collected will be analysed by the researcher alone. Participants will not be named in the research.

Mobile devices used for recording will have all recordings transferred to a secure server immediately following the event and the recordings deleted from the device. Recordings will be transcribed as soon as possible and all participation data will be anonymised during transcription and prior to analysis. All recordings will be deleted following transcription. Transcripts will be held only by the researcher and only until the completion of this project. Data will be stored in accordance with relevant Irish Data-Protection legislation. The data will be stored on an external hard drive accessible only by me and a personal NCIRL OneDrive account. All consent forms and transcripts will be securely stored. Access to anonymised raw data will be limited to the researcher and, potentially, examiners.

Data Destruction

Data will be retained until the completion of this study. Following this period, all electronic copies of the data will be deleted from all storage sites and all paper copies will be shredded.

Voluntary Participation

Participation in this research is entirely voluntary. Participants may withdraw from the Research Study at any point without having to give a reason and without prejudice. There will be no penalty for withdrawing before all stages of the Research Study have been completed. **T**here is no incentive offered for participating in the study.

Additional Information

It is hoped that in total approximately 30 participants will take part in focus groups. All participants will be employees in Iarnród Éireann.

If participants have concerns about this study and wish to contact an independent person, please contact:

National College of Ireland Research Ethics Committee,

EthicsSubCommittee@ncirl.ie

Appendix 3

INFORMED CONSENT FORM FOR INTERVIEWEES

Participant Informed Consent Form

I. Research Study Title

The study in which you are being requested to participate has the working title of "A needs analysis of stakeholder requirements for effective implementation of a learning management system (LMS) in a national rail body". The research is being conducted by Aisling Whelan, as part of the MA in Educational Practice at National College of Ireland.

II. Purpose of the research

Any adoption of technology to manage learning and development of employees in an organisation like Iarnród Éireann requires careful planning and commitment from stakeholders across the organisation.

It is intended that the outcomes of this study will help inform functional and non-functional requirements and aid decision making when evaluating future technology adoption thus achieving the best fit between technology, the organisation and all its' individuals.

III. Confirmation of particular requirements as highlighted in the Plain Language Statement

As stated in the Plain Language Statement, participants in this research will be requested to participate in one 30 - 45 minute interview via Microsoft Teams in March/April 2021, which the researcher will request to digitally audio and video record.

Participant – please complete the following (Circle Yes or No for each question)

Have you read or had read to you the Plain Language Statement?	**Yes/No**
Do you understand the information provided?	**Yes/No**
Have you had an opportunity to ask questions and discuss this study?	**Yes/No**
Have you received satisfactory answers to all your questions?	**Yes/No**
Do you agree to have your interview recorded?	**Yes/No**
Do you agree to anonymised quotations from your interview being used in the study report?	**Yes/No**

Participants' involvement in this study is totally voluntary. As a participant you may withdraw from the Research Study at any point with having to give a reason and without prejudice. There will be no penalty for withdrawing before all stages of the Research Study have been completed.

IV. Arrangements to protect confidentiality of data

Every effort will be made to respect participants' anonymity. The data collected will be analysed by the researcher alone. Neither participants names nor role titles will be used in the research and fake names will be used if direct references are required. All recordings will be deleted following transcription. Interview notes and/or transcripts from recordings will be anonymised. All research data and materials will be stored on an external hard drive accessible only by the researcher and a personal NCIRL OneDrive account.

Appendix C: Informed Consent Form

All consent forms and transcripts will be securely stored in the researchers place of work. Data will be retained until the completion of this study.

Following this period, all electronic copies of the data will be deleted from all storage sites and all paper copies will be shredded.

Participants should note that the research will be submitted for examination and publicly available through NCIs research repository http://norma.ncirl.ie/

V. Signature

I have read and understood the information in this form. My questions and concerns have been answered by the researchers, and I have a copy of this consent form. Therefore, I consent to take part in this research project

Participants Signature: _____

Name in Block Capitals: _____

Date: _____

Appendix 4

INFORMED CONSENT FORM FOR FOCUS GROUP PARTICIPANTS

Participant Informed Consent Form

I. Research Study Title

The study in which you are being requested to participate has the working title of "A needs analysis of stakeholder requirements for effective implementation of a learning management system (LMS) in a national rail body". The research is being conducted by Aisling Whelan, as part of the MA in Educational Practice at National College of Ireland.

II. Purpose of the research

Any adoption of technology to manage learning and development of employees in an organisation like Iarnród Éireann requires careful planning and commitment from stakeholders across the organisation.

It is intended that the outcomes of this study will help inform functional and non-functional requirements and aid decision making when evaluating future technology adoption thus achieving the best fit between technology, the organisation and all its' individuals.

III. Confirmation of particular requirements as highlighted in the Plain Language Statement

As stated in the Plain Language Statement, participants in this research will be requested to participate in one hour long focus group during March/April 2021, which the researcher will request to digitally audio and video record.

Participant – please complete the following (Circle Yes or No for each question)

Have you read or had read to you the Plain Language Statement?	**Yes/No**
Do you understand the information provided?	**Yes/No**
Have you had an opportunity to ask questions and discuss this study?	**Yes/No**
Have you received satisfactory answers to all your questions?	**Yes/No**
Do you agree to have your interview recorded?	**Yes/No**
Do you agree to anonymised quotations from your interview being used in the study report?	**Yes/No**

Participants' involvement in this study is totally voluntary. As a participant you may withdraw from the Research Study at any point with having to give a reason and without prejudice. There will be no penalty for withdrawing before all stages of the Research Study have been completed.

IV. Arrangements to protect confidentiality of data

Every effort will be made to respect participants' anonymity. The data collected will be analysed by the researcher alone. Neither participants names nor role titles will be used in the research and fake names will be used if direct references are required. All recordings will be deleted following transcription. Interview notes and/or transcripts from recordings will be anonymised. All research data and materials will be stored on an external hard drive accessible only by the researcher and a personal NCIRL OneDrive account. All consent forms and transcripts will be securely stored in the researchers place of work. Data will be retained until the completion of this project. Following this period, all electronic copies of the data will be deleted from all storage sites and all paper copies will be shredded.

Participants should note that the research will be submitted for examination and publicly available through NCIs research repository http://norma.ncirl.ie/

NOTE: The nature of focus groups is such that confidentiality cannot be guaranteed. However, participants are asked to confirm they will not discuss what is said in the focus group outside of the group.

V. Signature

I have read and understood the information in this form. My questions and concerns have been answered by the researchers, and I have a copy of this consent form. Therefore, I consent to take part in this research project

Participants Signature: _____

Name in Block Capitals: _____

Date: _____

Appendix 5

APPENDIX 5: QUESTION GUIDE FOR INTERVIEWS

Interview question guide.

1. What is your experience with e-learning and learning technology? Useful? Engaging?
2. What do you feel is the role of technology in learning and development (L&D) in Iarnród Éireann?
3. How do you feel such technology is perceived overall within the company? User views?
4. Where and how do you see technology being used for L&D? Do you think it is important for the future?
5. Where does technology sit within your L&D priorities/goals for the next 5 years?
6. In your view is there a main audience/group that benefit from use of technology in L&D?
   a. Are there different groups?
   b. Are there different benefits?
7. What features/aspects do you think are critical to encourage people to use technology for L&D?
8. What are the challenges/barriers to using technology effectively?
9. Strengths / weaknesses / opportunities / threats?
10. What kinds of support might be required in order to promote use of technology for L&D?
11. What do you consider the three most important factors in using technology to manage/deliver L&D?

Appendix 6

APPENDIX 6: Question guide for Focus Group – (training, development and I.T. participants)

Focus Group question guide 1.

1. What do you feel is the role of technology in learning and development (L&D) in Iarnród Éireann?
2. What is your experience of using digital technology for learning & Development?
3. How would you like to see technology used in the future for L&D? (examples: virtual reality/interactive content, blended learning, mobile "on-the-go" learning, gamification, MOOCS, webinars, videos, peer sharing etc.)
4. Who do you think are the main audience/group that benefit from using technology in L&D?
   a) Are there different groups?
   b) Are there different benefits?
4. What features/aspects do you think would be of greatest use in encouraging people to participate in using technology for L&D?
5. What do you feel are the biggest challenges to using technology effectively?
6. What features/aspects would most appeal to you?
7. What kinds of supports would most benefit use of technology for L&D?

Appendix 7

APPENDIX 7: Question guide for Focus Group – (learner and end-user needs)

Focus Group question guide 2.

1. What is your experience of using digital technology in your personal learning and development (L&D)?
2. How would you rate your knowledge of the use of digital technology?
3. How would you see yourself accessing technology for L&D? one location such as a classroom with computers, individual laptops, personal devices etc?
4. What is your opinion of the following uses of digital technology for learning, virtual reality/interactive content, blended learning, mobile "on-the-go" learning, gamification, MOOCS, webinars, videos, chat groups, peer-sharing or a social media platform for sharing resources. Can you think of any others?
5. Do you think there is a main audience/group that can use technology in L&D?
   a. Are there people who are left out?
   b. If so, why do you think that might be?
6. What features/aspects do you think would be of greatest use in encouraging people to participate in using technology for L&D? What features/aspects most appeal to you?
7. What do you feel are the biggest challenges to using technology effectively?
8. What kinds of support would most benefit your use of technology for L&D?